World Apple Review

2017 Edition

Solving the Variety Puzzle

A Publication of Belrose, Inc.,
World Fruit Market Analysts

1045 N.E. Creston Lane, Pullman, WA 99163-3806

TEL: 509-332-1754 **FAX: 509-334-5209** **Mobile:509-432-5258**
E-mail: belrose@pullman.com **Web address:** www.e-belrose.com

World Apple Review
2017 Edition

FOREWORD

Welcome to the twenty-first edition of the World Apple Review. Since our last edition appeared, dramatic events have occurred in the worlds of politics, business and trade that could bring long-lasting changes to the world apple industry.

Among the most dramatic has been the decision of the United Kingdom to end its four-decade membership of the European Union, long a pivotal player in world trade. It may be years before the full effects of the UK's exit on the EU and the rest of the world becomes clear. Another event that could seriously disrupt the global order is the ascension of Donald Trump to the presidency of the United States with the goal of reversing many long-term U.S. domestic and international policies.

While the influence of the United States and the European Union has been waning, China, the Russian Federation and many smaller countries are rebelling against the postwar western consensus that favored human rights, democratic processes, free enterprise and free trade. In their view, government's purpose should be to serve the interests of the prevailing regime, rather than the interests of individual citizens. That colors their attitude to international trade and investment.

The world apple industry has also been undergoing substantial internal changes. Firms have become larger, more integrated, more committed to new technologies, and more dependent on innovation to stay ahead of the competition. Their biggest single challenge has been choosing among the many excellent new apple varieties that have been introduced in recent years. The firms that most successfully solve the variety puzzle will be the ones that dominate the apple industry in the future.

The goal of this Review is to help readers focus on those factors that will be most conducive to firm success in the coming decade.

Desmond O'Rourke
President, Belrose, Inc.

World Apple Review
2017 Edition

TABLE OF CONTENTS

CHARTS

TABLES

Solving the Variety Puzzle

The most difficult strategic decision faced by all firms in the apple industry is what mix of apple varieties they should include in their portfolio going forward.

The demand for many traditional apple varieties has been slipping, both in terms of the quantity demanded, and in terms of the prices that consumers are willing to pay. At the same time, a steady succession of new apple varieties has been developed that offer premium prices, at least in the short run. Most of these new varieties have been deliberately restricted in their initial availability and in the rate at which production will be permitted to ramp up.

The sponsors of these “club” or “managed” varieties also are selective about which producing areas, or individual producers, will be allowed access to their exclusive variety. They charge hefty admission fees per acre or per hectare to the chosen producers. In addition, they charge producers fees for production, marketing and promotion for each unit of the variety produced or marketed. The implicit contract is that the club managers will use their control of production, marketing and promotion to generate price premiums that exceed the cost of club membership. In turn, club members will receive higher net income than they could obtain with traditional generic varieties.

On its face, the decision to invest in a new variety would appear to be incontestable. However, the reality is much more complicated.

The first challenge is that most apple producers around the world depend overwhelmingly for their current income on traditional varieties that have many years of productive life remaining. Planting a new variety will require them either to acquire additional land, or, if that is not possible, to remove some established, profitable, plantings.

Planting a new variety will involve both substantial costs and risks. A top quality new planting may require an investment of US$50 to $60,000 per acre, ($123,500 to $148,200 per hectare) depending on such factors as land costs, planting systems and rootstocks used, density of plantings, irrigation systems and weather mitigation systems employed. The producer must be able to generate the needed capital from earnings from the existing orchard or from borrowing.

Ironically, producers whose orchards are already highly profitable are most likely to be able to generate the needed capital from their existing resources and to also be able to borrow additional capital from outside sources.

In many producing districts in many countries, neither of these conditions exist. Apple producers are only marginally profitable, and outside loans to producers are either not available, or cost prohibitive. In some countries and some regions, governments have provided subsidies to producers for replant programs in which older varieties are removed and newer varieties planted. However, producers must still provide a substantial share of the additional capital needed.

In emerging markets, many producers had been hoping for an influx of foreign capital to help revitalize their orchards. However, that capital has been much more limited than expected. In the absence of government assistance or foreign capital, only a few producers in these countries have been able to find inventive solutions to finance modernization of their orchards.

Producers also face the choice of employing their scarce capital in a new variety, or in additional plantings of a familiar variety, where the potential costs and returns are better known. If they have been following good replacement policies in the past, they will have made provisions for experimentation with newer varieties. However, many producers have not had consistent replacement policies.

Many producers in many producing districts and countries also face limitations on their access to most new varieties. Prior to full commercialization of any new variety, sponsors now establish test plots in various microclimates and growing districts around the world. Based on those tests, sponsors usually restrict plantings to a limited number of most favored areas. For many years, the best new varieties were only made available in a few locations in the western United States, southern France, northern Italy, Chile and New Zealand.

In response to that limitation, the apple industry in many other countries and districts funded breeding programs with the specific goal of finding new varieties suitable to their growing conditions. However, the new varieties developed from such indigenous programs were often made available only to local producers.

More recently, there has been an explosion in the number of public and private breeding programs generating new apple varieties. A global marketplace for new varieties has developed. In this marketplace, breeding programs attempt to build international networks for their progeny, while major producers and marketers bid against each other for the geographic rights to the best new apple varieties.

However, in that marketplace, the better capitalized producers (usually integrated producer-packer-marketers) have a distinct advantage in bidding for the most desirable varieties. In turn, the breeders of previously successful varieties have a distinct advantage in seeking bids for their latest offerings.

However, each investor in a new variety must face a broad spectrum of risks. The first risk relates to how the variety will perform in the orchard and climate conditions where it will be planted. Even here, there will be varieties that perform well or poorly in early seasons, but have the opposite results in later seasons. A good example of that phenomenon was the Honeycrisp variety, which disappointed many early adopters, but became a highly successful variety as operators learned how best to grow, harvest, store and pack it. Other new varieties have impressed early, only to disappoint as trees matured.

A second risk relates to how patient the operator should be with any new variety. The high establishment costs for a new variety means that the operator is under strong pressure to persist with that new variety even when it is not performing as expected. Ideally, a grower should have objective performance standards (such as average yield and first class packout) that a new variety should meet in each year of its establishment. If trees fail to meet these standards, they should be pulled, and the experiment terminated. However, younger trees can be particularly fickle in the yields they generate in their early years, and differences in weather from year to year can affect actual yields obtained.

Another set of risks are associated with the various steps needed to prepare a new variety for market. This includes responding to the correct biological signals that the variety is ready for harvest, determining the optimal frequency of harvest picks, adjusting to the variety's special handling or transportation needs, determining the variety's susceptibility to storage disorders, finding the storage regimes that best preserve quality, and using treatments like SmartFresh to extend storage life.

While the risks faced in the orchard and in preparation for market are substantial, they are also risks that most operators find manageable. Producers and packers can draw on their own experiences with similar varieties, or learn from their neighbors, local extension agents and private consultants. Club sponsors often offer advisory services. Many growers and packers can share information with colleagues around the world through the internet or published fruit journals. The more progressive ones frequently travel to other countries, either on private missions, or for international meetings, where they can see first-hand how other operators handle the new varieties.

However, the biggest challenges for producers of new apple varieties are likely to come in the marketplace. In higher income markets, both within countries and between countries, retailers have tended to welcome new apple varieties because they bring excitement to their product offerings and because they can be sold at premium prices that generate greater revenue per store than traditional varieties. There is also a small core of consumers that avidly seek out new varieties to experience new tastes and are willing to pay premium prices for that indulgence.

However, there are currently finite limitations in many countries to how many supermarket chains are willing to stock new premium-priced varieties, and how many consumers are willing to pay for such varieties. The critical question for the apple industry will be. “As more and more new varieties attempt to enter the premium-priced market, will retailers continue to expand the space they are willing to allocate to these new varieties, and will more and more consumers be willing to pay premium prices for an increasing number of new varieties?”

Retailers’ willingness to expand space for apple varieties will be heavily influenced by the role they see produce playing in satisfying their customers. Limited assortment, discount retailers, like Aldi, tend to carry a minimal selection of apple varieties and packs. In contrast, superstores and hypermarkets with upscale customers may have an expansive approach to stocking apple varieties. Chains like Costco, that also serve upscale customers, but have a discounting focus, tend to stock large packs of a limited number of mainstream apple varieties and an occasional new variety. Many other retail permutations exist with different goals for their apple selection. However, the prevailing trend in food retailing is away from supercenters and towards smaller stores that will have physically less space for apple selections.

A related issue will be what market segments or market niches the new variety aims to serve. For example, the Envy apple is seeking wide distribution in North America, Europe and Asia. Its sponsors believe that it will be able to supplant existing mainstream varieties like Gala while retaining a price premium. The sponsors are betting that more consumers will be willing to pay more for a variety that provides superior taste and texture. Other new varieties have been aimed at seasonal niches that allow the retailer to maintain excitement in the produce shelves by rotating varieties. From the marketers' perspective, if consumers clamor for more supplies of the variety, production can be increased to make supplies available for a longer window. Other new varieties, such as New York state's SnapDragon, that are grown in one region, can use the "buy local" appeal. Many major marketers, that now have a portfolio of new varieties, in addition to mainstream varieties, will be challenged to justify different sets of varieties to different retailers.

The ultimate determinant of the fate of new apple varieties will be the preferences and decisions of many different consumers. Very little is known about how consumers make their choice of apple varieties, how loyal or disloyal they are to particular varieties, or how they decide how much they are willing to pay for any particular variety. Limited information is available from the annual "Fresh Trends" study conducted for the Packer newspaper. In the 2016 survey, in response to the question of what varieties consumers prefer to purchase, 18% named Red Delicious, 12% each named Fuji, Gala and Granny Smith, and 11% named Honeycrisp. No other single established variety reached 10%. Less than 1% of consumers mentioned any other variety, a category that would have included all the new club varieties. Thus, the share of consumers that preferred any of the newer club varieties would have been very small indeed.

For any single new variety to expand the number of its loyal consumers in a meaningful way will require that the variety has a memorable name, distinctive appearance, a convincing story and strong merchandising, packaging and promotional support from its major marketer. The major marketer will have to win the backing of a significant proportion of major retailers. However, all other major marketers will also have their own selection of new apple varieties, so competition for the retailer's business will be intense. The more intense that competition, the more concessions marketers will have to make in terms of promotional support, or, in some cases, reduced prices. Thus, the proliferation of new apple varieties will lead to downward pressure on the price premiums any single one can obtain.

Another casualty of the proliferation of new varieties will be the shelf space retailers are willing to provide to established varieties. Many retailers have begun to trim the shelf space they are willing to allocate to second tier varieties like Braeburn, Jonagold and Cameo. However, if the new varieties are to meet their sponsors' ambitions, it will probably mean reduced allocations of shelf space for current, major varieties like Red Delicious, Golden Delicious, Granny Smith, Fuji and Gala. Unless supplies of these varieties are curtailed in step, it will lead to downward pressure on their prices. Such falling prices would counteract the gains to be made from the new premium varieties.

The coming surge of new apple varieties appears inevitable. Producers, packers and marketers will face a difficult balancing act. Those that can add profitable new varieties without sacrificing too much profits on existing varieties will continue to be successful. Those who fail to achieve that balance will face an erosion of their profitability. This could be the single biggest issue facing the apple industry in the next decade.

The rest of the World Apple Review will examine many other issues that could have a significant effect on the global apple industry. Among the broad aspects to be discussed will be:

I. Past apple production for each country and the world.
II. Future production, in total, and by variety.
III. International trade in fresh apples.
IV. Consumption of fresh apples.
V. Prices and marketing margins.
VI. The processed apple sector, and
VII. Other critical issues for the world apple industry.

Each section presents and interprets the latest data on world, regional, 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 the most relevant information.

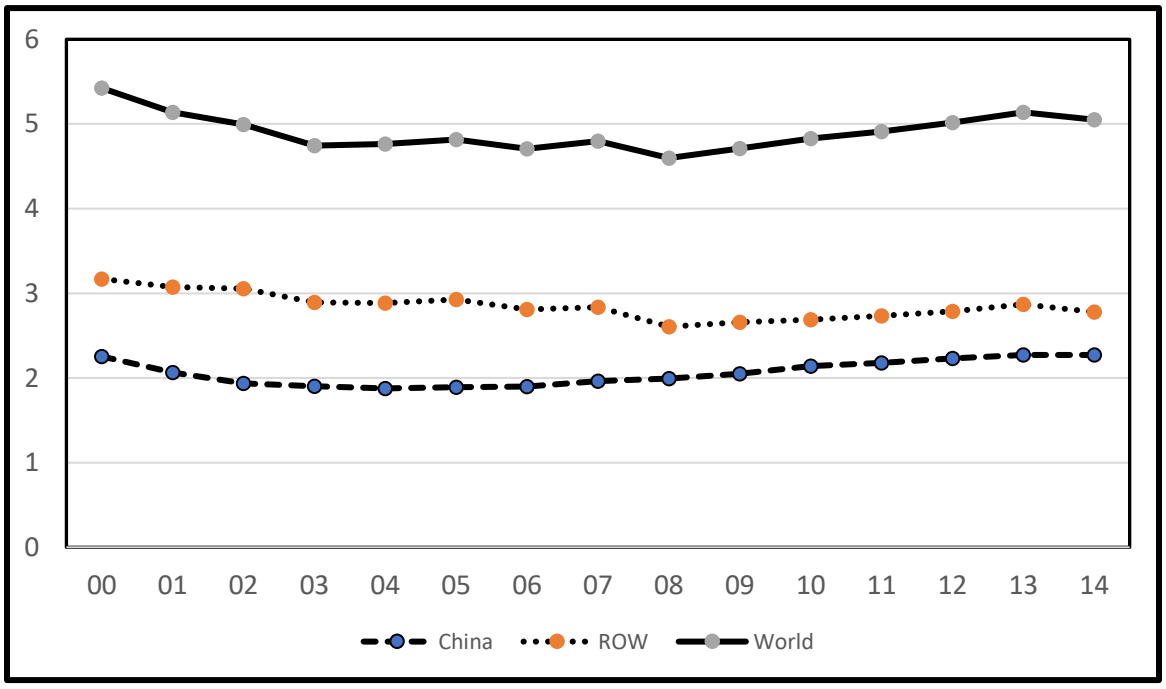
We apologize in advance for any errors or omissions. We hope that readers will bring these to our attention so they can be corrected in future editions.

I. Past World Apple Production

Forces Driving World Production Upwards

Numerous factors have been driving world apple production continuously upwards. Among the two most powerful have been increases in harvested area, and increases in average yields per hectare harvested. UN,FAO data on these phenomena are only available through 2014, but information from other sources suggest that these trends have persisted at least through 2017. The chart below shows that harvested area was trending downwards in both China and the rest of the world in the first few years of the twenty-first century. The level stabilized in China in the middle of the decade, and has risen gradually since. Preliminary data from USDA,FAS indicates that the upward trend continued at least through 2016. The major driving force in China has been the rapid growth in the economy which has enhanced the incomes of many in the middle and lower classes, and enabled them to add more low-priced fruit to their diets. Fresh apples have been among the most plentiful fruit available year-round.

World: Area of Apples Harvested, 2000-2014
(million hectares)



In the rest of the world, the downtrend in area harvested did not end until 2008. Since then, there has been a modest upturn, largely in response to improved returns for fresh apples. Prior to that turnaround, returns in apple production had been inferior to those in pears, sweet cherries, kiwifruit and other competing fruits. Apple area had also been affected by major structural changes in orchard ownership and management in the previous decade. Many smaller producers, with limited capital, had withdrawn from the industry. An increasing share of orchards was in the hands of large, integrated operators that could generate capital from their related packing, storage and marketing operations. In many cases, they were able to acquire large blocks of level land that had not previously been planted to fruit crops.

Despite the recent favorable trends, total area harvested in apples worldwide was still about 7 percent lower in 2014 than it was in the year 2000. In general, the decrease was greatest in countries and growing districts where there was a large number of small, traditional producers. Conversely, replacement plantings were most common in growing districts where large, integrated operations were most prominent.

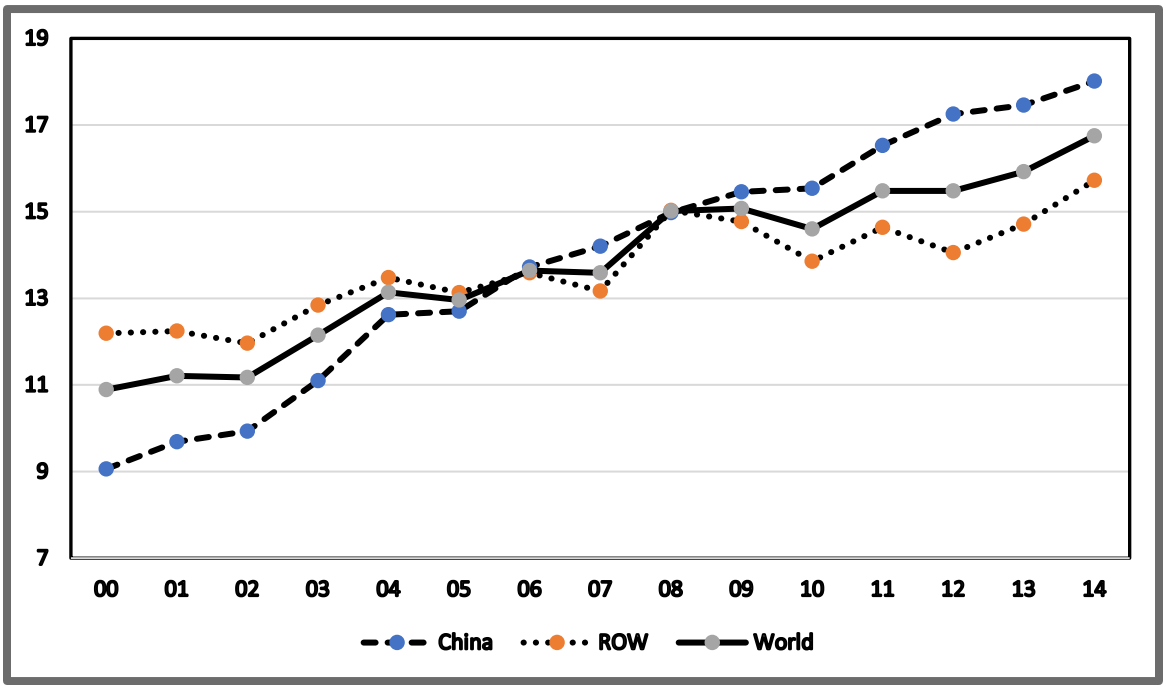
Rising Yields Critical

The second major factor in driving increased world apple production has been the dramatic increases in average yields that have been obtained since 2000, shown in the chart on the next page. Average yields have grown fastest in China. Between 2000 and 2014, they doubled from 9 to 18 metric tons per hectare. China's yields were 26 percent below the average in the rest of the world in 2000, but almost 15 percent above that average in 2014. However, given the maturity of the apple industry in the rest of the world in 2000, the increase in its average yields (almost 29 percent over the period) was quite impressive.

A major contributor to that increase in average yields in the rest of the world was the increased influence of the large, integrated operators. They planted newer orchards in areas where the climate, terrain and water supplies made intensive production more effective. Their plentiful capital enabled them to invest in the most productive rootstocks and cultivars, in improved tree architecture, and in various climate control technologies, such as sprinkler systems and protective canopies, that facilitated earlier production and higher, long-term yields.

Another distinguishing feature of these large operators has been their access to the best current information and technology available throughout the world fruit business. They have been able to maintain both formal and informal contacts with similar operations in other parts of the world and to keep abreast of the latest innovations in fruit production. They have also been able to hire experts in many parts of their apple operations to implement those innovations, whether they involved new equipment, materials or processes. Intense competition between these large, integrated operations to win or maintain the business of major retailers, has led them to continually search the world for innovations that might give them a marketing advantage.

World: Trends in Average Apple Yields, 2000-2014
(metric tons per hectare)



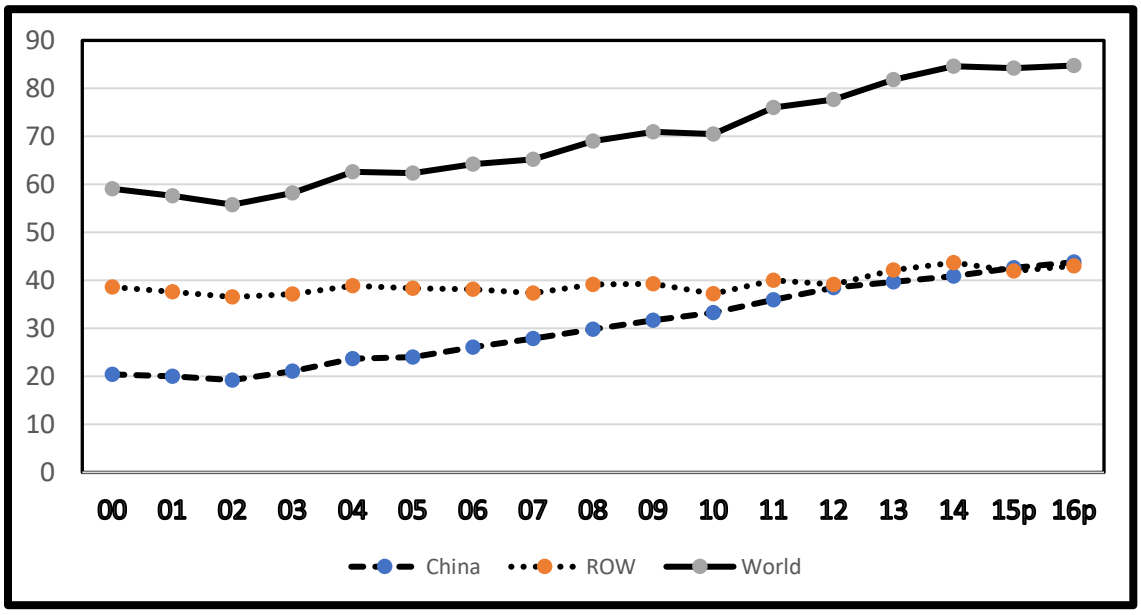
The net effect of these developments in China and in the rest of the world has been a steady upward increase in average world apple yields, from 10.89 metric tons in 2000 to 16.75 metric tons in 2014, an increase of almost 54 percent. Given the forces discussed above, that rise in average yields is likely to continue for the foreseeable future. Finding markets for this increased production will become one of the major challenges for the world apple industry in the next decade.

While the chart above might appear to indicate steady rises in average yields worldwide, there continue to be wide discrepancies in both the level and trend in yields between individual countries and regions. For example, average yields in western Europe, the United States and the Southern Hemisphere have ranged around 35 metric tons per hectare in 2014-2016. China's yields in that period are likely to exceed 20 metric tons. In contrast, countries in the same continents, such as Mexico and Turkey, have had yields ranging in the mid-teens. Yields in many transition countries in Eastern Europe have remained persistently low.

Relentless Increases in World Apple Production

The chart below shows the long upward trend in world apple production between 2002 and 2016. Data through 2014 are from the UN,FAO. Data for 2015 and 2016 are Belrose, Inc estimates. Clearly, the major driver of increased world apple production has been China, whose production more than doubled between 2000 and 2016. Production in the rest of the world broke out of its prolonged stagnation in 2008, moved upward since then, and is estimated to have exceeded 43 million metric tons in 2014 (about equal to that produced in China), before it stabilized in 2015 and 2016, about 15 percent above the last low point in 2007.

World: Trends in Apple Production, 2000-2016
(million metric tons)



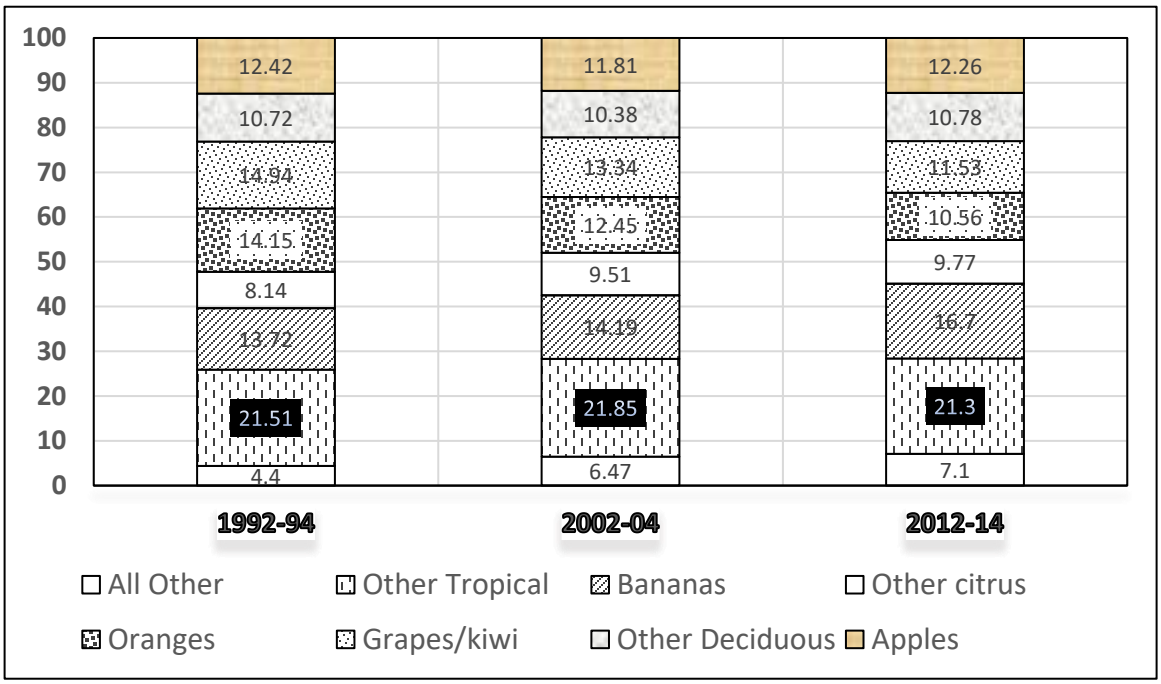
A major contributor to apple production increases in China has been the steady shift of plantings to areas that have a comparative advantage in apple production. In general, these newer areas have higher potential yields than traditional growing areas. In the rest of the world, different countries have been affected by different, often conflicting, forces. In the developed countries of Western Europe, North America, Asia and Oceania, the major positive contributor has been the concentration of production in larger, better financed operations. In contrast, in the many producing countries that have been in transition from central planning to market-oriented economies, the negative legacies from previous political regimes and industry structures have often outweighed any positive effects from improved market opportunities. These countries also suffer from highly variable yields due to their vulnerability to adverse weather.

Apples in the Global Fruit Complex

While world apple production is now on a clear expansion path, the same has been true of overall world production of fruit. UN,FAO data indicate that total world fruit production has grown from 387.4 million metric tons in the 1992-94 period to 499.4 million metric tons in 2002-04 and 663.9 million metric tons in 2012-14, the latest three-year period for which data are available. This equates to a growth of 28.9 percent in the first decade and of 32.9 percent in the most recent decade, from the higher base in 2002-04. This compares with world population growth of 14.7 percent and 11.6 percent in the same two decades. Per capita world supplies of all fruit rose by 12.4 percent between 1992-94 and 2002-04, but increased even more rapidly, by 17.8 percent, in the most recent decade.

The chart below shows how the apple share of world fruit production has changed over the same two decades compared to that of other main fruits and fruit categories. The apple share of world fruit production has hovered around 12 percent of the total, with a slight decrease between 1992-94 and 2002-04 and a slight increase in the most recent decade. Bananas have remained the most important single fruit. By 2012-14, their share had risen to a point where bananas accounted for more than one in every six kilograms of all fruit produced. The share held by the third major fruit, oranges, fell sharply in both decades, and had been substantially bypassed by apples in the 2012-14 period.

World: Share of Production for Major Fruit Groups, 1992-94, 2002-04 and 2012-14
(percent)



Bananas are among the lowest-priced fruits in many markets, fit into the diets of persons of all ages, and are now available twelve months a year. In contrast, oranges have seen their market share shrink by 3.6 percentage points in the two decades as orange consumption is a poor fit for today's mobile lifestyles. The share of grapes/kiwifruit has fallen by a similar amount, largely because of the falling use of grapes in wine production. Consumption of wine has come under pressure from numerous government programs to curb alcohol use, and, in particular, prevent drunk driving. Rises in demand for table grapes and kiwifruit have not been sufficient to halt the overall slide in the grape share of fruit production.

The share of total fruit production in alternative fruit categories has either risen or been stable over the two decades. The share of other citrus gained the most over the two decades, by over 1.6 percentage points, while that of other deciduous and other tropical fruits has been relatively flat. The share of all other fruits not fitting neatly in the deciduous, citrus or tropical categories has also continued to rise.

Berries have been included in the All Other fruit category in the chart above. The berry share of fruit production rose from 0.9 percent in 1992-94 to 1.23 percent in 2002-04 and 1.60 percent in 2012-14. However, since the average price of berries is twice or more the average price of all other fruits, berries play a more important role in the world fruit business than the production share would indicate. For example, berries occupy a bigger share of produce shelf space than their share of world fruit production would suggest. Notably, the share of All Other fruit, excluding berries, has risen from 3.5 percent in 1992-94 to 5.25 percent in 2002-04 and 5.5 percent in 2012-14 as more and more non-traditional fruits are now regularly featured on produce shelves in both the developed and developing world.

Factors Affecting World Fruit and Berry Production

Factors on both the demand and supply side have contributed, and will continue to contribute, to the rapid growth of total 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 explore both purchasing a greater number of different kinds of fruit and also greater diversity within each fruit category. The increase in sales of club apples ties into that second motivation. Whether they live in the tropics, semi-tropics or temperate zones, consumers have embraced the opportunity to try products from other regions.

Consumer preferences have been enabled by food retailers who have made shelf space available for more types of fruits and have cooperated with producing countries in promoting fruit diversity. Medical and educational authorities have encouraged greater consumption of fruit, regardless of the source. Food editors, and their food writers, have extolled the virtues of different fruits, and shown consumers how to store, handle and serve unfamiliar fruits. Despite these favorable forces, most experts agree that consumers still fall far short of consuming the ideal amount of fresh fruit, so promotional campaigns continue to be needed.

Numerous forces on the supply side have helped world fruit production to expand. In normal conditions, successful producers can reinvest profits in added acreage and production. Larger producers then tend to integrate forward into packing, storage or marketing activities on behalf of themselves and other operations.

While net returns at the producer level tend to fluctuate widely in response to supply changes, returns for packing, storage and marketing fees tend to be more stable. These operations also tend to do best when supplies are plentiful and producer prices are most depressed. As a result, integrated operations have done best at accumulating the capital needed to introduce new apple varieties and new production, packing, storage and marketing technologies. Integrated operations are likely to play a major role in the continued expansion of world fruit production.

Governments, and national and international development agencies, have also seen what a large boost fruit production can give to rural development projects compared to the boost that could be generated from 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. Public development agencies can usually provide the capital needed to establish perennial crops like apples or other tree fruits. Another advantage for government agencies is that the outcome of many development schemes is not known until many years later when the original proponents are no longer in office. The confluence of supply and demand factors favoring increased world fruit production shows no sign of abating at present.

Imports as Indicator of Changing Fruit Preferences

Data on consumer purchases or 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 of it is shipped across international borders from different climatic zones. Thus, trade is an excellent indicator of how consumer preferences for fruit are changing. Because most global apple production is aimed at the fresh market, our focus here is primarily on fresh fruit shipments. 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 member countries 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 fresh fruit.

EU-15: Imports of Selected Fruits, 2000-2016
(1,000 metric tons)

Fruit Group	2000	2005	2010	2012	2013	2014	2015	2016
	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)
Bananas	5,057	5,093	6,198	6,242	6,719	6,879	7,041	7,331
Melons/Watermelons	1,124	1,445	1,662	1,682	1,727	1,801	1,994	2,077
Dates, Figs, Pineapples	973	1,661	2,171	2,158	2,194	2,448	2,396	2,663
Grapes	1,474	1,724	1,719	1,653	1,708	1,679	1,702	1,678
Citrus Fruits, Fresh	5,017	5,304	5,451	5,428	5,616	5,262	5,695	5,814
Fruits, NES, Fresh	1,085	1,366	1,425	1,515	1,499	1,509	1,641	1,736
Apples/ Pears	3,383	4,082	3,540	3,381	3,585	3,260	3,273	3,169
Stone Fruit	1,210	1,354	1,284	1,349	1,428	1,390	1,473	1,464
TOTAL Fresh Fruit	17,996	22,029	23,441	23,408	24,476	24,228	25,215	25,932
Total, exc Bananas	12,939	16,936	17,243	17,166	17,757	17,349	18,174	18,601

The table above shows EU-15 imports of fresh fruit for five-year intervals between 2000 and 2010, and annually since 2012. This allows us to identify both longer term trends and more recent patterns. The fruit categories are those defined under the 4-digit harmonized system. They include both products like bananas, that cannot be grown domestically, products like apples and pears, that can be used to complement domestic production, and others, like table grapes or stone fruit, that serve narrow market windows in the importing countries. Because bananas still account for more than one quarter of all fresh fruit imports, the contribution of all other fresh fruits is identified separately in the table.

The EU-15 has long played a special role in world trade in fresh fruit. Many European powers had encouraged their colonies to specialize in production of fruits that could not be grown in the mother country, and gave special preferences to their colonial suppliers in order to stimulate such production. Such preferential access was preserved by the EU-15 in a series of special trade arrangements, such as the Lome Convention. Political, cultural and language ties have also worked to preserve these longstanding ties. As a result, the EU-15 has been by far the largest import market in the world for many fruit categories, and for all fresh fruit categories combined.

As shown in the table, the fastest period of growth for EU-15 imports of fresh fruits was between 2000 and 2005 when imports grew by more than 22 percent, and imports excluding bananas grew by over 30 percent. Every other category shared in the growth. The rate of growth dropped dramatically between 2005 and 2010. Between 2010 and 2014, during the height of the euro currency crisis, while imports of cheaper bananas grew by almost 11 percent, imports of all other fruit categories increased by less than 1 percent. Between 2014 and 2016, imports of bananas grew by 6.6 percent, while imports of all other fresh fruits grew by 7.2 percent. Imports of apples and pears reached their peak in 2005. On average, for the years 2014-2016, they were more than 4 percent below the level in the year 2000. While EU-15 imports of all fruits have increased over time, that has not been the case for apples and pears where the EU-15 has major domestic producers.

Imports of bananas have been relatively more important to the United States than to the EU-15. Although the share has been falling, it was still almost 42 percent of the total in 2016. Imports of fresh fruits by the United States were little affected by the Great Recession, and have moved steadily upwards in all categories except apples and pears and stone fruit. Between 2000 and 2016, imports of bananas rose by 16.6 percent, those of all other fresh fruits by 132 percent. Clearly, imports of non-competitive fresh fruits have risen strongly over time in the United States.

United States: Imports of Selected Fruits, 2000-2016
(1,000 metric tons)

Fruit Group	2000	2005	2010	2012	2013	2014	2015	2016
	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)
Bananas	4,246	4,089	4,361	4.645	4,868	4,892	4,960	4,951
Melons/Watermelons	963	1,028	1,226	1,207	1,381	1,426	1,531	1,674
Dates, Figs, Pineapples	645	1,120	1,505	1,833	2,014	2,202	2,361	2,462
Grapes	484	636	611	555	579	511	595	571
Citrus Fruits, Fresh	362	522	652	746	799	835	984	1,046
Fruits, NES, Fresh	188	265	428	601	609	653	708	775
Apples/ Pears	258	201	254	246	280	290	243	276
Stone Fruit	72	123	99	78	78	51	77	89
TOTAL Fresh Fruit	7,218	7,984	9,136	9,911	10,608	10,860	11,459	11,844
Total, exc Bananas	2,972	3,895	4,775	5,266	5,740	5,968	6,499	6,893

Because of its huge population and rapidly rising per capita incomes, China is often cited as the world's most promising growth market for fresh fruit. However, the table below shows that while China's total fresh fruit imports have risen rapidly, the total volume remains small compared to that of the EU-15 or the United States. China's imports of all fresh fruits grew tenfold between 2003 and 2014, but have since declined sharply. However, even prior to 2014, China's imports of most fruit categories were quite erratic from year to year. For example, imports of melons/ watermelons, and of dates, figs and pineapples, peaked in 2012. Imports of bananas, and of Fruits, NES, Fresh, peaked in 2014, before falling back dramatically in 2015 and 2016. Imports of apples and pears set a new record in 2015 before falling back in 2016. Imports of stone fruit (mainly sweet cherries) have varied erratically from year to year, but did set a new record in 2016. Only fresh grapes recorded gains in every year between 2003 and 2016.

The unfortunate reality is that Chinese officials continue to impede imports of fresh fruits in numerous ways. They have used political disputes as an excuse for temporary exclusions of imports from suppliers as varied as the United States, New Zealand, and the Philippines. Barriers have also been more frequently imposed on items in which Chinese domestic production is important, suggesting that the main goal is the protection of domestic industries. If China is to fulfil its potential as a fresh fruit importer, it will need to discontinue such political actions.

China: Imports of Selected Fruits, 2003-2016
(1,000 metric tons)

Fruit Group	2003	2008	2010	2012	2013	2014	2015	2016
	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)	(1000 mt)
Bananas	386	362	665	626	515	1,127	1,074	887
Melons/Watermelons	41	223	334	457	277	215	201	204
Dates, Figs, Pineapples	3	19	28	171	51	94	95	112
Grapes	48	52	82	168	185	211	216	252
Citrus Fruits, Fresh	70	80	105	126	129	162	218	74
Fruits, NES, Fresh	23	62	115	1,216	1,476	4,145	1,598	1,508
Apples/ Pears	37	48	67	64	55	59	96	67
Stone Fruit	11	12	28	134	64	82	123	154
TOTAL Fresh Fruit	619	858	1,424	2,962	2,752	6,095	3,421	3,258
Total, exc Bananas	233	496	759	2,336	2,237	4,968	2,347	2,371

External Competition for Fresh Apples

In addition to growing competition for fresh apples within the fruit sector there is also increasing competition from many other segments of the food industry. While all foods and drinks can be considered potential substitutes for fresh apples, a few segments can be considered more direct substitutes. For example, instead of reaching for a snack of fresh apples, a consumer may reach for a soft drink or for a packet of potato chips. The major battlefield for fresh apples is in the snack market, as more and more consumers forgo a few formal meals in favor of numerous snacking occasions throughout their day.

A wide array of food manufacturers caters to that snack market. They include both some of the largest consumer goods manufacturers in the world and many times more smaller companies that have developed products to tap specific market niches. The large manufacturers have sophisticated research, development and commercialization divisions geared to expand, adapt or strengthen their snack product lines. They also have widespread distribution systems in traditional grocery stores, restaurants, schools, colleges, hospitals, sporting venues, and other institutions, and increasingly, in sophisticated automatic vending machines. They have continuous promotional programs for their products and the ability to utilize the latest social media in their campaigns.

There is also a symbiotic relationship between the large and small snack food manufacturers. The smaller manufacturers attempt to compete by finding niches not currently served by their larger competitors, or by developing new products that add to the choices in a particular snack segment. If these niches or additions begin to offer substantial sales, the larger manufacturers either produce their own versions or, more often, acquire the smaller company, and roll its products into their portfolio. As a result, the snack food and drink market remains very dynamic.

The snack segment is also in continual evolution in response to changing food fads. One of the biggest battlegrounds is over health. Snack food manufacturers have come under assault for having too much sugar or salt or additives in their products, and for contributing to obesity and all the attendant ills of diabetes, cancer, heart attacks, increased medical costs and shortened life spans. In response, they are continually reformulating their products to reduce the criticism, and to use as a basis for positive promotion of those products.

The more that the manufactured food and drink industry attempts to develop a health aura, the more it impinges on the traditional territory of the fresh apple, which has long been associated with healthy eating. The manufactured snack industry has the ability to incorporate any desirable ingredient, such as fiber or vitamins, into its products, and a superior ability to promote that product with different consumer segments. In recent years, the fresh apple industry has disbanded many of the generic promotional programs that would have helped it counter such claims by emphasizing the natural properties of fresh apples.

Fresh apples themselves have faced negative publicity from critics like the Environmental Working Group that features fresh apples at or near the top of its annual "Dirty Dozen" list for being contaminated with chemical residues. At the same time, a number of other foods and beverages have been touting their health benefits. The list of products claiming to be "super foods" continues to grow, and new ones found in the Amazonian Jungle or in some obscure food laboratory are constantly being added to the list.

United States: Value of Shipments of Selected Snack Foods and Drinks, 2002-2015

($ million)

Item	2002	2008	2010	2011	2012	2013	2014	2015
	($m)	($m)	($m)	($m)	($m)	($m)	($m)	($m)
Breakfast Cereals	7,833	9,134	9,286	9,455	9,560	9,794	9,124	8,837
Confectionery	18,216	19,423	21,172	21,987	24,065	24,579	25,542	27,681
Ice cream/Pies/Cakes	14,481	15,664	15,334	15,394	15,064	15,866	16,592	16,347
Cookies and Crackers	9,380	11,095	10,785	10,934	11,151	10,632	11,882	11,028
Other Snack Foods	17,428	25,239	26,369	28,773	30,940	31,983	35,076	36,090
Total Snack Foods	67,338	80,555	82,946	86,543	90,780	92,854	98,216	99,983
Soft Drinks	29,174	34,786	32,599	34,679	36,701	36,684	38,162	38,648
Breweries	17,789	19,479	25,119	26,178	27,864	31,327	30,296	30,325
Wineries	9,026	12,584	14,299	14,982	14,699	14,986	16,982	18,592
Total Snack Drinks	55,989	66,849	72,017	75,839	79,264	82,997	85,440	87,565
Bottled Water	n.a.	6,789	6,422	6,446	7,188	7,322	6,791	6,727

The table above updates one presented in previous issues of the World Apple Review to provide some measure of the size and diversity of the snack food and drink market in the United States. Only the major segments of the snack market are included. The table shows that in 2015, the total food and drink snack market in the United States was approaching $200 billion in the value of shipments. The table also shows how the snack market has grown. Between 2002 and 2008, the value of both snack food and snack drink shipments rose by almost 20 percent. The overall rate of growth slowed markedly between 2008 and 2010 as the effects of the Great Recession were felt. There were notable declines in three categories, ice cream/pies/cakes, cookies and crackers and soft drinks. However, between 2008 and 2014, the rate of growth again matched that in the 2002-2008 period. There were particularly strong gains in shipments of confectionery, miscellaneous snack foods, breweries and wineries. The most stagnant sectors were breakfast cereals and bottled water, reflecting changes in lifestyles in the period.

The table shows the overall size of the snack food and drink market and its ability to grow. However, it also shows that the industry is vulnerable to economic setbacks, such as the Great Recession, to changing consumer habits and attitudes, and to demographic trends. For example, as the U.S. population ages, one would expect sales of breakfast cereals and ice cream to stagnate, and a strong increase in sales of beer and wine.

The shipments of snack foods reported above were valued ex manufacturing plant, close to the wholesale level of the distribution system. For bananas, the equivalent level would be the landed value of imports, which was approximately $2 billion in calendar year 2015. For apples, the equivalent level would have been at wholesale, which was approximately $4 billion in calendar year 2015. Thus, the combined value of shipments of fresh bananas and fresh apples would have been less than the value of shipments of bottled water.

Clearly, fresh apples face formidable competition in the snack food and drink markets in the United States, and in other developed and developing countries. However, apples continue to have a favorable nutritional and health profile, particularly with opinion leaders in education and medicine. Apples have also added to their consumer appeal by the introduction of new varieties with different taste profiles. While it is uncertain which of these new varieties will be successful, their existence has added excitement to the apple category.

In contrast, the manufacturers of snack foods have faced unrelenting criticism for the ingredients they include in their products and for their negative effects on consumers' health. They have made many changes in formulations to satisfy their critics or meet new legal restrictions (such as on trans-fats), but have struggled to satisfy consumers who still expect the new formulations to provide the same tastes and textures of the old formulations. In the past, they have been able to make claims about how natural, organic, authentic or artisanal their products may be, but these claims are being challenged both in law courts and in the court of public opinion. However, because of the size of the snack food and drink industry, manufacturers can be expected to make strenuous efforts to maintain their sales and profits.

Beverage manufacturers have been more successful in avoiding criticism for several reasons. The winery and brewery segments have been able to broaden their appeal by tailoring different products to different market segments. The proliferation of boutique wineries and craft brewers in many localities has won them support from economic development agencies that the large wineries and breweries could not obtain. In addition, their ads urge consumers to drink "responsibly". These developments appear to have muted criticism of the industries for their alcohol content.

Bottled waters have faced seesawing public opinion. They have benefited from the belief that hydration is important for consumer health. Consumers also feel safer drinking from their own bottle than from a communal water fountain. As a result, the availability of water fountains has been reduced in many public places. However, environmentalists have complained about the industry's use of scarce water resources, the littering problems due to plastic bottles, and the wasted energy involved in hauling bottled water long distances when the same refreshment could be found at the nearest tap. The future of bottled water may depend more on prevailing fashion than on the merits of the product itself.

While their competitors face many obstacles, the fresh apple industry will continue to face an uphill fight in competing against large, well-financed, politically connected snack food industries. Given the imbalance in resources, the fresh apple industry will need to be both nimble and progressive to avoid further erosion of its share of the snack market.

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, not all major apple producing countries have shared equally in that growth. The table below shows long-term trends in production between 1995 and 2016 in the fifteen countries that were the largest apple producers in 2016. Data through 2014 are drawn from the UN,FAO FAOSTAT database, while data for 2015 and 2016 are drawn from numerous sources. These data need to be considered as preliminary, and as subject to revisions in the future. In general, data from developed western countries are more reliable than those from emerging markets where statistical collection is less sophisticated. Data for Germany are understated because they do not include Germany's sizable backyard (non-commercial) production.

Top Apple Producing Countries in 2016: Volume of Production, Selected Years

(1,000 metric tons)

Rank 1995	Rank 2016	Country	1995	2000	2005	2010	2013	2014	2015	2016
1	1	China	14,017	20,437	24,017	33,263	39,683	40,923	42,600	43,500
2	2	United States	4,798	4,682	4,409	4,215	4,732	5,185	4,502	4,725
7	3	Poland	1,288	1,450	2,075	1,878	3,085	3,195	3,169	3,400
4	4	Turkey	2,100	2,400	2,570	2,600	3,128	2,480	2,740	2,700
6	5	Italy	1,940	2,232	2,192	2,205	2,217	2,474	2,280	2,282
8	6	India	1,200	1,050	1,739	1,777	1,915	2,498	2,200	2,000
12	7	Chile	850	805	1,300	1,624	1,729	1,757	1,678	1,635
5	8	Iran	1,990	2,142	2,662	1,662	1,693	1,573	1,600	1,600
3	9	France	2,516	2,157	2,241	1,788	1,737	1,532	1,600	1,515
8	10	Russian Fed.	1,200	1,832	1,786	992	1,573	1,624	1,311	1,337
11	11	Ukraine	1,046	648	720	897	1,211	1,085	1,196	1,209
13	12	Brazil	686	1,153	851	1,279	1,231	1,379	1,145	1,100
15	13	Germany	572	1,131	891	835	804	1,116	973	999
14	14	South Africa	518	574	680	724	904	777	863	883
10	15	Argentina	1,146	833	1,206	1,024	979	1,012	834	820
-	-	WORLD	49,309	59,052	62,388	70,503	81,855	84,483	85,347	85,793
-	-	China, %	28.4	34.6	38.5	47.2	48.5	48.3	49.9	50.7
-	-	World ex China %	71.6	65.4	61.5	52.8	51.5	51.7	50.1	49.3
-	-	Top Five %	51.5	54.0	57.5	62.6	64.6	64.3	64.8	66.0
-	-	Top Ten %	65.3	63.7	72.1	74.2	75.1	74.9	74.6	75.4
-	-	Top 15 %	72.7	70.3	79.1	80.5	81.4	81.2	80.5	81.2

Of the fifteen countries listed, eleven had experienced increases in production between 1995 and 2016. The exceptions were the United States (marginally lower), Iran, France and Argentina. The table also compares the ranking among the top fifteen in 1995 and in 2016. Chile and Poland had the biggest improvement in rank between 1995 and 2016, while France and Argentina had the biggest declines.

China remained a standout both in total volume of production and in the rate of growth over the two decades. While it is difficult to verify the accuracy of China's apple production statistics, it appears that Chinese production tripled between 1995 and 2016, and that by 2016, China accounted for more than half of all world apple production. The United States remains a distant second behind China. However, Poland vaulted into third place in 2014 as its production increased by over 160 percent over the two decades. Production in Chile almost doubled over the two decades while that in India grew by two-thirds. Among producers that ranked lower, three, Brazil, Germany and South Africa, had production increases of more than 60 percent.

The table above also shows the changing level of concentration in world apple production. Again, the major influence on changing levels of concentration has been the phenomenal growth of apple production in China. When China is included, the top five apple producing countries increased their share of world apple production from 51.5 percent in 1995 to 66.0 percent in 2016. It is interesting that the top five, excluding China, saw their share of world apple production fall from 23.1 percent in 1995 to 19.0 percent in 2005 and 15.3 percent in 2016. The share of the second five went from 13.8 percent in 1995 to 14.6 percent in 2005 and 9.4 percent in 2016. That of the third five went from 7.4 percent in 1995 to 7.0 percent in 2005 and 5.8 percent in 2016. Despite the influence of China's massive production, the remaining top producing countries still accounted for over half of the rest of world production. Concentration in the world apple industry remains high even outside China.

Many factors, both those that are common to all countries, and those that are unique to individual countries, have contributed to changes in apple production in different countries. The next section discusses the common factors, and a subsequent section examines the factors affecting production in a wide selection of the most important apple producing countries.

Common Factors Affecting Key Apple Producing Countries

Common factors affect apple production in different producing regions and countries. However, these factors are not immutable. They can vary over time as general circumstances change. For example, a pest or disease that wreaked havoc with yields in a specific area can be controlled by newly developed chemicals. Or, a new variety can be developed that can flourish in environments that are warmer or colder than traditional apple growing areas. However, producers have to make investment decisions based on current conditions, not on some new development that will rescue a bad decision.

Quality of the Natural Environment

The biggest, single factor contributing to the success of any orchard or apple producing district is a natural environment that makes apple growing easier and more productive. These attributes do not require any special expertise from the apple grower. They include factors such as the length of growing season, the number of frost free days, the rate of accumulation of cooling or heating units, the soil quality and orientation, air movement, ample water supply, and low pressures from pests and diseases. Orchard blocks or producing districts that score highest on these natural advantages will have the best prospects of establishing profitable and sustainable orchard businesses. The lower the score, the more effort and cost an orchard or producing district will need to commit to offsetting disadvantages. As global competitiveness increases in the apple industry, having a favorable natural environment will separate the successful from the unsuccessful operations.

Enhancing Nature

Many producers have chosen orchard sites because of their proximity to their homes, or because sites were made available by government schemes to resettle veterans or promote rural development. As a result, many orchards have been planted in sites that lack one or more of the natural advantages listed above. For that reason, orchardists, and their supporting research and extension services, have focused much attention on developing various techniques that can mitigate the effects of each disadvantage. These techniques can help producers to improve yield or quality. However, inevitably, they add to the costs of production and make it more difficult to achieve consistent profits. The wider the range of disadvantages, the greater will be mitigation costs. In a world market, it will be difficult for a poor site to ever become competitive with the best sites elsewhere.

Critical Role of Public Infrastructure

The quality and cost of public infrastructure will also be critical to the long-term success of any orchard or apple producing district. Success will also be affected by how well that infrastructure is maintained and funded over time. Among key elements of the infrastructure needed are energy grids and power, dams and water, communications and waste disposal, and farm roads to bring in inputs needed for production and to bring out harvested products. Since markets are often distant from production areas, a broader infrastructure of highways, railroads, bridges and ports is needed to facilitate sales of products to the nation and to the world. Ease of access to the outside world varies widely between different producing districts in different countries.

In developed countries, utility companies can be relied upon to provide the needed power and water at reasonable prices. However, in countries where supplies of inputs can be interrupted at any time, producers often require expensive emergency supplies or backup power units that can add to costs. In countries where utility companies and maintenance activities are funded from user fees, the services tend to be more reliable, but control of costs can be difficult. In many other countries, where the infrastructure is funded from general government budgets, the fruit industry is forced to compete in the political arena for the necessary funds. In recessionary times, securing the funds needed for operations and maintenance can be challenging.

Increasingly, critical infrastructure includes not just physical assets like dams and highways, but also intellectual assets, like plant variety protection, supporting research and extension systems, Wi-Fi connections, information systems, etc. Such infrastructure will become more important in the future.

Advancing Technology

Where orchards or producing regions stand relative to competitors around the world is increasingly dependent on their ability to understand and incorporate new technologies in every facet of their operations. Effective incorporation of new technologies usually requires enhanced knowledge by managers and employees, often requires changes in traditional ways of doing business, and frequently provides new capabilities for monitoring orchard performance. The additional expertise is as important for success as the new technologies themselves.

Handling Facilities

Unlike much infrastructure, handing facilities, such as hauling, storage, packing and processing, are usually provided by private sector operators. 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. In most cases, they are independent companies that handle the products of many producers for a fixed fee. Their increased size makes them able to afford newer technologies to increase efficiency and assure higher quality. More recently, an increasing share of fresh apple volume is handled by firms that carry out all four functions of growing, storing, packing and marketing their own and other producers' fruit. A small number of processors now handle most of the processed apple volume.

Due to their increasing size and technical sophistication, larger packers are now able to more precisely control and monitor their operations and final products, and to meet the increasingly sophisticated demands from their major retail customers and from government regulators for quality assurances of various kinds. In a sense, they are caught in a vicious circle where their technological capabilities have increased customer demands for ever more sophisticated quality controls.

Marketing Infrastructure

Marketing services provided by the apple industry include many legacy systems and numerous systems that have evolved to meet new market needs. They range from individual producers selling their own apples locally through direct markets, to private marketing companies that represent many individual producers and packers, to government controlled agencies that handle different parts of the selling, distribution and promotion activities for a district or country. However, more and more apple sales are now handled by integrated marketing networks. At their apex are large marketing firms that interact directly with numerous retail customers. They market product for their own and other packing operations. In turn, these packing operations pack fruit from their own orchards and from independent apple growers. Once bound mainly by geography, these marketing networks now often cross state boundaries, and frequently supplement their off-season supplies from Southern Hemisphere organizations.

Because of their size and close working relationships with large retailers, these marketers have become the prime interpreters of retailer requirements for their supplying producers and packers. They have become increasingly involved in consumer packaging, promotion, demonstrations, contests, social media and other activities to help retailers move apples more rapidly and profitably off their shelves.

Club Marketing

A decade ago, most integrated marketers supplied retailers with the same mix of established apple varieties. Marketers competed in providing consistent quality and improved services, both of which put downward pressure on their margins. One response to this stalemate was the introduction of exclusive club varieties. Managed newer varieties, especially Pink Lady, had demonstrated the economic advantages of this approach. Marketers gained a temporary advantage by acquiring exclusive rights to newer varieties. In turn, retailers welcomed these newer varieties as a way to increase excitement in their produce sections. However, this provided no particular advantage to any single retailer. In response, marketers began to develop club varieties that could be sold to one, or a small number of, retailers so each retailer could feature an item not available in competing retail stores. Many newer varieties are now in the process of being introduced. It is too early to tell which will remain limited to just a few retailers, or will serve a niche market for many retailers, or will eventually blossom into major varieties in their own right. In any case, the development has the potential to cause major changes in the market for fresh apples.

Capital Availability

Seeking the needed capital for orchard development and renewal continues to be a major challenge for apple producers everywhere. Even at today's low interest rates, the establishment of a hectare of apples can now cost US$150,000. Such funds can be accessed in three main ways, from retained earnings in existing orchards or other businesses, from private borrowings, or from public funds. Larger, especially integrated, operations have a better chance of generating the needed funds from retained earnings, and are also more likely to be considered as good credit risks by commercial lenders. Many countries have been either unwilling or unable to provide public funds for private operations. The public funds that are available rarely cover total establishment costs, so the producer must be able to find additional sources of capital. Thus, the availability of capital will continue to influence which producers and producing districts progress, and which do not.

Labor Availability

Labor emerges as the prime topic in any major discussion of the future of the apple industry in every producing country. Working in orchards is physically demanding and exposes the worker to weather hardships not faced by unskilled or semi-skilled workers in most alternative occupations. In many cases, the only substantial pool of workers for the fruit industry are workers residing in low-wage countries. The gap between pay in distant orchards and pay in the home country is sufficient to persuade such workers to re-locate to a foreign country. However, even that pool of workers is declining due to falling birth rates and the increased availability of alternative employment in industry or services in those same rural areas.

A further problem has been the increased political opposition in many fruit producing countries to even temporary immigration of foreign workers. In the past, many foreign workers often failed to acquire the necessary approvals to legitimize their work status in their new country. As a result, millions of farm workers are stranded in a legal no-man's land where they are subject to arrest or expulsion at any time. Most major apple producing countries have set up legal mechanisms that allow agricultural producers to bring in "guest workers" on a temporary basis for limited time periods. However, because of the heavy bureaucratic requirements and high costs, these programs can only be managed by larger growers.

For these and other reasons, the tree fruit industry has invested heavily in research and development work on technologies that would reduce their labor needs, especially at harvest time. Moving platforms have been developed to eliminate the climbing of ladders and physical hauling of fruit. Developers have promised that robotic pickers will soon be as effective as human pickers. For example, in one system, a robot makes a pass through the orchard and identifies the exact location of every apple. A second robot is then programmed to pass through the orchard picking the apple at each location.

The major challenge facing any alternative to labor is ensuring that the apples are treated as gently as they would be by a human picker. In addition, any robotic pickers or automated picking systems will require substantial changes in orchard layout and tree architecture to be most effective. More capital will be required to substitute for scarce labor, and as previously noted, such capital remains scarce.

Purchased Inputs

As apple industry operations at every level become more complex and sophisticated, the industry needs an ever-widening range of purchased inputs. In the past, that consisted mostly of materials such as chemicals, fertilizer, lumber and steel. Even here, for health and safety reasons, effective, broad spectrum chemicals have been withdrawn from the market and have been replaced with complex cocktails of chemicals that must be combined to provide the same level of pest or disease control. The use of agricultural chemicals remains controversial, and producers face the possibility of losing effective chemicals at any time.

However, most profitable orchards now also require wind machines, hail netting, automated irrigation systems and use of reflective materials. More and more activities are managed and controlled by mobile computers and smartphones, usually linked remotely to centralized control systems. To exploit all the additional data generated, sophisticated analytical systems are required. Support services are needed to keep these devices and systems working.

In advanced market economies, there are numerous competing suppliers of many of these inputs, and they can be secured relatively cheaply. However, they still add to a firm's total overhead costs. They are most affordable for firms that can benefit from economies of scale. Many of these inputs are less widely available and more expensive in emerging or transition economies. Thus, they provide another reason for marginal firms, and marginal producing areas, to exit the apple business.

Role of Food Activists

Among the most vocal critics of agricultural inputs, practices and products are a multiplicity of non-profit organizations that consider food as one of their prime areas of focus. Not content with criticism alone, most strive to change the agricultural industry using an array of tactics. They bring direct pressure on agricultural firms to change. They leverage pressure indirectly through the media, suppliers or customers. They pressure politicians and bureaucrats to make changes in the relevant laws, and they frequently use law courts to win rulings that favor their goals and that place constraints on agricultural firms. Food activists are expert in using publicity (often the more outrageous the better) to serve their purposes. They employ junk science to support their claims, exploit fear to undermine public trust in the targeted industry, and use subtle intimidation, such as boycotts, or threats of boycotts, to stifle opposition.

In general, commodity organizations have done a poor job of countering the claims of food activists. Commodity groups rarely have advance warning about which inputs, which practices, or which products will next come under attack. Many lack the financial or personnel resources to defend themselves on multiple fronts that can be opened simultaneously by different activist organizations. Even large, well-organized farm organizations struggle to debunk junk science or to counter fear mongering. Moderate voices tend to stay out of the fray lest their operations or motives be attacked. As a result, the agenda of food activists continues to place additional legal constraints on agriculture and to stimulate additional demands from retailers and consumers. In addition, the changes that they bring about in the developed world are passed on as burdens to suppliers throughout the developing world. Unless the food and agriculture sector, and the fruit industry, can find a way to mute the effects of food activists, they can expect to remain under attack from many fronts for the foreseeable future.

Retailers, Difficult Partners

Consolidation in the retail food sector has progressed rapidly in many countries. In response, there has been continuing consolidation among apple marketers. Thus, the options available for most apple producers to reach final consumers have continued to narrow. Local or direct market opportunities remain a small segment of the total food market. Most apple sales now require direct contact between large marketers and many times larger retail chains. The more dependent any marketer becomes on any single retailer, the more vulnerable that marketer becomes to a sudden loss of business.

Increasingly, large marketers and large retailers are forced to be partners in supplying fresh and processed apples to consumers. Such a partnership has inherent tensions, since the retailer wants to get the best value for its customers, while the marketer's future depends on delivering a satisfactory return to its suppliers. For the relationship to work sustainably, both parties must understand the other's perspectives, maintain transparency in their operations, build an atmosphere of trust, and work to find a jointly favorable outcome, all of which are easier said than done. The ultimate tension results from the imbalance of power. The marketer can incur relatively more damage from a breakdown of the relationship than can the retailer.

Developments within the retail sector are further complicating retailer-marketer relationships. Prior to the Great Recession of 2008, a few mega-retailers like Walmart, Carrefour and Tesco, were threatening to dominate the food market with their supercenters and low prices. At the upscale end of the market, chains like Whole Foods, Trader Joe's and Waitrose were tapping the growing market for organic, natural, specialty and exotic foods sold at premium prices. Traditional supermarkets in the middle were being squeezed. However, the Great Recession gave a major boost to limited assortment discount chains like Aldi and Lidl. Traditional supermarkets used mergers, acquisitions, store closures and format changes to help fight back. Some re-organized through the bankruptcy courts. Small, local stores filled some of the gaps left by closure of some supermarket outlets. In addition, many other retail formats, such as convenience stores and drug stores, began to expand the selection of food and drink that they offered. Different formats have increasingly encroached on non-traditional markets. For example, Walmart has expanded rapidly into the organic sector, while Whole Foods has fought back by opening its own discount chain, called "365".

Marketers are being forced to decide how they must tailor their product mix to the different potential retailers with whom they can partner. In turn, those decisions will affect the guidance they provide to the growers and packers in their network on how best to serve their retail partners. The networks will be forced to make difficult decisions about how to best prepare for changing affiliations.

Government Reach

While retailers are a highly visible partner for every food business, governments at different levels are a silent, but impactful, partner in all businesses, and especially so, in businesses related to food. In some countries, governments still have direct control of some aspects of the apple industry. However, more usually, government influence is felt indirectly. Through taxation, governments at all levels now spend up to 40 percent of their nation's GDP. In extreme cases like France, that share may exceed 50 percent. Government spending and economic influence is further increased by borrowing. In 2017, many developed countries had debts equivalent to over 100 percent of GDP. Government permits may be required for many business activities. Government regulators have the power to inspect, evaluate, fine or shutter all or parts of a business. Tax authorities apply varied assessments to different parts of every business. Thus, governments have a major influence on the costs businesses face, and ultimately on business profitability.

Concern about government effects on business have waxed and waned. For example, in the 1970s and 1980s, both Democratic president Jimmy Carter, and Republican president Ronald Reagan initiated deregulation measures. Prime Minister Margaret Thatcher promoted deregulation in Britain and in the European Union. However, these efforts met stiff resistance from government officials, union leaders and politicians who had benefited from government expansionism. After the terrorist attacks of September 11, 2001, many government departments extended their remit, usually in the name of fighting terrorism. The economic shocks resulting from the Great Recession in 2008, led government agencies around the world to again expand their activities, for the ostensible purpose of preventing such a recession ever happening again. For example, governments introduced hundreds of "stimulus packages" to get economies moving again and introduced numerous, additional regulations, especially in the financial sector, that affected almost every business. It is still unclear how much these government interventions contributed to solving global economic problems.

In the more favorable environment for regulation after 2008, President Obama signed the Affordable Care Act, a health program that affected every individual and business in the United States, a major program of financial reform under the Dodd-Frank Act, and the Food Safety Modernization Act, which permitted government intrusion in many parts of the produce system both within the United States and among foreign suppliers to the U.S. market. However, one of the main planks on which candidate for president Donald Trump ran was reducing government regulation. This early in the Trump presidency, it is not clear which areas of regulation Trump will target, or how effective his de-regulation effort will be. The forces of resistance remain just as strong as they were three decades ago.

In many other countries, faith in government regulation remains strong. Despite its many problems, the European Commission continues to place its trust in government intervention. In Japan, Prime Minister Shinzo Abe has relied heavily on government instruments to help Japan break out of prolonged economic stagnation. In China, now the world's second largest individual economy, the ruling communist party believes in centralized control of most aspects of China's economic, social and political life, so the concept of de-regulation is not even discussed. Under present conditions, the fresh produce industry cannot expect relief in the near future from government intervention and regulation.

Multinational Influences

Because the apple industry has become so globally interconnected, it is also subject to numerous multinational influences. For example, international trade is governed by regional treaties like the North American Free Trade Agreement (NAFTA) or the EU's Single Market, by bilateral trade agreements, and by the World Trade Organization (WTO). While these trade agreements most directly affect the apple industry, other international organizations, such as the United Nations, and international agreements on issues as diverse as climate change, Law of the Sea, freedom of navigation, etc., have had strong indirect effects.

The WTO was set up in 1995 under the Uruguay Round negotiations of the General Agreement on Tariffs and Trade (GATT), to carry on the GATT's trade liberalization agenda. However, although its membership now includes most nations in the world, the WTO has been unable to execute its ambitious agenda. Many member countries became frustrated by the WTO's ineffectiveness and turned to bilateral or regional agreements. In his last few months in office, U.S. president Barrack Obama negotiated two major regional agreements, the Transpacific Partnership (TPP) with eleven other Pacific Rim countries, and the Transatlantic Trade and Investment Partnership (TTIP) with the European Union. However, his successor, President Donald Trump, was openly skeptical about the WTO, and abandoned the TPP. In turn, the EU effectively shelved the TTIP due to internal opposition, the distractions of the Syrian refugee crisis, and the British vote to leave the Union.

During the Obama administration, China, Russia, Iran and other totalitarian states openly opposed the western consensus on democracy, human rights and free movement of goods, services, investment and people. They turned on its head the view that a government's duty was to serve its citizens. Rather, they argued that it was the duty of citizens to further the goals of the regime, whether that regime was based on state supremacy, as in Russia, religious beliefs, as in Iran, or the sanctity of the ruling communist party, as in China. President Trump campaigned on the slogan of "America First," arguing that existing trade deals had disadvantaged U.S. workers. Ironically, as the United States appeared to be withdrawing from its long-term role in furthering the western consensus, President Xi Jinping of China offered to lead like-minded countries in promoting globalization. It is too early yet to say how the multinational agenda will change as the leading countries adjust their policies. However, the eventual outcome will carry multiple hazards for the global apple industry.

Developments in Specific Apple Producing Countries

While the common factors described above can affect the apple industry in every country, their impact in each country can be affected by the unique situation in each country. For example, laws on employment, wages and social welfare can impact what proportion of the available labor will be willing to work in the fruit industry. In addition, many factors unique to individual countries can affect the progress of the apple industry. These unique relationships are discussed in the next section for many of the largest apple producing countries.

China Still Dominant

The Chinese apple industry continues to be the dominant apple producer in the world. It now consistently supplies at least half of all world production. Although the growth rate of production fell close to 2 percent in 2016, that increase amounts to almost one million metric tons, greater than the total annual production of all but 12 apple producing countries. For many years, the Chinese authorities actively encouraged the apple industry to increase its exports of both fresh apples and of apple juice concentrate. Beginning around 2008, domestic demand absorbed most of the increased production, exports either stagnated or fell, and imports began to creep upwards.

However, since 2015, those trends again appear to have reversed. The growth of the Chinese economy has slowed, unemployment in manufacturing has risen, Chinese consumers have become more cautious, and imports of fresh apples have slipped backward. Fresh exports are expected to set new records in the 2016-17 marketing year, while exports of AJC have begun to rebound.

If China's production of apples continues to increase, and domestic demand for fresh apples stagnates, these trends are likely to create problems both in China and in the rest of the world. In China, they may reduce the profitability of apple production and curb future expansion, a development the rest of the world will welcome. However, they are also likely to lead the Chinese apple industry to increase its emphasis on exports of both fresh apples and of AJC, and to resist further increases in fresh apple imports. This will intensify competition in apple markets around the world. All these developments assume that tensions between China and its neighbors in the South China Sea will not interrupt normal trade flows.

United States Renewal Continuing

The apple industry in the United States made major adjustments in the 1995-2005 period in response to stagnant domestic demand and falling export sales. Many small, marginal orchards went out of business. Much of the remaining orchards are now owned by, or affiliated with, large integrated grower-packer-marketers. These well-capitalized entities invested heavily in new, high density plantings. Such plantings aimed at achieving earlier, and higher, yields because the lifespan of plantings was becoming shorter, and because orchards would need to be renewed more frequently with improved orchard architecture, rootstocks and apple varieties. The results of that strategy became apparent in 2014, when U.S. apple production soared above 5 million metric tons for the first time since 1994. The industry is on target to produce 6 million metric tons by 2025.

However, it has become apparent that it will be difficult to find markets for this increased production. Domestic per capita consumption of fresh apples has been stagnant for two decades. Export markets tend to be more volatile, and easily disrupted by anti-dumping disputes, phytosanitary alarms, temporary bans and logistical barriers. Few export markets offer substantial opportunities for growth, and major exporting countries have tended to target the same best prospects.

In response, major integrated operators have been investing heavily in club varieties that they hope will generate sustainable price premiums. They have been working more closely with retail partners in packaging and promotion to assure the success of their club varieties. However, it is difficult to predict how many club varieties the market can absorb before the price premiums are eroded. In addition, the more successful the club varieties, the greater the price pressure that will be placed on mass market varieties. The shakeup of the U.S. apple industry is likely to continue at a rapid pace, but the winners and losers will be hard to predict.

European Union Predicament

The apple industry in the European Union was already in trouble when it was hit by the Russian embargo in August 2014. Relations with Russia have remained tense, so there appears to be little chance for the embargo to be ended soon. EU producers sustained a further shock when the United Kingdom voted to withdraw from the Union. In addition to being the world's third largest importer of fresh apples, the United Kingdom was also a major importer of fresh apples from other EU member countries, in particular, France.

Early in the evolution of the European Union, the six original member countries adopted a policy of self-sufficiency in agricultural products. The EU sought to keep marginal operations and marginal producing areas in production through high import barriers and domestic subsidies, enshrined in its Common Agricultural Policy, better known by its initials, CAP. The EU also had programs to aid depressed regions that also benefited agricultural firms. As potential new member countries evaluated the decision to join the EU, these policies were a major attraction for their agricultural sectors. They were particularly attractive for the largest recent tranche of new members, most from Eastern Europe, that joined the EU in 2004.

However, the CAP has had to be amended several times as large surpluses were generated, program costs became too high, and the EU entered into new trade agreements under GATT and the WTO. Support for agriculture, and for individual farms, has had to be modified. However, supports remain at a level that encourages production. While large operations have gained most of the benefits, small and part-time farms have gained enough to remain strong defenders of the CAP and related programs. In general, apple producers in the older member countries have adjusted more rapidly to stagnant per capita consumption of fresh apples by eliminating marginal plantings and introducing advanced technologies in their remaining plantings. However, newer members in Eastern Europe remain heavily invested in processing apples and have been slower to make these adjustments. As a result, apple production in the EU-28 has continued to rise. The most dramatic increase has been in Poland, where 2016 production is forecast to again set a new record. The safety valve for Poland had been its large exports of low-cost fresh apples to Russia. That safety valve has now been lost.

In response to the Russian embargo, the European Commission provided emergency funds to promote domestic consumption and to boost fresh apple exports. EU member countries have become much more aggressive in seeking to expand exports of fresh apples to countries in Africa, South America and East Asia, but it takes time and money to build foreign markets. However, these efforts have not been large enough to provide the needed economic relief. While the most effective way to reduce the demand-supply imbalance would be to remove orchards, such schemes have not been very effective in the past and there is little support for a new scheme as long as the Russian embargo is considered to be temporary.

Poland in the Crosshairs

The apple industry in Poland had become heavily dependent on exports of fresh apples to Russia, so it has been hardest hit by the Russian embargo. There have been efforts to circumvent the embargo by re-routing Polish apples through non-EU countries like Belarus and the Ukraine. However, the Russian authorities have sporadically clamped down on such illegal imports. One consequence of this cat and mouse game is that the statistics on trade flows in fresh produce between Russia's neighbors and Russia are no longer a reliable guide to the actual volume shipped. Thus, it is difficult to measure how much Polish exporters have been hurt.

Poland has attempted to diversify its exports by sending more fresh apples to EU partner countries and to third countries. However, Poland has limited supplies of the varieties and qualities of fresh apples that are most desirable in western Europe. The same problem arises in many third country markets. In addition, Poland often has not completed agreements on the protocols needed to allow entry of Polish apples to many countries. Poland urgently needs to realign its apple production and variety mix with the needs of markets other than Russia. However, action by the EU Commission or the Polish government is unlikely to take place until the crisis in the Polish apple is recognized.

Turkey in Multiple Quagmires

Many outside observers believed that Turkey would be the main beneficiary of the Russian embargo on EU produce, as a major supplier of many produce items. However, Turkey itself was embargoed by Russia after its air force shot down a Russian fighter plane. That ban was still being enforced erratically as this Review went to press. Because of rapid growth in the Turkish economy, its apple industry had focused primarily on domestic market, only recently reforming its operations and variety mix to compete in international markets. Exports of fresh apples rose 180 percent between the 2013-14 and 2014-15 seasons.

However, Turkey has increasingly been drawn into the Syrian crisis. It has recently been racked by internal strife over efforts by its ambitious president, Recep Erdogan, to consolidate power in his hands. Its economy has sputtered, and the EU has postponed possible membership talks because of Turkey's questionable human rights record. The Turkish economy and apple industry may take several years to regain momentum.

Italy Steady Progress

The apple industry in Italy has become increasingly concentrated in a few major producing areas in the South Tyrol. Although many of the individual orchard holdings are small, the region has used several tiers of cooperatives, and strong research and extension support, to keep the industry internationally competitive. Italy also benefits from having a large home market, and from its nearness to its largest export market in Germany.

However, as a result of the Russian embargo, Italy has faced rising competition in both its domestic and export markets. It has made strenuous efforts to reduce its dependence on old mainstays like Golden Delicious by introducing newer, premium varieties. However, it has had difficulty in finding newer varieties that prosper in the region's growing conditions. It has also expanded into a wide range of export markets in Asia, Africa and North and South America, but has faced severe competition. It will be increasingly difficult under present circumstances for Italy to maintain its apple industry at its present size.

India Seeks to Emulate Imports

Until the Indian market was opened to imports at the turn of the present century, the Indian apple industry was centered in small holdings in the foothills of the Himalayas at a great distance from many of India's major cities. Supplies were highly seasonal, and transportation often difficult. However, importers of fresh apples quickly showed that many Indian consumers were willing to pay a premium for foreign apples that were superior in quality to the domestic offerings. Red Delicious from Washington State, and Fuji from China set the pace in the import market, and have since been joined by other varieties from other suppliers. Although reliable statistics are scarce, it appears that India has expanded the area planted to apples in the last decade. However, it will have to make strenuous efforts to provide the variety mix, and storage, packing, distribution and logistical services, needed to begin to compete against imports on an even footing. Executing such a development plan will be difficult, but not impossible.

Chile Faces Headwinds

Chile has many natural advantages in growing fresh apples for off-season export markets. It has a wide range of micro climates suitable for different varieties. This has made it a popular choice for testing new varieties and a desirable partner in international clubs for fresh apples.

Chile faces relatively low pest pressure, so its yields are relatively high and its average costs low. It also has a modern infrastructure for storage and packing, and a diverse array of exporters, from individual farms to multinational corporations, that enable it to tap a wide range of markets. The Chilean Exporters Association (also known by its Spanish initials as ASOEX) has active promotional programs in major markets. In addition, the Chilean government has been very aggressive in securing access for Chilean fruit in diverse markets.

However, the Chilean apple industry has been frustrated by a series of headwinds in recent years. A strong peso raised the cost of Chilean apples in export markets. The window for off-season apples has been shrinking as Northern Hemisphere suppliers have been able to stretch their marketing season due to improved storage regimes and newer varieties. Finally, Chilean apple producers have a wide array of alternative crops that they can grow, such as table grapes, wine grapes, kiwifruit, soft fruit and berries. They will only begin to increase apple plantings again if apples can generate more profits than these alternative crops.

Iran Seeks Respectability

For much of the last two decades, Iran has been an international pariah, subject to multiple sanctions. That has stymied the normal growth of industries like the apple industry. They have been restricted in importing the inputs needed to modernize their industry, and in earning foreign exchange from exporting their surplus. As a result, the Iranian apple industry has grown little in the last decade.

President Barrack Obama negotiated a deal that would have gradually removed sanctions on Iran in return for its ceasing to build nuclear weapons. However, since Iran continued to fund groups considered terrorists by the United States, the new president, Donald Trump, has indicated that he is unwilling to remove sanctions until Iran's support for terrorists is terminated. In the first half of 2017, Iran's fate was still undecided. Some countries and corporations have been actively pursuing business deals with Iran, while many having been holding back waiting for clearer signals from the United States. In the case of fresh apples, Iran continues to ban all imports, but its fresh apple exports have expanded dramatically in markets in the Middle East and South Asia in recent years. Clearly, many neighboring countries no longer regard Iran as a pariah. However, the continuation of western sanctions will continue to impede development of its fruit industry.

France in Decline

As previously noted, two decades ago, France was the third largest apple producer in the world, and consistently among the top exporters of fresh apples. However, it has faced steady erosion of the area planted to apples, and because yields have been relatively flat, production and exports have also declined. Since similar declines have occurred across the entire French fruit sector, it suggests that common factors have contributed to the decline. Among these are the high costs of wages and benefits, the relatively high tax rates, the expanding burden of regulations, and competition for land from more lucrative uses such as urbanization, housing, recreation and tourism.

As the total French apple industry has shrunk, the industry has consolidated into fewer, larger cooperative ventures that can provide modern storing and packing facilities and marketing clout. The industry has been more successful than neighboring Italy in introducing newer varieties both from French breeding programs and from international consortiums like that of Pink Lady.

The French apple industry has sought to earn price premiums for its apples in domestic and export markets by emphasizing quality. However, economic weaknesses in major European markets have stimulated discount retailing. Discounters have become more resistant to passing on price premiums. Buy local movements in the United Kingdom and Germany have also hurt French exports. Efforts to expand exports to Asian countries have been plagued by inconsistent supplies and promotions. France will require major changes in the domestic and export environment if it is to prevent further decline of its apple industry.

Russian Federation Going It Alone

The artificially bloated apple industry in Russia almost collapsed after the fall of communism in the early 1990s, and has fallen short of the communist era level of production ever since. Few areas in Russia have a comparative advantage in apple production, and capital for regeneration has been scarce. When the Russian economy began to grow rapidly after the turn of the century, imports increased to meet expanding Russian demand. By the end of the decade, Russia had become the world's largest importer of fresh apples, fresh pears and fresh sweet cherries, and of many other produce items. Many apple exporting countries saw Russia as the best hope for future market growth. None became more dependent than Poland. However, the Russian embargo of 2014 dramatically altered Russia's role.

That embargo applied to fresh produce from member countries of the EU-28, and from Australia, Norway, Canada and the United States. Most analysts assumed that product from the embargoed countries would be replaced in the Russian market by product from other suppliers, and that there would be no significant changes in apple markets in the rest of the world. However, as a result of the retaliatory sanctions placed on Russia, its economy slipped into a deep recession, the value of the Russian ruble fell by about 50 percent, and Russian purchasing power was greatly reduced. While some alternate suppliers were able to increase exports to Russia, many were forced to find alternative markets around the world.

The Russian authorities seized the opportunity of reduced imports to attempt to stimulate greater domestic production of produce items. This worked to some extent for vegetables, but the response from the fruit industry was predictably slow. Agribusinesses were not willing to invest in tree fruits that take many years to mature as long as the embargo was seen as temporary. Even though the embargo will enter its fourth year in August 2017, its potential end remains unpredictable, depending as it does on the policies of the Russian, EU-28 and other governments. Given the present political stalemate, the Russian apple industry is unlikely to change much in the near future.

Troubled Ukraine

The fate of the apple industry in the Ukraine remains closely tied to developments in its Russian neighbor. The Ukraine was an important source of agricultural and mineral wealth in the Former Soviet Union (FSU), but its economy has struggled since that time. After the FSU collapsed, Russia feared that the Ukraine would hitch its economic, social and political fate to the European Union. That eventually led Russia to annex the Crimea and to aid a military uprising of secessionists in Ukraine's eastern provinces. In response, western countries placed sanctions on prominent Russian political and business leaders. Russia then retaliated with its 2014 embargo on western produce.

The apple industry in the Ukraine received a major boost from a World Bank development project in the last decade. It now produces over one million metric tons of apples on a planted area of about 100,000 hectares, so productivity remains low. However, difficult internal economic conditions, and the continuing trade disputes in the region will continue to hinder future expansion.

Brazil Promise Unfulfilled

After the turn of the century, many analysts were predicting that Brazil would finally win its place among the world's great economic powers. It enjoyed growing world demand for varied products like soybeans, coffee, beef and orange juice. Its apple industry also expanded behind numerous protective barriers, and was able to expand exports in large crop years. Brazil was honored by its peers with the right to host the World Cup of soccer in 2014 and the Summer Olympics in 2016. However, about the same time, Brazil's economy began to struggle as China's imports of key commodities began to wane. A series of political and business scandals led to the removal of President Rousseff from office and the conviction of many business leaders for corruption. Brazil still languishes in a deep recession.

Area planted to apples and apple production peaked in 2012 and 2013, and apple area fell by 13 percent between 2011 and 2016. Many less productive acres have been removed and not replaced. While the Brazilian apple industry remains the second largest in Latin America, it will have to fight just to maintain present area and production.

Germany Maintains Position

Virtually all of the apple orchards in East Germany were removed soon after the unification of West and East Germany. Since then, there has been gradual attrition of apple plantings in West Germany because of the pressures of urbanization. While most production comes from small blocks in three main growing areas, many producers have been able to upgrade their orchards and increase productivity substantially. However, Germany continues to rely on imports for more than 40 percent of its fresh consumption. Since it draws from some of the most competitive suppliers in the world, the level of competition faced by domestic producers remains intense.

Imports include numerous apple varieties from many different suppliers. However, German producers have one major advantage over imports. German consumers and retailers strongly support "Buy local" campaigns. German breeders have also introduced a number of unique new varieties. By tapping these emotional niches, the German apple industry should be able to retain a majority share of the domestic market for fresh apples.

South Africa Lingering Shadows

In many respects, the South African apple industry continues to be very successful. Planted area continues to increase. Yields remain relatively high. The South African apple industry has a modern infrastructure that enables it to meet the requirements of the most demanding foreign customers. South Africa has been able to expand fresh apple exports in developed countries, has opened up export markets among many African countries, and has a growing domestic market for cheaper fruit.

However, overhanging the industry is the reality that most of its assets are owned by white minority operators, and that black empowerment efforts to increase the black share of employment, management and ownership have had limited success. When tensions have arisen within the ruling African National Congress party (ANC), white ownership is an easy scapegoat for national problems. The profitable fruit industry becomes a tempting target for expropriation. Those tensions have returned in full force in 2017 as the economy has struggled, unemployment has risen, and there has been a fierce debate within the ANC over the leadership of the current president Jacob Zuma. The apple industry can only hope that some other issue will draw attention away from it and allow it to continue its slow, but steady expansion.

Argentina Struggles Continue

The shrinkage of the apple industry in Argentina has now been under way for over two decades. This has occurred despite Argentina's natural advantages in producing apples for fresh market and for processing. Much of the blame for the shrinkage is due to the failed macroeconomic policies pursued by a series of Argentine governments. Essentially, the productive sectors of the economy, such as agriculture, were penalized to support the mass of voters in the major cities. These policies led to loss of global creditworthiness, crumbling domestic infrastructure, runaway inflation, worker unrest and spiraling wage demands. Smaller producers that primarily served the domestic market were hardest hit.

In 2015, Argentina elected a new president, Mauricio Macri, who promised to end populist policies and encourage free markets. However, reform has been slowed by the old guard that still controls the national legislature. The apple industry is continuing to lose hope that conditions will improve soon. If that does not occur, the Argentine apple industry may be doomed to further attrition.

New Zealand On a Roll

The apple industry in New Zealand was badly shaken after the industry was privatized in 2002. There was much experimentation with organizational formats to replace the single desk seller on international markets. Over time, much of the industry has re-organized into integrated structures where numerous producers supplied fewer storage and packing operations, who, in turn, consigned their packed fruit to a limited number of large marketing companies. A German conglomerate, Baywa Limited, now owns T&G, the New Zealand company that inherited the Enza brand, and many of the cultivars Enza had been developing, and the Apollo Company, another large integrated operation.

The New Zealand apple industry has long recognized that the key to overcoming its distance from major markets is innovation, in new varieties, in superior quality, and in branded promotions. Prior to privatization, the monopoly marketer worked closely with the national produce research organization, HortResearch, to fund the discovery, testing and commercialization of new varieties. To replace that structure, a new organization, Prevar Limited, was set up with shared ownership by industry organizations in New Zealand and Australia, and in cooperation with HortResearch, now part of the broader Plant and Food Research organization. A number of private breeding programs have also been active in discovering and commercializing new varieties. In addition, New Zealand firms continue to experiment with new varieties developed in other parts of the world.

The industry re-organization and the continued emphasis on innovation have enhanced the competitiveness and the profitability of the New Zealand apple industry in recent years. However, as its operations in other producing countries have flourished, its New Zealand supply base has become relatively less important. Many of New Zealand's innovations are now altering the structure of competition in the global apple market in ways that are difficult to predict at this time.

Australia Renewal

For many years, the Australian apple industry survived behind a protective wall that inhibited innovation, limited cooperation among Australia's widely dispersed apple production areas, and reduced export competitiveness. However, faced with the prospect of imports from China, the United States, Chile, and other countries gaining access to the Australian market, the industry took numerous actions to make itself globally competitive.

Over a number of years, the “Future Orchards” program, funded by industry body, Apple and Pear Australia (APAL), preached the need for change to producers across the country. APAL’s investment in the Prevar Limited breeding program emphasized the importance of innovation. The international success of the Australian-managed Pink Lady program encouraged re-investment in both public and private breeding programs. As a result of these efforts, Australian orchards have rapidly switched to superior new varieties, the packing and marketing infrastructure has been reformed, and Australia has begun to regain some of the export markets that it once dominated. Much work still needs to be done, but the Australian apple industry now seems set firmly on a more favorable path.

Spain Holding Pattern

The Spanish apple industry was in decline even before Spain was hit by a severe recession in 2008. Spain has only limited areas where apple production has a comparative advantage over production of citrus and other, warm-weather fruits and vegetables. Before the recession, the apple industry had begun a replant program with financial aid from the EU and Spanish governments, and had made some progress in introducing improved orchards and varieties. However, those funds have now dried up. Production has stabilized in recent years at well below past peak levels. Spain also faces intense competition in its domestic market from larger neighbors like France and Italy, and has been a magnet for Southern Hemisphere imports in the off-season. That competition is likely to intensify while the Russian embargo remains in place.

Portugal Stable

The apple industry in Portugal is also limited in area, but has been able to keep production relatively stable over the last two decades. However, average yields remain very low compared to those of its major competitors. Portugal remains a net importer of fresh apples. Although its exports have increased in recent years. Portugal is likely to remain a marginal influence in the European apple market.

Austria Seeking Green Niche

Austria is another small European country located between three of Europe’s largest apple producing countries, Poland, Italy and Germany. The Austrian apple industry has decided that its best avenue to prosperity is to emphasize its green, organic and natural credentials. These niche markets have been under stress

because of widespread economic malaise in European markets, and retailers' heavy emphasis on discounting. However, these niches still appear to offer the Austrian apple industry the best chance for prosperity moving forward.

Belgium-Netherlands Makeover

Because of their close proximity, the apple industries in Belgium and the Netherlands have tended to face similar problems and opportunities, and have tended to seek similar solutions to their problems. For many years, both specialized on a single apple variety, Jonagold in Belgium, and Elstar in the Netherlands. As the popularity of these varieties waned, both turned increasingly to production of pears, that were then enjoying a profit advantage over apples. The switch to pears has now peaked, and both countries are aggressively pursuing the discovery and commercialization of new apple varieties. Two of these, Kanzi and Red Prince, have already shown considerable potential as club varieties, and have been adopted in many other producing countries. Such franchising opportunities could alter the fortunes of these two countries in the apple world.

Greece Slow Recovery

While the general economy in Greece has been in severe distress since the euro crisis hit in 2010, the fruit industry, and the apple industry, have resisted further declines in production and have been able to increase exports to lower-priced neighboring markets. That effort has been impeded, but not derailed, by the sanctions imposed on EU suppliers by Russia in 2014. There is little sign that the Greek economy will bounce back rapidly, or that the Russian embargo will soon end. In the meantime, export opportunities will continue to be the bright spot for the Greek apple industry.

United Kingdom Revival Continues

The apple industry in the United Kingdom went into long-term decline after the UK entered the European Union and faced intense competition from countries like France. Area planted reached its low point in 2007, but has increased steadily since, rising by 14 percent by 2016. The key to the turnaround has been the gradual phasing out of less profitable, older UK varieties and the introduction of strains of newer varieties, like Gala, Braeburn and Jazz, that have been adapted to UK growing conditions. The turnaround was aided by a promotional campaign that used the patriotic symbol of the Union Jack flag, exploited the buy local trend among consumers, and received strong support from UK retailers.

The United Kingdom still must import about 75 percent of domestic apple consumption, but UK producers see that as an opportunity for them to serve UK customers for a longer period each year. Because of the limited availability and high cost of orchard land, future expansion will require producers to earn premium prices for their output. This means that they will continue to need a steady flow of new varieties that can be profitable under UK conditions.

Canada Seeks to Turn the Tide

Area and production of apples in Canada has been in long-term decline. The industry has been dominated by small producers that found it difficult to compete against U.S. and other major exporting countries that introduced a steady stream of popular new varieties. Many apple acres were converted to other perennial crops, such as wine grapes, raspberries and sweet cherries.

However, the Canadian apple industry has found two new varieties, Honeycrisp and Ambrosia, that flourish under Canadian conditions, and that have been able to generate premium prices. This has provided producers and packers with surpluses for re-investment. In addition, several provinces have provided supplementary funds to help producers replace obsolete orchards with high density plantings of new varieties. The seeds of a renaissance in the Canadian apple industry have been planted. If the replant programs are successful, it would bring a new sense of optimism to the Canadian apple industry.

Mexico Modernization

Prior to the signing of the North American Free Trade Agreement (NAFTA), the Mexican apple industry faced little competition. Rapid growth in the Mexican population and rising incomes provided producers with a growing market for fresh apples. Even under NAFTA, seasonal restrictions shielded Mexican apple production from direct competition, while a series of anti-dumping actions impeded the free flow of U.S. imports. Orchards remained low density, inefficient, and focused on traditional varieties such as Red Delicious and Golden Delicious.

However, the Mexican apple industry has gradually improved its production technology, added new varieties, and improved average yields. While there is still much room for improvement, the Mexican apple industry appears to be headed in the right direction in its modernization efforts.

Revival in Transition Countries

Many countries in Europe and Asia that transitioned from central planning to free markets in the 1990s had apple industries that were protected within the central planning system. When that system fell apart, large areas of apple orchards fell into disrepair due to disputed ownership, and lack of management, capital, labor and assured markets. It has taken more than a decade, and numerous false starts, for the apple industry in many of these countries to regain their momentum, often on a much smaller scale than previously. Three of these transition countries, Poland, the Russian Federation and the Ukraine, have already been discussed individually. However, many smaller producing countries have suffered similar problems in their transition to free markets.

A number of these countries, including Bulgaria, Czechia (formerly known as the Czech Republic), Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia, joined the European Union in 2004, and were hoping that both public and private funds from the EU would be available to help modernize their industries. For numerous reasons discussed previously, the level of funding available has fallen far short of the needs.

Another group of small transition countries, including Albania, Belarus, Bosnia-Herzogovina, Macedonia, Moldova, Montenegro and Serbia in Europe, have a combined production of over 1 million metric tons, while Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan in Asia have a combined production of over 2 million metric tons. Progress in these transition countries has been mixed, but a few like Belarus, Moldova, Serbia and Kazakhstan could generate sizable increases in production under favorable circumstances. A continuation of the Russian embargo on EU suppliers could provide further incentives for many of these countries to attempt to replace apple supplies from the EU.

Significant Apple Production in Other Countries

The apple industry is important either in absolute or relative terms in many other countries. Richer countries such as Norway and Switzerland have sought to preserve their traditional rural areas by protecting their apple industries through import controls and domestic subsidies. So far, these interventions have not attracted sanctions from the World Trade Organization.

In many other countries, such as Peru, apple production has been limited by geography or climate, although those limitations have been receding as technologies and cultivars have changed. These countries primarily supply their domestic markets and do not try to meet the quality standards of internationally competitive exporters. In other geographic areas, such as the Middle East, North Africa and East Asia, there are numerous countries that can produce small volumes of apples, often of questionable quality. However, their combined volume in some years can be sufficient to affect normal trade flows with major exporters.

In summary, the world apple market is supplied by a wide diversity of producing countries with widely varying capabilities. This means that competition for the attention of retailers and consumers is quite complex.

II. Future World Apple Production

Uncertainty of Forecasting

For perennial crops like apples, the time lag between the decision to plant a new block and when that block comes into production can be a decade or more. If investors are to evaluate the wisdom of any investment, they must make predictions about what will be the annual flow of commercial product from that planting and what the price trend will be many years into the future. Those two factors will have a major influence on the profitability of the planting.

In most cases, investors assume that prices will be similar to those experienced in recent years, an assumption that has often proved wrong in the past as prices have fluctuated widely from season to season. Investors also often do not consider how planting decisions by other producers in their own country, and in other parts of the world, will affect total supplies during the years when their output will be sold. When numerous investors simultaneously decide to increase plantings of a popular variety, it almost ensures that the price of that variety will fall below expectations in the future. Likewise, when numerous investors decide to increase overall plantings of apples, it almost ensures that future average apple prices will fall below expectations.

For many years, the World Apple Review has attempted to develop systematic projections of future world production, by country, of all apples and of major apple varieties, in order to provide producers and investors better information on what the market environment is likely to be as their investment decisions reach maturation. Such forecasts are likely to be of value, not just to producers and investors, but also to related businesses such as 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 spelled out so that forecasts can be more easily adjusted when the underlying assumptions change. The forecasts are also made available to operators anywhere in the world so they can make decisions that reflect the cumulative decisions of other operators.

It is important to re-iterate the distinction between forecasts 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 are 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 planted in any year, a certain percentage will die in the first year for various reasons. The percentage that will survive into the second year can be determined from historical statistics for each area. It will be possible to forecast fairly accurately how many of the initial 100 trees will survive into each subsequent year. In a similar manner, yield per tree tends to follow a predictable pattern as the tree ages.

Of course, forecasting future apple production cannot be reduced to predetermined formulas. We know that average yields of fruit trees tend to follow an S curve as trees age. Yields tend to increase rapidly in the early years, then enter a phase of slowing growth rates, reach a peak, and then enter a phase of slow, gradual decline. In the past, these phases tended to take longer, and the life span of trees could stretch beyond 30 years. However, the profitable life span of many varieties has been reduced as a flood of newer varieties have entered the market. Orchard developers have been forced to speed up each of the phases of growth, in particular, how rapidly a new planting begins to provide a marketable crop. They have also become resigned to removing plantings while their productive capacity is still high, but their financial returns are waning.

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 out over a number of years. This is known as the lagged response to price. There are several reasons why responses are lagged. For example, producers or investors may be reluctant to make major changes in long-term strategy based on the outcome of a single year. Normally, it will require a sequence of relatively high priced years to persuade them to undertake new plantings. Conversely, they may shrug off one low price year, but a sequence of low price 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 or the rootstocks and 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 and information available through mid-year 2017. 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. They should provide producers and investors with a useful guide to the competitive situations which their future production will 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	1,774	1,820	1,870
Italy	2,205	2,280	2,475	2,600
Poland	1,878	3,979	4,200	4,250
Other Europe	7,945	8,487	9,652	9,995
Total Europe	13,816	16,520	18,147	18,715
United States	4,215	4,538	5,400	5,800
Other North America	957	1,054	1,242	1,322
Total, North America	5,172	5,592	6,642	7,122
China	33,265	42,600	45,760	48,000
Turkey	2,500	2,740	3,000	3,230
Other Asia	8,286	9,251	11,294	11,897
Total, Asia	44,051	54,591	60,054	63,127
Total South America	4,201	3,758	3,993	4,087
South Africa	781	961	1,030	1,080
Total Oceania	748	843	964	1,037
Total, Southern Hemisphere	5,730	5,562	5,987	6,204
Russian Federation	910	1,311	1,400	1,450
Other Producing Countries	907	1,771	1,908	1,997
WORLD TOTAL	70,586	85,347	94,138	98,615

The forecasts were derived by analyzing trends in area, yield and production of apples for individual countries that are covered in the UN,FAO crop production database. These results were then combined to make forecasts for major geographic and economic regions, and for the total world. The forecasts for future years assume average yields. Actual production in 2020 and 2025 could deviate from these forecasts if yields are higher or lower than the forecast average.

The table above shows that world apple production increased by over 20 percent between 2010 and 2015. It is forecast to increase by a further 10 percent between 2015 and 2020 and by 5 percent between 2020 and 2025. Thus, the rate of growth is expected to fall sharply. The chief driver of past and future expanded production of apples is the increasing level of optimism in many major apple producing countries in the last decade as demand for apples has grown. China has been the biggest absolute contributor to increased production in the recent past. However, the recovery in the rest of the world has been impressive, and growth in production is expected to remain strong between 2015 and 2020, before slowing between 2020 and 2025.

All the major apple producing countries are forecast to experience increased production in 2020 and 2025. The forecast for China is the most uncertain. If the Chinese economy succeeds in returning to its rapid growth path, the Chinese apple industry would have incentives to increase plantings and production. The rapid growth in the United States is expected to continue, driven as it is by large, well-capitalized integrated operations. Prospects for continued growth in the major European producing countries will be heavily influenced by how long the Russian embargo remains in place. As we went to press, relations between Russia and its western trading partners had reached new lows. However, that deterioration may give both sides a greater incentive to back off hardened positions and seek mutual solutions.

For many other major countries, two key influences on their planting decisions will be the continuation of price premiums for new varieties, and the continued growth in demand for mainstream varieties in export markets. The stronger the growth in per capita incomes in export markets, the more likely is total demand for apples to grow. Producers and investors will continue to assess changing market conditions and include them in their decisions about future plantings and production.

Inertia versus Innovation in Apple Varieties

The mix of varieties in any firm, producing district or country is the outcome of two powerful conflicting forces, that of inertia, and that of innovation. The forces of inertia are very influential in a permanent tree fruit like apples where there are high sunk costs, and the asset has a long physical and economic life. Producers will tend to stick with existing varieties as long as variable costs in any year are covered. They hope that in some future year(s), they will be able to recover all or some of their fixed costs. Another disincentive in switching to a new variety is the attendant costs and risks. Even when producers might prefer to switch to a new variety, they may not be able to generate the needed capital from retained earnings, borrowing, or government subsidies. At the same time, in every region, there are examples of progressive growers that have switched to new varieties and that have been extremely successful. The more success stories that occur in any district, the greater the incentive to embrace innovation.

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.** These include varieties that have been grown successfully in only a few producing localities or regions, and have not been widely adopted elsewhere because of cultural problems, or lack of consumer acceptance elsewhere. Some of these varieties have been rediscovered and rehabilitated locally as “heirloom” varieties. These are too numerous to list separately here.
4. **New Varieties.** The definition of “new” varieties is not precise. The most acceptable definition refers to the length of time that a variety has been actively commercialized. Varieties spend different lengths of time in test plots, test markets and in limited supply. Many never make it over those hurdles. Those who do are recognized as serious new varieties when sales reach commercial levels.

The inertia is apparent in the first three categories of varieties, most particularly in the continuing production of regional or local varieties. Innovation dominates the fourth category. The sponsors of this fourth category have different expectations for their proteges. Some believe that their new variety can fill a brief seasonal niche, others that their new variety can earn a premium price relative to those currently on the market. Others believe, more ambitiously, that their new variety could eventually replace major varieties, like Red Delicious, Gala or Fuji, in the favor of retailers and consumers.

Many individual growers, packers, marketers, breeders and variety sponsors see their future in moving more of their production to new varieties. Most now prefer to commercialize these new varieties under a club (managed) format. The goal is to maintain price premiums for the variety by expanding demand more rapidly than supply is made available, under the principle of "induced scarcity." While this principle has been applied successfully in a few cases, it is difficult to achieve in practice. It is difficult to predict how much supply of any individual variety can be expanded before its price premium erodes. It is also difficult to predict how many clubs can simultaneously maintain Induced scarcity as their combined supplies continue to rise.

Club marketing has given rise to additional challenges. Many sponsoring organizations sought to restrict licensing rights for their chosen variety to a few, favored producing areas such as Washington State, Southern France or central Chile. Individual producers elsewhere worried that they would be stuck with obsolete varieties, and be at an increasing disadvantage. In response, several major states and provinces have set up their own programs to breed new varieties that would initially be made available only to state or provincial producers. The problem here is that the location in which a new variety is originally bred may not be the most suitable for growing that variety. In addition, the breeder gives up the opportunity to earn fees from producers in other areas, a flow of funds that is often critical to the maintenance of a breeding program.

Another challenge is that the sponsors of new club varieties consider information about the performance of their new varieties to be proprietary. Public agencies do not collect data on these varieties, especially when production is still small. As a result, it is difficult to compare key metrics, such as the productivity, quality or price of different new varieties. Objective, independent evaluations are not possible.

The ever-wider availability of proprietary club varieties alongside traditional open source varieties has significantly altered the marketing and promotion systems for apples. Large, integrated grower-packer-marketers are dominant suppliers of a wide range of traditional varieties to major retailers. However, they have been able to outbid smaller competitors for the rights to produce and market most of the new club varieties. Thus, they face an inherent conflict in deciding how much emphasis to give to marketing and promoting these different categories. Efforts they put into marketing traditional varieties indirectly help all other producers, packers and sellers of those products. In contrast, benefits that they gain from marketing unique, new varieties, can be captured by the firm itself. This system has the potential to make many traditional varieties "orphan" varieties, that is, varieties that lack committed marketing and promotional support.

In turn, major retailers face challenges as they transition to stores with smaller footprints and more limited produce shelf space. Those who cater to upscale customers have been willing to replace mundane varieties that sell at standard prices and margins with new, premium varieties that can generate much higher gross and net revenues per square foot. In the past, pricing of varieties tended to be relatively flat, with most bunched closely, and one or two varieties selling at a small discount or a small premium. Now, many retailers have at least three distinct price points for apples. For example, Red Delicious or Golden Delicious are priced lowest, newer varieties like Ambrosia, Jazz or Pinata at a 30 to 50 percent premium, and Honeycrisp, SweeTango and Envy at 100 percent above the base. In contrast, discount retailers stock only varieties that can be sold at a base price. Thus, their customers are rarely exposed to premium varieties.

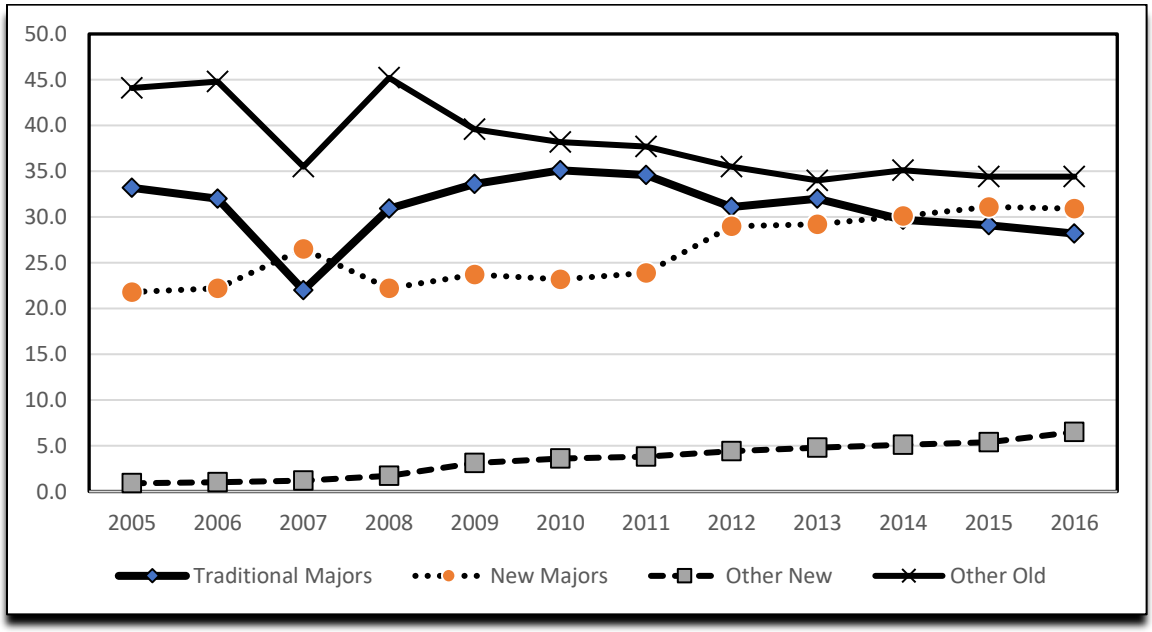
While many new varieties have emerged from managed breeding programs, others are the result of creative marketing programs that exploit some unique aspect of an existing variety. For example, in the European Union, apples can gain protection for their place of origin and seek to earn a premium when so identified, for example, Pomme Limousin from the Limousin region in France. The economic advantage of these protected geographic indicators is uncertain. The Braun organization in Italy has used promotional tools to earn a premium for its Kiku brand of Fuji. Other large marketers have attempted to earn a premium from the halo effect of using a common brand for all their apple offerings in the manner of Chiquita bananas or Dole pineapples. Such efforts are intensifying as marketers attempt to distinguish themselves from the competition.

Trends in Major Varieties

There is much evidence that the apple variety mix is changing in many countries. However, the data available is often not on a basis that allows exact comparisons. Some countries report the volume of major varieties produced, or sold fresh, or exported. Others report the area planted or harvested in major varieties. Data on minor varieties are rarely reported. In addition, most statistical agencies are slow to report on newer varieties. Accordingly, the data available are most useful in indicating broad trends in the importance of different varieties.

The longest detailed series on apple varieties has been produced for the European Union. However, since the number of countries included has changed over time, long-term comparisons are difficult. In particular, the inclusion of Poland after 2004 caused distortions because of Poland's large volumes of older apple varieties. The chart below shows trends between 2005, after the last major EU enlargement took place and 2016, the year of the most recent data.

European Union: Apple Production, by Major Categories of Varieties, 2005-2016
(percent)

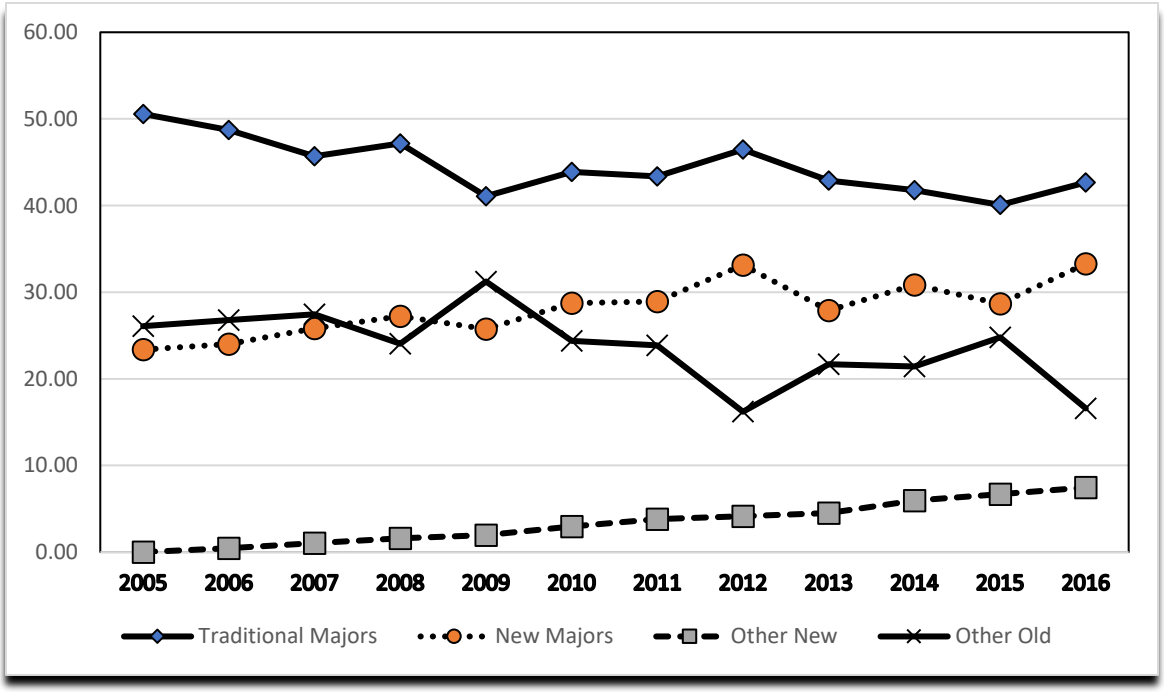


Apple varieties are grouped into the four major categories described previously, traditional majors, new majors, other new varieties and other old (regional and local) varieties. For the enlarged EU-28, several trends are apparent since 2005. The share held by the new majors (like Gala) rose from about 22 percent in 2005 to almost 31 percent in 2016. The share of other new varieties (such as Pinova, Jazz and Red Jonaprince) rose from less than one percent in 2005 to 6.5 percent in 2016. The share of the traditional majors (like Golden Delicious) resisted decline until about 2011, when it began a slow erosion. The share of other old varieties had a more persistent decline, from about 44 percent to about 34 percent in the period. However, the traditional varieties (traditional majors and other old) still accounted for over 60 percent of apple varieties produced in Europe in 2016.

The chart below shows comparable data for the United States for the same time period. The overall trends are quite similar, although the market shares are different.

United States: Apple Production, by Major Categories of Varieties, 2005-2016

(percent)



The share for the new majors in the United States rose from 23 percent in 2005 to 33 percent in 2016, quite similar to that experienced in the EU. The share of other new varieties increased a little more rapidly, from less than one percent to 7.5 percent. The share of the traditional majors remained higher than in the EU. It was still over 40 percent in 2016. In contrast, the share of other old varieties fell to a new low of 16.6 percent in 2016. Together, the traditional varieties still averaged over 60 percent of all production in the last three years. As in the EU, the forces of inertia and of innovation were both quite evident in the apple variety mix.

Some of the disruptive forces in the variety mix in the Northern Hemisphere have emanated from the Southern Hemisphere. New Zealand pioneered the commercialization of new majors, such as Gala, Fuji and Braeburn, that rapidly won favor with Northern Hemisphere consumers, and were widely copied by Northern Hemisphere producers. However, the New Zealand apple industry continues to be heavily committed to innovation. The table below shows how New Zealand has moved away from Gala and Braeburn as these varieties became commoditized and price premiums evaporated. The Braeburn share of plantings fell by half between 2005 and 2016, while the Gala share edged downwards, the Fuji share peaked in 2011, and the share for Granny Smith and Cox's Orange continued to shrink.

New Zealand: Apple Plantings, by Variety and Calendar Year, 2005-2016
(percent)

Variety	2005	2007	2009	2010	2011	2012	2013	2014	2015	2016
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Granny Smith	3.5	3.4	3.3	3.1	3.0	3.1	2.9	2.8	2.5	2.6
Cox	3.7	3.6	3.3	2.9	2.8	2.4	2.1	1.8	1.6	1.4
Royal Gala/Gala	31.5	33.0	29.9	28.0	28.6	28.5	28.5	27.7	27.9	28.9
Braeburn	29.4	28.3	24.0	21.7	20.5	19.1	18.0	16.4	15.6	14.8
Fuji	9.5	9.5	10.6	10.8	11.5	11.2	10.8	9.9	9.7	9.7
Cripps Pink/ Lady	3.2	2.8	4.2	4.6	5.1	5.4	5.5	5.3	5.3	5.9
Jazz	2.7	6.6	10.8	11.3	11.6	11.3	10.8	10.3	9.9	9.4
Pacific Beauty	3.3	2.0	1.8	1.6	1.5	1.4	1.3	1.1	1.0	0.9
Pacific Queen	3.3	2.5	2.6	3.0	3.4	4.2	5.4	7.4	8.5	9.4
Pacific Rose	7.6	6.0	5.0	4.8	4.7	4.8	4.7	4.5	4.2	4.1
Envy	0.0	0.0	0.0	1.0	2.1	3.3	3.4	3.8	4.0	4.7
Other	2.3	2.3	4.5	7.2	5.2	5.3	6.6	9.0	9.8	8.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In contrast, there were big percentage gains in the share of plantings for Cripps Pink/Pink Lady, Jazz, Pacific Queen, Envy and all other (mostly new) varieties. Not all innovation paid off. Both Pacific Beauty and Pacific Rose are being gradually replaced by newer varieties. However, even in New Zealand, the forces of inertia have remained strong. In 2016, over 63 percent of plantings were still traditional majors or new majors.

Data on new varieties in Chile are available for the varieties exported each season. However, since Chilean apple production is primarily aimed at the export market, these should be closely aligned with Chile's overall apple production trends. Export data for Chile are available for at least the last two decades. To capture long term trends, the data below are presented for five-year periods and for the most recent, 2015-16, season. Golden Delicious has always been relatively unimportant in Chile. However, the share of exports for the other two traditional majors, Red Delicious and Granny Smith, fell dramatically in each five-year period, and was less than 30 percent of the total in 2015-16. In contrast, Chile was very successful in switching to the new majors, Gala, Fuji, Braeburn and Cripps Pink/Pink Lady. Their share more than doubled between 1996-2001 and 2015-16. These varieties now dominate the Chilean variety mix. Newer varieties have been slower to gain traction in Chile, averaging 2.4 percent in 2011-16, and reaching only 2.9 percent in 2015-16.

Chile: Apple Exports, by Major Varieties, Selected Periods, 1996-2016
(percent)

Variety	1996-2001	2001-2006	2006-2011	2011-2016	2015-2016
	(%)	(%)	(%)	(%)	(%)
All Red Delicious	43.1	28.9	21.0	14.4	10.9
All Granny Smith	24.6	18.7	15.5	12.7	9.9
Gala	20.1	32.1	41.4	45.4	48.2
Fuji	5.5	7.7	8.0	7.8	8.5
Braeburn	4.2	5.0	3.7	2.2	1.4
Cripps Pink/Pink Lady	0.4	4.9	8.0	13.1	15.7
Newer Varieties	0.0	0.1	0.1	2.4	2.9
All Other	2.0	2.6	2.3	2.0	2.4
TOTAL	100.0	100.0	100.0	100.0	100.0

Both planting and export data are available for South Africa. However, unlike Chile, South Africa has a large and growing domestic market, so export data can be misleading about the relative importance of different varieties. The table below shows apple plantings by variety in South Africa for calendar years from 2006 to 2015. In general, the forces of inertia have been stronger, and the impetus for innovation weaker, than in either New Zealand or Chile.

South Africa: Apple Plantings, by Variety and Calendar Year, 2006-2015

(percent)

Variety	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Golden Delicious	21.8	25.5	25.4	25.2	24.9	24.5	24.5	24.8	24.6	24.2
Granny Smith	25.5	24.9	24.4	23.4	22.2	21.4	20.2	18.7	18.4	17.8
Royal Gala/Gala	11.7	13.7	13.7	14.1	14.7	15.0	15.5	15.9	16.1	16.3
Braeburn	3.3	3.4	3.4	3.4	3.5	3.4	3.3	3.3	3.1	3.2
Fuji	4.0	4.4	4.9	5.6	6.3	7.1	7.6	8.2	8.3	8.5
Cripps Pink/ Lady	6.7	7.1	7.1	7.7	8.9	9.3	9.4	9.8	9.8	9.9
Cripps Red/Joya	0.0	2.1	2.1	2.1	2.0	1.9	1.9	2.3	2.7	3.2
Topred/ Starking	14.9	15.6	15.5	15.0	14.3	13.9	13.8	13.0	12.9	12.4
Oregon Spur	0.0	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.1
Kanzi	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.7	0.9	1.0
Other	12.1	2.1	2.3	2.3	1.9	2.1	2.2	2.2	2.2	2.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In contrast to Chile, the shares of the traditional majors, Golden Delicious, Granny Smith and various Red Delicious strains, have fallen only modestly, from 62.2 percent in 2006 to 55.5 percent in 2015. The biggest gains have been for the new majors, especially Gala/Royal Gala, Fuji and Cripps Pink/Pink Lady, with an overall gain in share of plantings of over 15 percent. Only two newer varieties, Cripps Red/ Joya and Kanzi, have been identified separately. Together, they represented only 4.2 percent of all plantings in 2015. Part of the inertia in South Africa derives from the need to service the more traditional, lower income domestic market with commodity apples. Most of the innovation is channeled towards markets in Europe and Asia. As noted previously, the new majors continue to account for a growing share of the markets in Europe. The present variety mix in South Africa allows it to continue to supplement European supplies in that market segment.

Future World Apple Variety Trends

The previous section has shown that decisions about plantings and removals of orchard blocks are the result of the offsetting forces of inertia and innovation. The forces of inertia are strongest when overall revenues are low, costs are high and profit margins slim. Producers have an incentive to hunker down and attempt to ride out the storm until more profitable times return. When the opposite occurs, producers and investors can switch from being more cautious to being more aggressive. Of course, within any group of producers or investors, there will be some that have a higher tolerance for the risks involved in innovation, and some that have greater financial resources to buffer their firms against potential risks.

The actual investment decisions are heavily influenced by the relative profit potential of different varieties. The wider the expected profit margin, the more likely is that variety to be chosen. Decisions can also be affected by the availability of suitable land and adequate capital, and by the availability of the chosen trees. Demand for trees often does not match the supply available from nurseries, so producers are forced to wait one or more seasons before the desired trees are available. Preferences for different varieties can change rapidly, so mismatches between supply and demand for trees are common.

Most new varieties are now commercialized within club systems. Club sponsors are quite selective in the licensees they choose to commercialize their new variety in different regions. These are usually integrated grower-packer-marketers. In turn, these licensees are quite selective about which producers they choose to grow their new variety, and about how much volume they will allocate to any single producer. Often growers will be chosen that already have a relationship with the licensee. So, the club system both affects the supply response of individual producers and limits the volume of a new variety that will reach the market. These restrictions make it difficult to forecast future production trends for new varieties.

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. Inclusion of China would have distorted the market shares for all other varieties. The table on the next page shows the share of major apple varieties in the rest of the world in 2010 and 2015 and the forecast share in 2020 and 2025.

World, excluding China: Share of Apple Production, by Variety, 2010 and 2015 Actual, 2020 and 2025 Forecast
(percent of total)

Rank 2015	Variety	2010 Actual	2015 Actual	2020 Forecast	2025 Forecast
1	Delicious	21.51	18.35	18.87	15.40
2	Golden Delicious	16.60	14.55	14.82	16.95
3	Gala/Royal Gala	13.91	14.00	14.85	15.82
4	Fuji	7.13	6.88	6.94	7.19
5	Granny Smith	5.55	5.38	4.91	5.12
6	Idared	2.75	4.42	4.26	4.32
7	Jonagold	2.46	2.76	2.70	2.68
8	Cripps Pink/ Pink Lady	2.18	2.65	2.73	2.93
9	Jonagored	1.00	2.14	2.18	2.35
10	Braeburn	2.39	2.04	1.89	1.82
11	Elstar	1.43	1.45	1.29	1.22
12	McIntosh	1.34	1.38	1.04	0.97
13	Honeycrisp	0.41	1.00	1.42	1.72
14	Jonathan	1.37	0.96	0.94	0.87
15	Rome Beauty	1.03	0.80	0.74	0.69
16	Gloster	0.50	0.71	0.70	0.70
17	Empire	0.56	0.50	0.45	0.43
18	Ohrin	0.69	0.49	0.48	0.48
19	Reinette	0.41	0.49	0.42	0.43
20	Melrose	0.31	0.44	0.36	0.38
21	Tsugaru	0.40	0.41	0.35	0.36
22	Jazz	0.32	0.40	0.43	0.50
23	Pinova	0.13	0.39	0.42	0.53
24	Red Jonaprince	0.11	0.38	0.58	0.67
25	Spartan	0.32	0.37	0.30	0.29
26	Boskoop	0.30	0.36	0.32	0.31
27	Cortland	0.44	0.34	0.31	0.30
28	Bramley	0.37	0.30	0.26	0.27
29	York	0.30	0.29	0.24	0.24
30	Cox's Orange	0.43	0.18	0.18	0.16
31	Pacific Rose	0.15	0.17	0.16	0.15
32	Northern Spy	0.18	0.16	0.15	0.12
33	Sundowner	0.14	0.16	0.13	0.14
34	Cameo	0.18	0.14	0.12	0.12
35	Lobo	0.25	0.13	0.13	0.13
36	Ambrosia	0.07	0.12	0.26	0.36
37	Stayman	0.15	0.12	0.11	0.08
38	Mutsu	0.12	0.12	0.10	0.10
39	Hokuto	0.10	0.10	0.09	0.09
40	Senshu	0.08	0.08	0.07	0.07
41	Kanzi	0.00	0.04	0.06	0.09
42	Ingrid Marie	0.05	0.04	0.04	0.03
43	R.I Greening	0.08	0.04	0.04	0.03
-	All Other	11.80	13.77	14.41	13.72
-	TOTAL	100.00	100.00	100.00	100.00

The table above was compiled from data on past production and plantings of different apple varieties acquired from many different sources and placed on a standardized basis so future projections could be compared with past experience. It shows the share of production accounted for by 43 leading apple varieties in 2010 and 2015, with projections for 2020 and 2025.

The first point to note is that the share of the world apple market accounted for by any single variety changes slowly over time. One result is that a small number of major varieties will continue to dominate apple supplies outside China for at least the next decade. For example, the top ten varieties in 2015 accounted for 75.5 percent of apple production in 2010, 73.1 percent in 2015 and a forecast 74.2 percent in 2020 and 74.6 percent in 2025. Only three varieties, Delicious, Golden Delicious and Gala/Royal Gala, had shares of greater than 10 percent in any year. Of these, Delicious has lost most share over time, but Golden Delicious has held its own, and the Gala/Royal Gala share is expected to increase.

Changes are continuing to take place, although their effect will be muted by the slow pace of change. For example, between 2015 and 2025, the share of traditional majors is expected to fall about one percentage point to 37.5 percent, while the share of new majors is expected to rise by 2 percentage points to 34.0 percent. The greatest rate of growth will be for the varieties introduced after the year 2000, including Honeycrisp, Jazz, Pinova, Red Jonaprince, Pacific Rose, Ambrosia and Kanzi. The share for that group rose from 1.2 percent in 2010 to 2.5 percent in 2015. It is expected to reach 4.0 percent by 2025. Unfortunately, lack of data prevented projection of the future market share for other prominent new varieties such as Envy and SweeTango, so the share of all newer varieties reported here will tend to be an underestimate. However, those newer varieties are unlikely to exceed a 6 percent share by 2025. Despite their profit potential, some of these varieties face numerous factors inhibiting them becoming more important competitors.

On the other hand, certain factors could hasten changes in the worldwide apple variety mix. One would be a greater commitment of capital by sponsors of newer varieties in gaining distribution and enhancing promotion for these newer varieties. A second would be retailer decisions to favor newer varieties at the expense of less profitable established varieties. Finally, clear signals from the mass of consumers that their preferences have changed, could prod both producers and retailers to switch their choices of apple varieties more rapidly.

Apple Varieties in China

As previously noted, the mix of apple varieties in China continues to be dominated by the Fuji variety, which was originally bred in Japan, but has proved particularly suited to Chinese growing, harvesting, storage and marketing conditions. USDA, FAS estimates suggested that in 2015 Fuji still accounted for 66 percent of all apples produced in China. Fuji also dominates Chinese exports of fresh apples. However, the dominance of Fuji in Chinese apple production and exports is not likely to last much longer. Prices of Fuji have been falling, and Chinese operators are very aware that newer varieties in other countries are receiving substantial premiums. Because of concerns about intellectual property, few foreign breeders have been willing to license production of their new, proprietary varieties in China. One recent exception has been the Pink Lady consortium. Even if licensing was permitted, it would take several years of trials to determine which new varieties were best suited to Chinese conditions.

In addition to Fuji, 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. Some processors made efforts to expand production of Granny Smith apples because they needed an apple that was more tart than Fuji for apple juice blends, but that effort remains small. Until now, Chinese apple producers have been able to rely on the low-risk Fuji variety. However, experience from other industries and commodities suggests that when the Chinese decide to move in a new direction, they can do it very rapidly, and on a large scale. The world apple industry needs to be on the alert.

The Hunt for New, Winning Varieties

The hunt for winning, new varieties is not likely to wane any time soon. Indeed, it is more likely to heat up because the larger, integrated operators still believe that profitability cannot be sustained with open source commodity varieties, and that their best hope for sustainability is to find and promote newer varieties that can command a price premium. They are also aware that they need a sequence of new varieties in the pipeline because price premiums can rapidly erode.

This has meant that the apple industry has placed renewed emphasis on breeding programs, including those funded publicly, those funded privately, and searches by individual orchardists for promising chance seedlings. There are no good data on the amount of industry expenditure on such breeding programs, but intense activity is ongoing in many districts and countries.

The Honeycrisp story is one that has had a major influence on the industry's attitude to new varieties. The Honeycrisp was bred in Minnesota, a state that is only a marginal producer of apples. It was a difficult apple to grow and pack successfully in other locations. It required substantial adaptations to be produced in areas with milder climates than Minnesota. However, with little promotion, it generated an enthusiastic following among consumers and retailers. Even as supplies increased, it was able to maintain a very substantial premium. Indeed, it set a new bar for the price at which a premium apple could be sold.

Another stimulus for new variety development has been the apparent change in attitude among major retailers towards the mix of apples they were willing to stock. Retailers have found that by including more new apple varieties on their shelves they have added to both the excitement and profitability of their apple segment. In turn, marketers have recognized that they can win the business of retailers by offering them preferred or exclusive access to attractive, new varieties. This has led marketers to bid against each other for the licensing rights to the best new varieties from around the world.

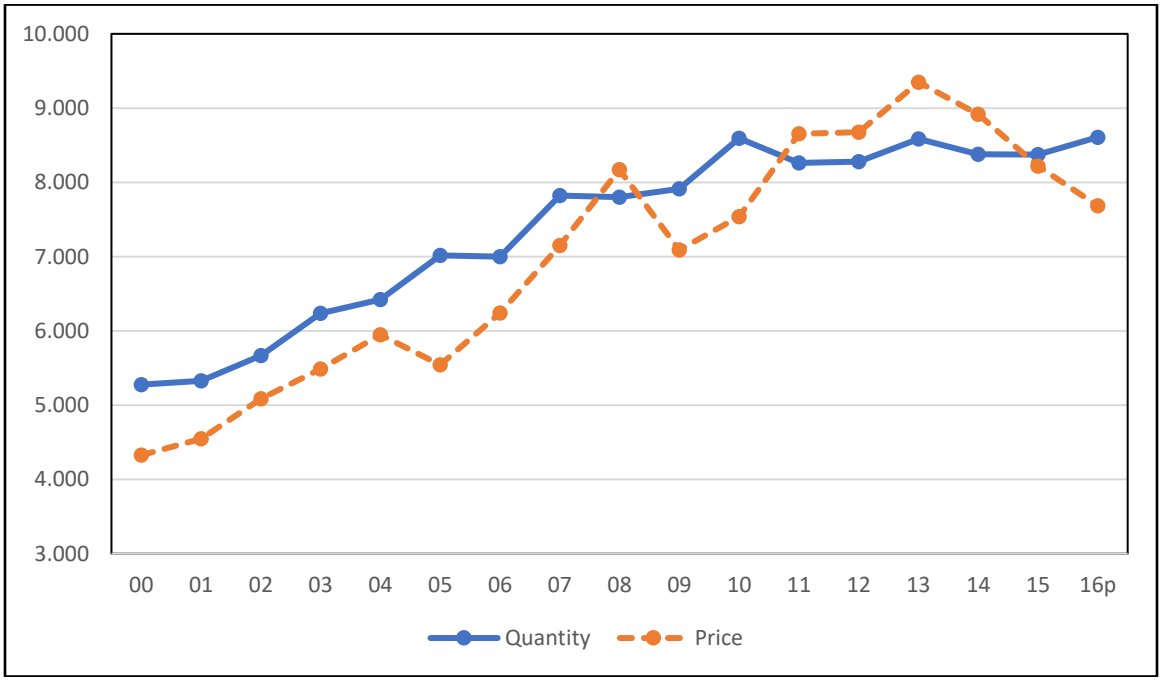
The hunt for new varieties has its downsides. For example, few retail buyers recognize the high costs and risks involved in bringing a new variety to the commercialization phase. They may come to expect more innovation, at a more rapid pace, than the apple industry can deliver, and turn to other fruits for innovation. There is also increasing risk that the leading marketers in the industry will devote too much of their resources to their newer varieties, and that the remaining varieties (still 90 percent or more of apples on offer) will be neglected. Per capita consumption of apples is already declining or vulnerable to erosion in many countries. Lack of promotion for the 90 percent could lead to further erosion of per capita consumption.

III. World Trade in Fresh Apples

World Trade in Fresh Apples Stalls

World trade in fresh apples was on a strong upward path between the year 2000 and 2010 when it grew by an average of about 7 percent per year. Since export and import data are highly correlated, only export data are shown here. Export data for 2000 to 2013 was derived from the UN,FAO FAOSTAT database. Data since 2014 were compiled from the UN Comtrade database, supplemented by other data sources where needed. The slowdown in the volume of exports coincided with the global economic slowdown after the Great Recession of 2008. Exports have varied little in volume from year to year between 2010 and 2016. The average price of world fresh apple exports was also on a strong upward trend between 2000 and 2013, despite sharp pullbacks in 2005 and 2009. However, the average export price has fallen for three consecutive between 2013 and 2016.

World: Exports of Fresh Apples, Calendar Years, 2000-2016
(volume, million metric tons, and average price, UD$100 per metric ton)



The Great Recession and its aftermath affected world demand for fresh apples and many other products in several ways. Clearly, it directly affected the purchasing power of many consumers. A brief international financial crisis following the Great Recession disrupted normal trading patterns for a year. Faced with economic difficulties, many countries introduced protectionist measures to try to save scarce foreign exchange. Many of these measures affected the fresh apple trade. A series of geopolitical crises, including the Arab Spring rebellions in the Middle East and North Africa, the outbreak of civil war in Syria, the rise of ISIS in Iraq and Syria, and the dispute between Russia and many western allies over Russia's invasion of the Crimea, led to disruptions in normal trade flows. The average price of world fresh apple exports recovered in the years immediately after the Great Recession. However, the fall in prices in the last three calendar years when the volume of exports was flat indicates an absolute shrinkage in export demand for fresh apples.

Historically Important Fresh Apple Exporters

In previous issues, the World Apple Review has focused most attention on the top ten exporting and importing countries for fresh apples. The table below includes countries that were among the top ten exporters through calendar year 2013.

Top Ten Fresh Apple Exporters, Calendar Years, 2009-2016
(metric tons)

Country	2009	2010	2011	2012	2013	2014	2015	2016p
	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)
China	1,171,805	1,122,953	1,034,635	975,878	994,664	865,048	833,356	1,350,617
Poland	777,071	728,500	532,058	941,678	1,216,294	1,026,593	845,105	1,009,193
Italy	732,794	856,596	976,131	933,361	787,795	974,847	1,143,838	1,049,438
United States	816,167	790,376	826,438	870,185	890,463	888,632	989,083	777,399
Chile	678,629	842,668	801,167	761,984	833,251	820,184	629,046	764,813
France	611,279	695,760	726,609	625,943	541,921	695,865	634,084	572,910
South Africa	338,829	307,783	333,435	580,992	482,435	381,865	381,051	510,879
New Zealand	302,854	284,187	296,931	309,464	350,011	336,785	358,508	381,585
Turkey	59,791	80,569	87,303	68,916	25,682	111,521	142,155	140,595
Argentina	207,196	180,309	234,138	132,117	163,598	144,418	106,438	100,000
Top Ten	5,510,015	5,890,501	5,848,855	6,100,518	6,387,114	6,245,758	6,062,664	6,657,429
World Total	7,915,471	8,594,174	8,262,926	8,280,054	8,584,796	8,379,146	8,374,474	8,608,865
Top Ten %	69.6	68.5	70.8	74.9	74.4	74.5	72.4	77.3

Even among these traditional leading exporters of fresh apples, there have been considerable swings in volume and in rankings since 2009. Between 2009 and 2012, China was the leading exporter of fresh apples. It was replaced by Poland in 2013 and 2014, fell to third place behind Italy and Poland in 2015, and regained the top spot in calendar year 2016. The United States, Chile and France have been consistently in the middle of the pack. In contrast, South Africa, New Zealand and Turkey have significantly increased their export volume, while Argentina has suffered a significant decline.

There are now four countries that each have the potential to supply exports of over one million metric tons of fresh apples to the world market in any year. They are China, Poland, Italy and the United States. Indeed, fresh apple exports from Poland and China have already exceeded 1.2 million metric tons in previous years, while Italy's has exceeded 1.1 million metric tons. For France, Chile and Argentina, trends in production suggest that future growth in fresh apple exports will be limited. However, South Africa, New Zealand and Turkey appear to have considerable potential for further export growth.

China and Turkey represent special cases. The share of their apple production exported fresh has remained small both because they have had large and growing domestic markets, and because the quality of many of their apples were not suitable for the more demanding export markets. However, both countries now expect total production of apples to continue to rise in the next decade. Both face rates of domestic economic growth considerably below what they have achieved in the recent past. Any slowing in domestic demand will make it even more necessary to expand exports. Both have the capability of rapidly improving the quality of fresh apples for export. Poland faces a different challenge. Russia was its major market for fresh apple exports, and with the Russian market closed it will either have to find alternative markets (no easy task), or reduce its production capacity. Neither of these changes will come easily.

The table above also showed the estimated share of world exports accounted for by the top ten exporters. That share was below 70 percent in 2009 and 2010, but has been rising since. Forecasts for 2016 suggest that the top ten exporters accounted for over 77 percent of world exports of fresh apples in that year. As these export heavyweights increase the volume of sales, it will intensify competition in the world export markets for fresh apples.

Shuffling Ranks among Major Importers

The table below shows the volume of fresh apple imports from countries that were among the top ten importing countries through 2013. The most dramatic change relates to the Russian Federation. By 2013, it was the world's largest importer of fresh apples, with a volume double that of second place Germany. The United Kingdom was a distant third behind Germany, with just above one third of the Russian level of imports. By 2016, Russian imports of fresh apples had fallen by almost one half from the 2013 level, while those of Germany and the United Kingdom had fallen further. Among the remaining top ten, India was the only country where imports had a strong upward trend, and even India had suffered minor setbacks in 2010 and 2015. Imports of fresh apples by the United States remain sensitive to the size of the domestic apple crop. Since that is expected to increase in the next decade, there appears to be little chance for significant increases of fresh apples by the United States. Imports by countries like Mexico, Spain and Canada are sensitive to general economic conditions, while those of the United Arab Emirates and Saudi Arabia are affected by the level of world oil prices.

Concentration of fresh apple imports tends to be much less than of fresh exports. The top ten importers continue to account for just 40 percent of all world fresh apple imports.

Top Ten Fresh Apple Importers, Calendar Years, 2009-2016
(metric tons)

Country	2009	2010	2011	2012	2013	2014	2015	2016p
	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)
Russian Fed.	1,108,205	1,204,175	1,157,724	1,278,551	1,352,347	1,049,872	880,311	720,000
Germany	622,564	621,502	672,823	593,485	658,423	637,833	682,804	602,398
United Kingdom	455,671	400,722	459,187	476,525	479,540	446,026	426,356	397,159
Mexico	222,209	221,301	198,481	235,893	274,978	235,502	306,402	212,678
Spain	238,712	253,496	244,081	223,046	239,415	247,167	232,268	249,985
Canada	182,119	191,717	198,618	202,608	233,589	222,140	212,345	238,765
UAE	158,680	155,753	149,763	156,720	172,726	205,192	222,666	220,000
Saudi Arabia	50,747	176,572	181,280	187,139	189,295	179,386	204,292	200,000
India	98,895	93,264	179,015	186,368	194,335	204,570	193,692	246,808
United States	155,775	191,579	147,789	183,453	198,746	207,994	153,311	193,620
Top Ten	3,293,577	3,310,081	3,588,761	3,723,788	3,993,394	3,635,682	3,514,447	3,281,413
World Total	7,504,227	8,302,899	8,095,873	8,386,623	8,613,231	8,337,612	8,739,066	8,316,466
Top Ten %	43.9	39.9	44.3	44.4	46.4	43.6	40.2	39.5

Presumptive Major Importers and Exporters

Identifying trade flows in fresh apples has always been difficult for countries like Belgium, the Netherlands and Austria that have a substantial transit trade in fresh fruit. With the closure of the Russian market to direct imports from traditional EU suppliers, UN Comtrade data are showing even larger trade in fresh apples for a number of Russia's neighboring countries.

Major Transit Countries: Reported Trade in Fresh Apples, 2015

(volume, metric tons, value US$ thousand, price, US$ per metric ton)

		Exports			Imports		
Country	Population	Quantity	Value	Price	Quantity	Value	Price
	(1,000)	(mt)	($ '000)	($/mt)	(mt)	($ '000)	($/mt)
Austria	8,545	107,520	69,682	648.08	113,605	34,308	301.99
Belgium	11,299	236,584	141,532	598.23	149,962	135,991	906.84
Netherlands	16,925	202,529	193,365	954.75	238,886	227,724	953.28
W. Europe	36,769	546,633	404,578	740.13	502,453	398,023	792.16
Belarus	9,496	610,791	111,181	182.03	731,082	439,629	601.34
Czechia	10,543	110,494	22,860	206.89	89,516	43,446	485.34
Lithuania	2,878	458,969	96,200	209.60	427,640	114,325	267.34
Serbia	8,851	187,366	104,097	555.58	58,759	17,480	297.48
E. Europe	31,768	1,367,620	334,338	244.47	1,306,997	614,880	470.45
Total	68,537	1,914,253	738,917	386.01	1,809,450	1,012,903	559.79

The table above shows that the volume of fresh apples exported and imported by these transit countries was evenly balanced in 2015. This was also true for the average prices of imports and exports for the Western European countries, especially the Netherlands. However, there were large discrepancies in the average prices of exports and imports for each of the countries in Eastern Europe. Oddly, the average price of imports was much higher for all of the Eastern European countries except Serbia, where export prices were almost twice import prices. The total volume of fresh apple exports and imports through these transit countries with a combined population of less than 70 million people was over 20 percent of total world trade in fresh apples. Unfortunately, it is impossible to determine how much of this trade was for transit only. This has made it more difficult to determine the true origin of imports and the true final destination of exports.

Strategies of Major Exporters

Since detailed trade flows from export origins to 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 destination for the two most recent calendar years, 2015 and 2016, for the European Union in total, and for the eight largest individual apple exporting countries.

The table on the next page compares the volume of exports of fresh apples from China, the United States and the EU-28 for 2015 and 2016. Together, these three suppliers generally account for over 70 percent of all world fresh apple exports. In any year, the EU-28 exports twice as many fresh apples as China and the United States combined. However, between 55 and 60 percent of EU-28 exports in any season includes transactions between EU member countries, whereas all of the exports from China and the United States go to third countries.

In general, each of the three major exporters focused on different primary destinations. For example, China shipped over 87 percent of its exports in both 2015 and 2016 to other Asian countries. The primary focus of the United States was other countries in North America, while the Asian region was second in importance. While other EU-28 countries were the primary target for EU-28 exporters, the EU-28 was also the largest supplier of fresh apples to the rest of Europe and to the Middle East and Africa. Russia became a more important market for Chinese fresh apple exports in 2016 as the ban on sales from the United States and the EU-28 remained in place.

All three major exporters went head to head most directly in non-producing countries in Asia, the Middle East and Africa. China and the United States were close competitors in North Asia, but China was the dominant supplier to Southeast Asia and South Asia. The EU-28 led China in other Asian countries. The EU-28 was the leading supplier to the Middle East and Africa, followed by the United States. The EU-28 moved sharply ahead of the United States in tapping Southern Hemisphere markets in 2016. It remained the dominant supplier to all other markets. These relative positions in any year are affected by the total apple crop available. Competition is likely to be most intense in years when all three major suppliers have large apple crops.

China, United States and EU-28: Destination of Fresh Apple Exports, calendar years, 2015 and 2016

(metric tons)

Destination	China 2015	China 2016	U.S. 2015	U.S. 2016	EU-28 2015	EU-28 2016
Germany	7	0	0	0	679.851	541,414
United Kingdom	609	839	6,200	4,384	215,056	199,583
Other EU-15	207	1,304	414	100	1,071,363	1,036,939
NMS	0	0	63	0	682,645	442,358
Total EU-28	823	2,143	6,677	4,484	2,648,915	2,220,293
Other Western Europe	397	836	533	379	55,228	59,384
Russian Federation	85,660	114,620	0	0	51,424	1,929
Other Europe	0	12	6	23	744,423	629,995
Europe, exc EU-28	86,057	115,468	593	302	851,075	691,308
Canada	1,661	4,647	141,894	143,588	2,307	5,161
Mexico	0	0	305,187	212,571	0	0
United States	112	3,819	0	0	205	383
North America	1,773	8,466	446,912	356,159	2,512	5,544
Central America	28	73	77,418	70,544	1,460	6,553
Southern Hemisphere	921	866	24,058	17,764	27,515	70,468
Middle East	18,411	34,885	94,033	53,199	226,036	252,622
Africa	995	1,329	1,324	312	429,629	299,611
Middle East & Africa	19,406	36,214	95,357	53,511	655,655	552,233
North Asia	64,372	113,357	127,604	104,670	8,003	7,519
Southeast Asia	393,999	615,392	96,714	100,163	14,373	16,215
South Asia	202,953	406,801	108,981	61,440	22,182	30,272
Other Asia	63,093	51,782	60	0	84,901	86,694
Total Asia	724,327	1,187,332	333,359	266,273	129,459	140,700
All Other	21	55	10	467	68,088	98,592
TOTAL	833,356	1,350,617	984,384	769,504	4,384,679	3,785,691

The table on the next page compares fresh apple exports in 2015 and 2016 for the three leading exporters within the EU-28, France, Italy and Poland. France and Italy have been leading fresh exporters for decades and have adapted their variety mix to the tastes of higher-income consumers, primarily in Western Europe, but also in more advanced economies in Asia. However, the closure of the Russian market has forced them to more aggressively seek export opportunities in transition countries and in the developing world. France, in particular, has strong ties with numerous ex-colonies that have helped with export expansion. Italy has been under more pressure to find new markets because its export volume has grown rapidly, while that of France has declined over time.

Poland has been most severely impacted by the Russian embargo. Prior to the embargo, Russia was its largest single market and accepted low-priced apple varieties that were not acceptable in Western Europe. Exports to Russia through official channels have fallen from over 400,000 metric tons in calendar year 2014 to less than 200 metric tons in 2015 and 2016. From the transit statistics discussed in the previous section, Poland may have been able to continue to supply Russia through unofficial channels. However, accurate data on such shipments are elusive. In addition, such exports are vulnerable to sudden, erratic clampdowns by the Russian customs authorities.

All three countries have speeded up the process of gaining entry to markets that were previously not accessible due to tariffs, quotas, licensing or absence of pre-arranged import protocols. However, such diplomatic efforts tend to be both slow and difficult, and often require the applicant country to make concessions to products from the importing country.

France and Italy have continued to be heavily reliant on markets in the EU-15, the richer members of the EU-28. In contrast, Poland has been most successful in supplying the poorer new member states (NMS) of the EU, and non-member states in Eastern Europe. In general, none of these countries have made significant inroads in markets in the Americas, although Italy made substantial gains in Canada and in the Southern Hemisphere in 2016. All three made gains in the Middle East in 2016, but both France and Italy experienced significant falls in exports to Africa, probably due to weaker economic conditions there. Within Asia, France was strongest in Southeast Asia, Italy in South Asia, and Poland in Other Asia. Poland also made the biggest gains in exports to all other (unspecified) countries.

France, Italy and Poland: Destination of Fresh Apple Exports, calendar years, 2015 and 2016

(metric tons)

Destination	France 2015	France 2016	Italy 2015	Italy 2016	Poland 2015	Poland 2016
Germany	57,092	43,056	304,561	256,973	92,130	53,935
United Kingdom	117,348	112,582	33,190	30,840	5,502	8,384
Other EU-15	271,211	262,765	249,268	292,022	70,451	74,913
NMS	5,734	1,198	125,817	85,669	349,728	234,136
Total EU-28	451,386	419,601	712,836	665,504	517,810	371,368
Other Western Europe	1,576	2,031	37,692	38,810	5,416	7,129
Russian Federation	0	0	133	57	116	156
Other Europe	7	4	12,877	9,846	323,595	553,121
Europe, exc EU-28	1,583	2,035	50,702	48,713	329,127	560,406
Canada	976	846	921	2,929	207	674
Mexico	0	0	0	0	0	0
United States	71	251	121	96	0	0
North America	1,047	1,097	1,042	3,025	207	674
Central America	215	1,356	425	1,944	0	21
Southern Hemisphere	3,466	6,410	6,499	33,182	0	0
Middle East	64,882	65,928	115,386	135,450	2,898	9,467
Africa	77,297	44,933	232,191	133,825	16,860	31,627
Middle East & Africa	142,179	110,861	347,577	269,275	19,758	41,094
North Asia	6,308	5,498	305	704	110	464
Southeast Asia	12,051	13,181	483	326	323	1,630
South Asia	2,391	2,202	11,804	15,082	1,348	2,179
Other Asia	266	3	372	174	57,489	64,113
Total Asia	21,016	20,884	12,964	16,286	59,270	68,386
All Other	13,201	11,295	11,794	11,510	19,702	51,183
TOTAL	634,093	573,539	1,143,839	1,049,439	945,874	1,093,132

Chile, South Africa and New Zealand have been the most consistent exporters of fresh apples from the Southern Hemisphere in recent years (See table next page.). Chile has been the most diversified in the markets it serves. New Zealand has tended to be more selective, focusing on markets that are willing to pay a premium price sufficient to overcome its distance from markets. All three countries have sought to move away from over-dependence on traditional European markets, and to pivot towards Asian markets. However, demand in most Asian markets has not grown as rapidly as exporters have anticipated, largely due to protectionist actions by Asian countries that have interrupted the free flow of imports.

All three countries succeeded in reversing the decline in exports to the EU-28 in 2016. South Africa made big gains in the United Kingdom for the second year in a row. None of these countries have been particularly strong in other European countries, or in the Russian Federation. Only South Africa was able to increase exports to Russia in 2016. North American markets have continued to be important for both Chile and New Zealand. Chile made big absolute and percentage gains in Canada, Mexico and the United States in 2016, while New Zealand staged a strong recovery in the United States. Of the three, Chile was the dominant supplier to Central America and to the Southern Hemisphere, primarily to its neighbors in South America.

Opportunities in the Middle East tend to be heavily related to the price of oil, but all three exporters were able to maintain their sales in the Middle East. South Africa continued to dominate African markets where it has been a pioneer in opening many countries to fresh apple sales. However, exports to Africa dropped marginally in 2016 as many African countries struggled with economic setbacks.

Asia continued to be important to all three exporters, most especially New Zealand that has received good acceptance for its new, premium varieties in Asian markets that are much closer than its traditional markets in Europe and North America. UN, Comtrade data showed a large volume of fresh apples from each country going to Asia n.e.s. (that is, not elsewhere specified). Thus, it is unknown where in Asia these exports went. However, Southeast Asia was the most important designated destination. In contrast, the biggest declines were reported for North Asia. This may reflect the increased competition from cheaper Chinese fresh apples in that region. However, there is no doubt that success in Asia will be crucial for all three leading Southern Hemisphere exporters.

Chile, New Zealand and South Africa: Destination of Fresh Apple Exports, calendar years, 2015 and 2016
(metric tons)

Destination	Chile 2015	Chile 2016	N Zealand 2015	N Zealand 2016	S Africa 2015	S Africa 2016
Germany	6,592	9,791	8,867	13,285	3,507	4,884
United Kingdom	25,373	27,149	47,236	47,722	87,828	107,614
Other EU-15	78,362	86,702	63,004	68,187	19,672	27,007
NMS	559	639	62	67	81	46
Total EU-28	110,886	124,281	119,169	129,261	111,088	139,551
Other Western Europe	4,171	4,424	1,392	1,173	1,421	1,278
Russian Federation	26,076	20,632	7,821	6,348	7,832	14,739
Other Europe	0	0	0	0	4,224	5,946
Europe, exc EU-28	30,247	25,056	9,213	7,521	13,477	21,963
Canada	10,528	22,648	5,481	6,012	1,683	2,259
Mexico	1,827	3,983	686	23	0	0
United States	78,290	106,519	31,356	53,319	22	29
North America	90,645	133,150	37,523	59,354	1,705	2,288
Central America	26,271	32,848	177	23	0	111
Southern Hemisphere	220,815	275,749	5,732	6,805	n.a.	2,845
Middle East	58,875	67,500	22,202	22,685	25,713	34,188
Africa	6,434	3,988	528	68	198,379	189,303
Middle East & Africa	65,309	71,488	22,730	22,753	224,092	223,491
North Asia	62,829	17,108	54,270	32,079	9,785	3,512
Southeast Asia	841	902	55,793	63,314	66,396	64,141
South Asia	20,083	33,493	23,651	18,689	17,778	29,289
Other Asia	42	49,899	0	34,970	0	13,539
Total Asia	83,795	91,402	133,714	149,052	93,959	110,481
All Other	280	10,839	629	6,816	1,702	10,149
TOTAL	628,248	764,813	328,887	381,585	465,695	510,879

Changes in World Import Markets

Data on world imports of fresh apples tend not to be available in as timely a manner as data on world exports. In contrast, data for the EU-28 and some individual countries are available more rapidly. Since the EU-28 remains the dominant world importer of fresh apples, its data provide a good indicator of overall changes in world imports. The table below shows EU-28 imports of fresh apples by major sources for the calendar years from 2008 to 2016. Total EU-28 fresh apple imports have fluctuated in a range between 2.75 and 3.2 million metric tons during the period. This lack of growth in the EU-28 import market is to be expected given the upward trend in apple production in the EU-28 and the economic problems that many member countries have endured since 2008.

EU-28: Imports of Fresh Apples, by Major Sources, 2008-2016

(1,000 metric tons)

Source	2008	2009	2010	2011	2012	2013	2014	2015	2016
France	518.8	450.8	525.5	523.1	464.4	413.4	499.8	446.9	414.5
Italy	506.0	536.5	672.1	615.2	579.2	517.9	520.8	605.2	569.0
Poland	224.9	165.9	100.5	57.6	183.7	345.9	281.4	397.8	383.8
Other EU-28	1,142.5	1,031.7	1,064.2	1,151.1	1,196.7	1,145.9	949.0	1,337.9	939.3
Total EU-28	2,392.2	2,184.9	2,262.2	2,356.0	2,424.0	2,423.0	2,251.0	2,787.7	2,306.6
Canada	2.5	1.2	1.6	1.2	0.8	0.1	0.2	0.2	0.2
United States	27.3	26.4	20.1	10.2	10.5	12.1	9.0	6.2	4.3
N America	29.8	27.6	21.7	11.4	11.3	12.2	9.2	6.5	4.5
China	38.2	18.4	11.0	5.6	3.2	7.8	1.6	0.9	2.0
Argentina	79.8	57.7	47.1	49.8	29.2	45.5	34.9	14.1	14.2
Australia	0.6	0.3	0.4	0.3	0.5	0.5	0.1	7.0	13.6
Brazil	97.5	80.2	70.7	39.8	57.8	66.4	30.5	35.6	16.8
Chile	211.5	186.5	177.8	170.2	133.0	169.4	164.3	112.2	124.7
New Zealand	140.9	165.2	126.6	147.0	115.5	131.6	129.0	117.2	117.4
South Africa	171.2	144.9	112.8	110.5	120.0	152.7	84.4	105.7	97.5
S Hemisphere	701.4	634.8	535.4	517.6	456.0	566.1	443.2	391.8	384.2
All Other	41.4	19.4	47.3	61.3	33.7	82.6	40.8	56.1	54.2
TOTAL	3,203.0	2,885.1	2,877.5	2,951.9	2,928.2	3,091.7	2,745.8	3,243.0	2,751.5

However, even more notable is that the share of EU-28 imports of fresh apples coming from internal sources has continued to increase, from about 75 percent in 2008 to almost 84 percent in 2016. France, Italy and Poland remain the major internal suppliers, but imports from other member countries set a new record in 2015. During the same period, the volume coming from North America and China has fallen drastically. However, the main third country fresh apple supplies to the EU-28 have tended to be off-season imports from the Southern Hemisphere. The total imports from the Southern Hemisphere fell by almost one half between 2008 and 2016. There were dramatic declines from Argentina and Brazil. Imports from Chile and South Africa fell by over 40 percent. Imports from New Zealand declined more modestly, by about 17 percent. Only Australia, the smallest supplier bucked the trend with increases in both 2015 and 2016, largely due to sales of the premium Pink Lady apples.

These trends in EU-28 imports are significant in a number of ways. They indicate little or no growth in one of the world's biggest import markets. They remove one of the major underpinnings to future growth of the apple industry in the Southern Hemisphere. And, they indicate difficult times ahead for niche suppliers to the EU-28 that do not have unique product offerings.

Russian Import Ban Roils Fresh Apple Trade

The continuing ban by the Russian Federation on imports of produce, including fresh apples, from the EU-28, the United States, Canada, Australia and Norway continues to roil world apple trade patterns. It has already been noted how the ban has led to much smuggling of fresh apples into Russia, and has made statistics surrounding the Russian apple trade quite unreliable. When the ban was first imposed, it was assumed that banned suppliers would simply be replaced in the Russian market by those that were not included in the ban, and that banned suppliers would divert their apples to markets other suppliers had left. However, since the original ban in August 2014, the Russian authorities have also banned other countries for being complicit in trying to circumvent the sanctions on EU suppliers. The effects of those supplementary bans have been hard to measure. In addition, the sharp drop in the value of the Russian ruble after western sanctions were imposed on Russia, have reduced the purchasing power of Russian importers and consumers, and affected total Russian demand for apples.

Fresh apple exports by member countries of the EU-28 have been most directly impacted by the Russian ban. The table below shows how the EU-15, Poland, and the entire EU-28 have altered their pattern of exports between 2013-14, before the Russian ban, and in the two most recent complete seasons, 2014-15 and 2015-16. Total fresh apple exports by the EU-15 countries rose in both 2014-15 and 2015-16. In contrast, total exports from Poland fell in 2014-15 before rebounding in 2015-16. As a result, the total exports from the EU-28 rose in 2014-15, but fell in 2015-16. The net effect was that export availabilities from these countries was little changed. As expected, exports to Russia fell dramatically in 2014-15 and 2015-16. The table also lists the countries bordering Russia that might have been a conduit for unofficial exports to Russia. The biggest anomalies have been the increases in exports from Poland to Belarus and Romania. Poland's exports to the Ukraine rose sharply in 2014-15, but tumbled again in 2015-16 as the Ukraine became subject to unrelated Russian curbs on agricultural imports from that country. Surprisingly, average prices fell by only about 10 percent for Poland and for the total EU-28.

How EU Adjusted to the Russian Import Ban: 2013-14, 2014-15 and 2015-16 Seasons

(Exports in Metric Tons)

Exporter	EU-15	EU-15	EU-15	Poland	Poland	Poland	EU-28	EU-28	EU-28
	2013-14	2014-15	2015-16	2013-14	2014-15	2015-16	2013-14	2014-15	2015-16
Destination									
Russia	81,579	5,800	296	529,031	173	158	653,747	60,643	1,912
Azerbaijan	215	565	125	390	158	1,015	633	723	1,142
Belarus	8213	3,635	2,689	234,561	289,921	436,154	262,779	653,887	558,560
Georgia	462	1,734	1,115	488	1,044	3,377	1,005	2,778	4,492
Kazakhstan	1,010	4,554	1,730	54,019	61,473	54,579	57,356	87,419	74,246
Kyrgyzstan	0	0	0	59	880	77	73	1,018	77
Moldova	178	20	46	32	717	1,873	226	778	2,659
Romania	17,144	27,951	29,693	36,406	45,942	64,078	12,784	83,120	98,804
Tajikistan	0	20	0	625	117	39	683	456	39
Ukraine	601	317	130	35,212	61,725	25,718	35,859	62,072	26,136
Subtotal	27,823	38,795	35,529	361,790	461,975	586,910	417,340	892,251	766,155
TOTAL	2,398,272	2,431,540	2,535,936	1,126,713	899,936	980,485	3,804,225	4,080,731	3,904,598
EU-15	1,587,151	1,505,758	1,577,231	167,375	169,522	131,943	1,887,148	1,756,889	1,853,373
NMS	136,818	90,588	164,670	95,024	251,888	230,331	310,929	539,039	465,400
EU-28 Extra	674,303	835,193	794,035	864,314	478,526	618,212	1,606,148	1,784,803	1,585,860
Ave Price €	787.55	769.74	783.21	336.15	299.47	300.45	622.96	559.91	608.47

All three exporters, the EU-15, Poland and the EU-28 recognized the need to find alternatives to Russia for their fresh apple exports. However, the table above shows that there was little opportunity for growth in demand in the EU-15. Indeed, Poland's exports to the EU-15 fell by over 20 percent in 2015-16. Exports to the New Member States (NMS) from Poland and the total EU-28 soared in 2014-15, but fell back in 2015-16. Exports to other countries outside the EU-28 had mixed fortunes. Those from the EU-15 and EU-28 rose in 2014-15 and fell in 2015-16. Those from Poland fell sharply in 2014-15, and remained well below the 2013-14 pre-embargo levels in 2015-16.

The table below shows the impact of the Russian ban on EU-28 exports of fresh apples for the August-December period of each year since Aug-Dec 2013 before the ban was imposed. In general, the pattern established in the first post-ban period, Aug-Dec 2014, has persisted through the latest two seasons. These included the dramatic drop in exports to Russia, and major increases in exports to Russia's neighbors, and to other countries outside the EU-28. Exports to the EU-15 actually declined in Aug-Dec 2014 before rebounding in Aug-Dec 2015. Exports to the New Member States (NMS) changed little in Aug-Dec 2014, but were at much higher levels in Aug-Dec 2015 and Aug-Dec 2016. In summary, the Russian ban has led to changes in the patterns of EU-28 exports of fresh apples, but those patterns have begun to stabilize.

EU-28 Adjustments to the Russian Ban, 3 years on. August-December 2013, 2014, 2015 and 2016

(metric tons)

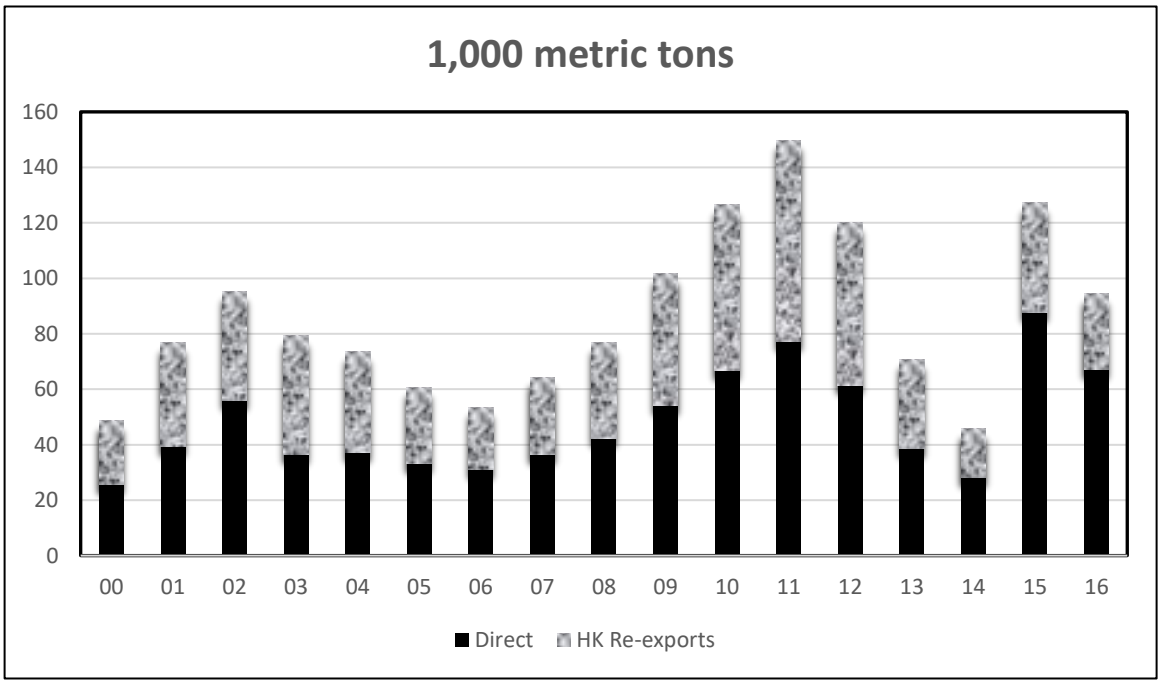
Destination	Aug-Dec 2013	Aug-Dec 2014	Aug-Dec 2015	Aug-Dec 2016
	(mt)	(mt)	(mt)	(mt)
Russia	155,138	9,252	105	122
Russia's Neighbors	61,281	164,290	147,605	163,295
Other Outside EU-28	243,936	429,068	412,626	380,871
Total Outside EU-28	450,014	581,038	534,366	514,113
EU-15	887,091	757,114	900,596	808,766
Other EU-28 (NMS)	100,844	104,452	164,204	143,447
Total EU-28	987,935	861,566	1,064,800	952,213
TOTAL	1,437,949	1,442,603	1,599,166	1,466,326

China to the Rescue?

China's economic performance over three decades of maintaining high growth rates, dramatically reducing poverty and building a large, middle class, made many exporters of fresh fruit view China as the great, potential growth market for imports. However, the chart below shows the combined effect of direct imports by China and re-exports from Hong Kong to China. The promising trend between 2006 and 2011, has been undermined by the erratic performance since. The estimated level in 2016 was well below the recent peak in 2011.

China: Imports of Fresh Apples, Direct and Reported Re-exports from Hong Kong, 2000-2016

(1,000 metric tons)



Despite the high hopes of many exporters for China as a potential market for fresh apples, actual performance has been characterized by a series of false starts and unexpected downturns. For example, both direct imports and re-exports from Hong Kong had promising upswings in the late 1990s and near the end of the next decade. However, each was followed by sharp downturns, for example, between 2002 and 2006, and again between 2011 and 2014. Direct imports set a new record in 2015, but they then declined sharply in 2016. Re-exports from Hong Kong were

far below historic levels in 2016. Complicating the picture is the fact that for many years, fresh apples entered China through unofficial channels in Hong Kong (smuggling). An unknown volume of smuggled apples was not captured in the official import or re-export data.

Prospects for World Fresh Apple Trade

The data presented in this chapter indicate that world trade in fresh apples has stabilized in recent years after a period of rapid growth. The biggest, over-riding problem has been economic setbacks in many of the major apple importing countries. In some cases, countries have not yet recovered from the Great Recession. In others, the problem has been exacerbated by the decline in the demand for many commodities, from oil, to copper, to soybeans. Both developed countries, like Australia and Canada, and developing countries, like Indonesia and Angola, have been affected. The oil-exporting countries as a group have been hard hit by the decline in oil prices because of their dependence on a single industry.

In many other countries, economic problems have been compounded by political crises, civil strife, widespread corruption, and unwise policies. While the most troubled region in the world remains the area that stretches across much of North Africa and through the Middle East, there have been serious problems in every continent, for example, Greece in Europe, Nigeria in Africa, Argentina in Latin America, and Pakistan in Asia. Growth has remained sluggish in the rich countries like the United States, Germany and Japan, while many of the BRICs countries, just recently touted as the next great economic powers, have fallen off the path of rapid growth. Even China, which has continued to grow at over 6.5 percent per year, faces serious problems of overcapacity, a real estate bubble and shaky finances.

While many individual countries have had problems, many weaknesses have also emerged in the institutions that have helped support international trade. Since its inception in 1995, the World Trade Organization (WTO) has failed dismally to meet the targets for trade liberalization agreed during the Uruguay Round GATT negotiations. Many member countries have despaired of improving freer trade under WTO rules, and have increasingly turned to bilateral or regional trade deals instead. However, while such deals can help selected sectors, they often create further distortions for countries not included in such deals.

Two international treaties that promised to restore the prominence of trade liberalization appear to be dead. The Transpacific Partnership (TPP) had laid out an agenda for improving trade flows among 12 leading Pacific Rim nations, including the United States and Japan, but not China. The hope was that if the TPP became successful, other nations, including China, would wish to join, but China would be forced to accept the established rules. However, after his election, President Donald Trump withdrew U.S. support, effectively killing the TPP. Efforts by other members to develop a more limited TPP have been unsuccessful.

The second mega-deal, the Transatlantic Trade and Investment Partnership (TTIP) between the European Union and the United States, would have freed trade and investment in a trading block that accounts for about half the world's GDP. It was hoped that TTIP would both stimulate the EU and U.S. economies and help them set rules for world trade and investment that would offset Chinese influence. However, interest in completing the TTIP has waned as the EU has grappled with problems like the uncertainty about the euro, managing a flood of refugees, dealing with Russian aggression, and the potential departure of the United Kingdom from the Union. While the Trump administration has claimed to favor bilateral deals over regional or multilateral deals, it has so far shown no interest in reviving the TTIP. At least for now, both the TPP and the TTIP are sidelined.

Perhaps the greatest threat to further trade liberalization is the rising tide of opposition in many western countries to globalization. Since World War II, the United States, Japan and other developed countries have agreed that the best path to world peace and prosperity was to lessen barriers between countries to free movement of goods, services, intellectual property, capital and people. That freedom included respect for human rights, the rule of law, and private property, and rights to free speech and freedom of worship. Under those traditions, governments derived their power from the people, and that power was best delegated to governments through free, democratic elections. This so called "western consensus" has succeeded in lowering many barriers, establishing democracy, and helping numerous countries to escape the cycle of poverty and generate sustainable economic growth. However, support for the western consensus in the developed world has faded as globalization was blamed for loss of jobs, dilution of traditional cultures and other undesirable societal changes. The western consensus has also faced frontal attacks from regimes that reject the democratic principles of governance.

Three of the most notable examples of this rejection are China, Russia and Iran. In these regimes, all power derives from the state, and citizens are only permitted the rights that the state grants them. In each case, the legitimacy of the state derives from a higher source, in China, the Communist Party, in Iran, the tenets of Islam, in Russia, the ruling junta. Rejection of, or opposition to, these superior powers is seen as treason. These regimes feel free to abrogate human rights at any time for the higher purposes of the state, and often do so. They are openly hostile to the western consensus because it challenges the state's absolute power.

However, these countries still see the advantages to their economies of being able to import needed raw materials and export their final products. Accordingly, they favor managed trade where controls can be exercised to serve national purposes. For example, China envisages creating a large sphere of influence along new Silk Roads on land and by sea where Chinese investment and interests would be the dominant force. At the same time, it maintains rigid controls on information reaching the Chinese people through old media or the internet. In a world where might often makes right, a resurgent China is likely to gain greater influence over its neighbors than an arthritic western alliance.

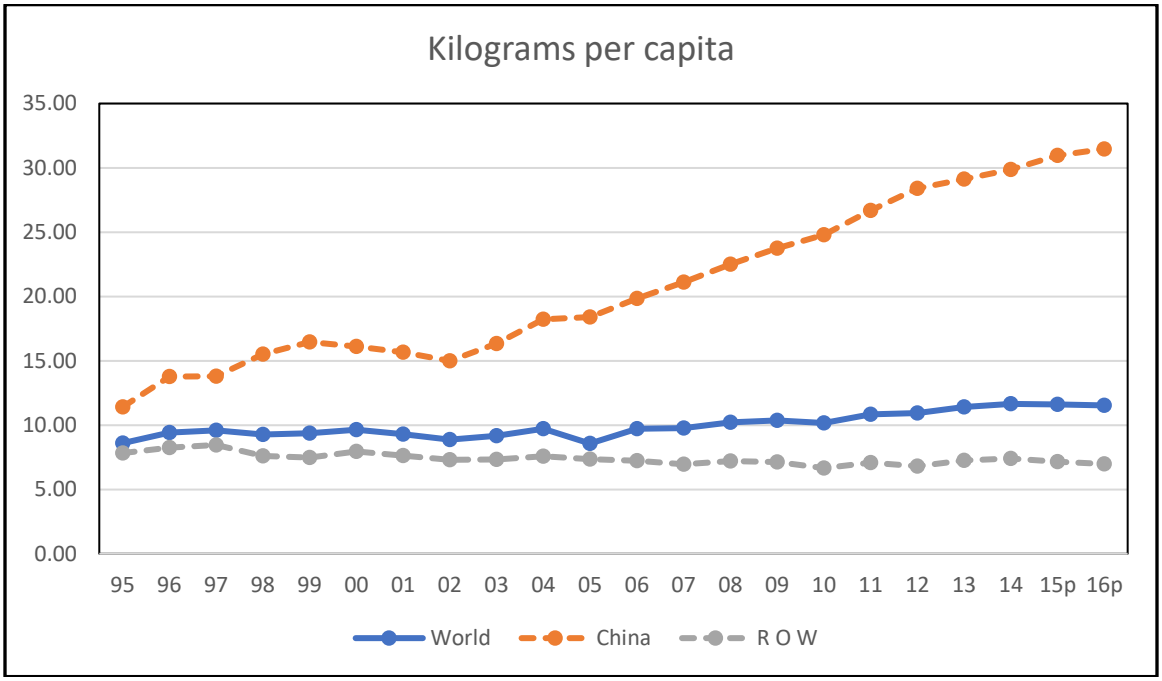
For an apple industry that is heavily reliant on exports for its prosperity, this battle between the western consensus and the proponents of managed trade could have major implications. If the Chinese model of managed trade spreads to other Asian countries, it could make exports to Asia even more erratic than they currently are.

IV. Consumption of Fresh Apples

World Apple Availability Slows Rise

The volume of apples per capita for all uses has been on a modest upward trend over much of the last two decades. However, the major driver of that trend has been in China where production growth has far outpaced population growth. The chart below has been prepared using the latest available data on apple production and population in the total world, China, and the Rest of the World for the years from 1995 to 2016. Production data in 2015 and 2016 were estimated by Belrose, Inc. from other data sources.

World: Per Capita Supplies of Apples, 1995-2016
(kilograms)



Per capita supplies of apples for China have been growing for most of the two decades, with only occasional setbacks between 1999 and 2002. By 2016, they had reached almost 31.5 kilograms, about three times the level in 1995. While it is not possible to verify the precise accuracy of the Chinese apple production data, even if somewhat inflated, they represent a dramatic rate of growth over a long period.

In contrast, per capita availability of apples in the rest of the world peaked in 1997 at 8.46 kilograms. It dipped below 7 kilograms per capita in 2007, 2010, 2012 and 2016. For the most recent five years, 2012-2016, it averaged 7.13 kilograms per capita, 16 percent below the 1997 peak. Clearly, per capita supplies in the rest of the world have been relatively stagnant in recent years. Per capita supplies for the total world, including China have grown in most years since 2003, largely due to the growth in China.

In 2016, China had 18.6 percent of world population, giving China a major influence on world per capita supplies of apples. However, population in China has been growing by less than 7 million people per year, while that of the Rest of the World has been growing by 77 million people per year, so the Rest of the World will become relatively more important to the global apple industry in the future. Most apple production in China currently enters the fresh market, while many other countries divert a substantial share of their production to processing and other uses, so China's production has exceptional influence on world fresh apple supplies. A few other countries with large apple production also rely on fresh exports to dispose of a substantial volume of their product, so trade has a major influence on fresh apple consumption. Those issues will be discussed in more detail in a subsequent section.

Trends in Per Capita Consumption

Information on trends in per capita consumption of fresh apples is of great value to every segment of the apple industry, whether internal operators like producers, packers, storage operators or marketers, or support activities like investors, breeders, nurseries, and distributors. They can be used in assessing the effectiveness of past pricing, promotion, marketing and trading activities, and in planning how to exploit the future supplies that are coming along. Despite their importance, for many reasons, recent, reliable data on per capita consumption of fresh or processed apples are no longer available for many countries. UN,FAO occasionally publishes such data for all apple products, but only after a long time lag. However, knowledge of per capita consumption trends is so important that the World Apple Review has, for many years, generated its own unofficial estimates of per capita consumption of fresh apples. The results are presented below.

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

Fresh apple consumption = Total apple production + Fresh apple imports
– Fresh apple exports – Apples for processing – Withdrawals from market.

Per capita consumption is estimated by dividing the total fresh apple consumption by the population in that period. This relationship overstates actual fresh apple consumption because it does not account for shrinkage of apple weight in storage, deterioration in the distribution system, or unused fruit wasted by consumers. However, the measure should be a reasonable proxy, and should facilitate making comparisons between countries in any period and among countries over time.

Europe: Estimated Per Capita Consumption of Fresh Apples, Selected Countries and Periods, 1992-2016

(kilograms)

Country/Region	1992-94	2000-02	2007-09	2014-16	14-16 v 00-02
	(kg)	(kg)	(kg)	(kg)	(% change)
Austria	32.80	24.11	24.90	24.97	+ 3.6
Belgium	26.80	18.52	18.26	15.39	- 16.9
Denmark	16.03	20.00	19.22	18.45	- 7.7
France	14.94	17.03	15.04	14.79	- 13.2
Germany	24.31	20.73	19.48	18.93	- 8.7
Greece	21.33	21.71	20.42	16.42	- 24.3
Italy	20.93	21.87	20.26	17.18	- 21.5
Netherlands	28.51	19.99	18.27	18.81	- 5.9
Spain	18.88	17.10	13.72	12.28	- 28.2
Sweden	16.42	15.44	15.45	13.87	- 10.1
United Kingdom	11.39	9.41	9.80	8.78	- 6.8
EU-11	19.51	17.88	16.47	15.22	- 14.9
Bulgaria	6.17	3.99	4.35	7.48	+ 87.7
Hungary	23.25	13.78	13.87	16.12	+ 17.0
Norway	16.27	14.67	16.11	13.76	- 6.2
Poland	12.23	16.67	12.56	13.86	- 16.9
Romania	24.71	14.02	15.48	22.04	+ 57.2
Serbia	16.84	9.88	7.65	8.62	- 12.7
Slovakia	11.15	10.74	10.48	10.14	- 5.6
Other Europe	16.29	13.63	12.29	14.59	+ 7.1

The table on the previous page shows the results of the estimates of per capita fresh apple consumption for eleven countries that were members of the original EU-15 (here referred to as the EU11), and for seven other countries in Europe for which consistent data were available. Of these other countries, all but Norway and Serbia have been members of the broader EU-28 since 2004. The data are shown for three-year periods to reduce the effects of any disruptions in supplies in a single year. The first period shown, 1992-94, is the first for which the needed data were readily available. It provides a base against which long term comparisons can be made. The next three periods, 2000-2002, 2007-2009 and 2014-2016 show results since 2000 for three more recent periods that are equidistant from each other.

The table shows the wide range in per capita consumption of fresh apples between countries in each period examined. For example, in 2014-16, within the EU-11, that of Austria was about three times that of the United Kingdom. Within Other Europe, there was a similar gap between Romania and Bulgaria. It also shows the widespread decline in per capita fresh apple consumption among the richer, EU-11 countries. Between 1992-94 and 2000-02, per capita consumption fell in seven of the eleven countries. The decline became more widespread after 2000-02. Between that period and 2014-16, per capita consumption declined in every country except Austria, and declined on average by almost 15 percent. The decline was over 20 percent in Greece, Italy and Spain, all of which have faced economic crises in the last decade. However, the decline was over 10 percent in Belgium, France and Sweden, countries that did not suffer similar crises.

Among the countries in Other Europe, Norway was the only one that did not experience the disruptions resulting from shifting their economies from central planning to free markets. However, despite Norway's economy being shored up by wealth generated from its discovery of oil and natural gas, its per capita consumption of fresh apples fell by over 15 percent between 1992-94 and 2014-16, and by 6.1 percent since 2000-02. On average, the countries of Other Europe suffered declines in per capita consumption between 1992-94 and 2000-02, but recovered somewhat in the latest decade. The biggest percentage increases between 2000-02 and 2014-16 were for Bulgaria and Romania. However, per capita consumption in Romania was less in 2014-16 than it had been in 1992-94. Even though Poland is now a major player in world fresh apple trade, its per capita consumption remained close to the average for the group, and fell by almost 17 percent between 2000-02 and 2014-16.

Another indicator of the general decline in per capita fresh apple consumption in these European countries is the number of countries that had per capita consumption above 20 kilograms in each period. That number fell from eight in 1992-94 to five in 2000-02, three in 2007-09 and just two in 2014-16.

There were no obvious geographical patterns in the level or trends in per capita consumption of fresh apples in these European countries. For example, Scandinavian neighbors, Norway and Sweden, had quite similar levels and trends. In contrast, neighbors Bulgaria and Romania, had widely different levels of per capita consumption. Many factors, such as income levels, unemployment, volatility in domestic production, availability of competing fruits, and trade policies, could affect fresh apple consumption. However, that would require detailed studies of each country.

The table on the next page provides similar data on per capita fresh apple consumption for 14 other major apple producing countries scattered around the world, for all 32 countries combined, and for all 32 countries, excluding China. The first six countries are in the Southern Hemisphere, the next four are in Asia, an additional three are in North America, and the last one is the Russian Federation.

In most of the Southern Hemisphere countries, per capita consumption of fresh apples is affected by their heavy focus on fresh exports. When export markets are available, they tend to be serviced first, and the surplus then retained for domestic consumption. All these countries are also producers and exporters of competing fruits, such as bananas, citrus fruits, pears, grapes, kiwifruit and other soft fruits. A number also divert substantial volumes of apples for processing. This affects availability for fresh consumption.

Per capita consumption of fresh apples has been consistently highest in New Zealand and lowest in South Africa. By 2014-16, three countries, Australia, Chile and New Zealand, had per capita consumption above 10 kilograms, while the other three countries had per capita consumption below 6 kilograms. Growth in per capita consumption of fresh apples since 2000-02 has been particularly strong in Australia and Chile. The biggest declines have been in Argentina which has been buffeted by economic problems for many years. However, the net effect has been a small, but steady increase in per capita fresh apple consumption for all these countries combined.

Other Major Producing Countries: Estimated Per Capita Consumption of Fresh Apples, Selected Periods, 1992-2016
(kilograms)

Country/Region	1992-94	2000-02	2007-09	2014-16	14-16 v 00-02
	(kg)	(kg)	(kg)	(kg)	(% change)
Argentina	8.32	9.59	7.76	5.75	- 40.0
Australia	9.53	6.84	10.60	11.44	+ 67.2
Brazil	3.47	4.44	4.83	5.58	+ 25.8
Chile	6.39	6.63	10.25	14.09	+112.6
New Zealand	14.78	16.43	13.27	13.65	- 16.9
South Africa	5.31	3.48	3.85	3.91	+ 12.5
S Hemisphere	5.07	5.36	5.80	6.28	+ 17.2
China, mainland	4.78	13.17	15.92	27.19	+106.6
Japan	6.64	6.01	5.83	5.51	- 8.5
Taiwan	6.10	5.70	5.85	6.97	+ 22.4
Turkey	34.05	33.89	33.91	30.60	- 9.7
Asia selected	6.16	13.35	15.75	25.36	+ 89.9
Canada	12.25	11.56	12.44	11.43	- 1.1
Mexico	5.61	5.20	5.62	6.90	+ 32.7
United States	8.72	7.62	7.37	8.34	+ 9.5
N America	8.26	7.33	7.30	8.20	+ 11.9
Russian Federation	4.92	6.35	9.67	11.78	+ 85.7
All 32 Countries	8.42	11.82	13.02	18.21	+ 54.0
Excluding China	11.48	10.71	10.64	10.87	+ 1.5

The four Asian countries included are extremely diverse in many ways, so average data are relatively meaningless. Per capita consumption of fresh apples has been relatively low in Japan and Taiwan, where consumers have high incomes and a wide choice of fresh fruits, and relatively high in Turkey, where incomes are relatively low. Of the three, only Taiwan has had a positive consumption trend since 2000-02. However, growth in per capita fresh consumption has been spectacular in China, and has distorted the average figures for the Asian countries. While the level of per capita consumption in China in 2014-16 was high by Chinese historical standards, it was still less than that in Turkey. While Turkish apple production has been growing, most of that production is still only suitable for the domestic market.

The three countries in North America, Canada, Mexico and the United States, all had low per capita consumption of fresh apples compared to the traditional producing countries in Europe. Their levels of per capita consumption have tended to converge since 2000-02, with that of Canada falling and those of Mexico and the United States rising.

The results for the Russian Federation have been presented separately. While domestic apple production has fallen over time, much of that has been replaced by rising imports. Imports have slowed since 2014. However, per capita consumption in 2014-16 was still 85 percent above that in 2000-02. If the Russian embargo continues, per capita consumption of fresh apples is likely to decline further.

The last two entries in the table above show the average per capita fresh apple consumption for all 32 countries, weighted by the relative populations. Data for all 32 countries suggest a strong upward trend. However, when data for China is excluded, the average falls to about 11 kilograms per capita, with a very small increase since 2000-02. This is another indication of the stagnation in per capita fresh apple consumption even in countries that are major producers of apples.

Consumption Trends in Non-Producing Regions and Countries

There are many countries that do not produce apples that have become regular consumers of fresh apples. However, the level of per capita consumption varies widely. 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 no domestic production of apples. While most domestic production of apples tends to enter the fresh market, it is difficult to measure how large the volume is without additional statistical information such as that discussed in the previous section.

The table on the next page shows estimates of the average per capita consumption of fresh apples by region for non-producing countries for the periods 2002-04 and 2011-13 and for 2014 and 2015. The averages are for 15 countries in Africa, 3 in North Asia, 9 in Southeast Asia, 6 in the Middle East11 in Central America, 5 in Latin America, and 5 island communities in the South Pacific. Most of these countries are small in both area and population.

Non-Producing Regions: Average Per Capita Consumption of Fresh Apples, Selected Years, 2002- 2015
(kilograms)

Region	2002-2004	2011-2013	2014	2015
	(kg)	(kg)	(kg)	(kg)
Africa	0.24	0.43	0.52	0.35
North Asia	7.75	7.63	8.81	13.26
Southeast Asia	0.82	1.12	0.85	0.84
Middle East	7.24	8.64	8.87	9.45
Central America	1.12	1.38	1.38	1.36
Latin America	1.06	1.67	1.55	1.46
South Pacific	0.85	1.04	1.00	0.94

In general, per capita consumption of fresh apples has been highest in regions with high per capita incomes, such as North Asia and the Middle East. Those have also been the regions where per capita consumption has continued to grow in the two most recent years, 2014 and 2015. Growth in per capita consumption has slowed in Southeast Asia, Africa and the South Pacific. Of the total population of 1.11 billion in these regions in 2015, 52.6 percent were in non-producing countries in Southeast Asia and 27.3 percent in non-producing countries in Africa, so bosting average per capita consumption in these regions would offer the best payoff for exporters.

The World Apple Review has been tracking per capita consumption in many individual countries in these regions since 1990. A few individual countries not included in this series, that have become more important in recent years, are discussed in the next section.

Many of these non-producing countries in East Asia, the Middle East and Latin America have been important targets for fresh apple exports for over three decades. A knowledge of trends in individual countries is necessary in developing targeted marketing plans. However, for many reasons, an individual country may experience fluctuations in net imports. Faced with obstacles in one market, it is easier for apple exporters to deploy their marketing efforts in nearby countries in the region, so trends in regional data are also important. Data on these 23 non-producing countries are included in the table on the next page for selected years between 1990 and 2015.

Non-Producing Countries: Estimated Per Capita Consumption of Fresh Apples, Selected Years, 1990-2015
(kilograms)

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

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 doubled between 1990 and 2010, but growth has slowed since.

The combined population of the countries in East Asia was almost 500 million in 2015, while that in the Middle East and Latin America was about 150 million, so the total for all countries included was close to 800 million people, more than one tenth of the world's population. Their total net imports were close to 1.5 million metric tons, about 18 percent of total world apple imports. The highest per capita consumption of fresh apples tended to be in a few high-income countries with small populations, such as Hong Kong, Singapore, Bahrain, Kuwait, Oman and the United Arab Emirates. However, only two of these, Hong Kong and the United Arab Emirates, had experienced rapid growth in per capita consumption in recent years. In contrast, the lowest per capita consumption of fresh apples was in low-income countries with large populations like Indonesia, the Philippines, Egypt and Venezuela. In each of these, estimated per capita consumption of fresh apples in 2015 was well below past peak levels. Two countries, Taiwan and Saudi Arabia, with relatively high incomes and mid-sized populations, had per capita consumption in the mid-range between 6 and 7 kilograms.

Because per capita fresh apple consumption in these countries and regions are heavily dependent on trade, the future trajectory of consumption will be influenced by the rate of economic growth that drives demand and by the absence of political or social unrest and of new protectionist measures in the importing countries. Some countries in these three regions remain more vulnerable than others to these disruptions.

Apple Consumption Relative to Produce Consumption

The consumption of fresh apples in any country is constrained by the consumption of competing fruits and vegetables. Consumption of fresh apples can only increase if total produce consumption increases, or if apples take a bigger share of the produce consumption. Unfortunately, data on consumption of fresh produce has become increasingly scarce in many countries. The table below shows estimates of per capita consumption of fresh vegetables and fresh fruit in five major developed countries for selected years between 1990 and 2015. Included is data for the United States, United Kingdom, France, Germany and Japan. Because the data were developed independently by each country's statistical agency, there is no guarantee that the fruits and vegetables covered are identical in all cases. However, they provide the only source for comparisons between countries and over time.

Selected Developed Countries: Per Capita Consumption of Fresh Produce, Selected Years, 1990-2015
(kilograms)

Country	Item	1990	2000	2010	2011	2012	2013	2014	2015
United States	Veg	65.1	78.9	77.4	75.9	77.2	75.2	75.8	75.6
	Fruit	41.3	44.5	46.5	47.7	49.3	50.7	51.7	50.8
United Kingdom	Veg	38.3	39.2	39.4	38.4	38.2	38.9	38.7	n.a.
	Fruit	31.6	39.8	39.3	39.7	38.7	38.7	39.8	n.a.
France	Veg	88.3	91.6	85.2	86.2	80.7	76.6	76.6	n.a.
	Fruit	62.5	56.6	52.7	51.9	62.3	59.5	59.3	n.a.
Germany	Veg	n.a.	94.0	92.5	94.4	96.4	96.5	94.9	97.0
	Fruit	n.a.	111.9	65.6	68.6	68.8	68.0	69.0	65.4
Japan	Veg	56.9	59.1	56.4	56.4	56.3	57.7	58.1	57.5
	Fruit	24.3	32.1	27.3	27.1	27.5	27.0	26.7	25.8

In the 1990s, per capita consumption of both fresh vegetables and fresh fruit rose in nine of ten instances. The exception was a fall in per capita consumption of fresh fruit in France. In contrast, in the next decade, between 2000 and 2010, per capita consumption of fresh vegetables and of fresh fruit fell in four of five countries. The exceptions were a rise in fresh fruit consumption in the United States, and in fresh vegetable consumption in the United Kingdom. The general tendency between 2010 and 2015 has been towards stable per capita consumption. The biggest exceptions have been a rise in per capita consumption of fresh fruit in the United States and a fall in fruit consumption in Japan.

In many cases, weaknesses in per capita consumption of fresh produce in these countries reflects the effects of aging populations. This has not been such an important factor in the United States. The table below shows that in the United States, per capita consumption of fresh apples and fresh bananas in 2015 was just slightly below the level in 2000. That of fresh oranges was slightly higher than in 2000, but still near record low levels. The big gain was in per capita consumption of all other fresh fruit, which has been in a growth trend since 1990. It rose by over 4 kilograms per capita between 1990 and 2000, by almost 4 kilograms between 2000 and 2010, and by almost 3 kilograms between 2010 and 2015. The share of fresh fruit consumption accounted for by the three main fruits fell from 62.5 percent in 1990 to 49.2 percent in 2010 and 48 percent in 2015. Demand for other fruits has been the major driver of U.S. fresh fruit consumption.

United States: Per Capita Consumption of Fresh Fruit, Selected Years, 1990-2015
(kilograms)

Fruit	1990	2000	2010	2011	2012	2013	2014	2015
Apples	8.89	7.94	6.94	6.99	7.26	7.85	8.44	7.80
Oranges	6.52	3.81	4.40	4.54	4.76	4,76	4.26	3.86
Bananas	11.07	12.88	11.61	11.57	12.25	12.75	12.66	12.70
Other Fresh	15.56	19.82	23.64	24.57	25.04	25.31	26.30	26.40
Total Fresh	41.44	44.45	46.49	47.67	49.31	50.67	51.66	50.76

Factors Affecting Per Capita Fruit Consumption

Many countries and regions, especially in the developed world, have a goal of increasing per capita consumption of fresh fruit and fresh vegetables. However, no country or region has claimed to have found an effective strategy for expansion of consumption. In normal circumstances, the first step to achieving such a goal would be understanding of the factors that currently drive consumption, and capitalizing on those factors to develop educational or promotional campaigns that would meet that goal.

Many countries have had sophisticated Five-a-Day programs to try to persuade consumers to eat at least five servings of fresh fruit and vegetables per day. France has an even more ambitious Ten-a-Day program. However, uniformly, countries report that their consumers continue to fall far short of these targets. For example, the United Kingdom has a target of consumption of 400 grams each of fresh fruits and fresh vegetables per person per day. In 2015, only 25 percent of men, 28 percent of women, and 20 percent of boys and girls met the five-a-day target on the previous day. A report for Australia entitled “Fruit, Vegetables and Diet Score”, published in April 2017 by Horticulture Innovation Australia, found that only 24 percent of women and 15 percent of men reported that they met the dietary guidelines of at least 2 fruits and 5 vegetables per day. In the United States, the Produce for Better Health Foundation reported that about 4 percent of children and adults achieved the national daily target for vegetable consumption and about 8 percent the target for fruit consumption.

Numerous rationales have been offered for why consumption of fresh fruits and vegetables continues to lag far below the level recommended by health and nutrition experts. Economic theory would suggest that the three most important factors relate to changes in per capita incomes, changes in fruit prices, and changes in lifestyle preferences.

One of the most comprehensive studies ever conducted of the influence of per capita incomes and prices was published by USDA's Economic Research Service in February 2017. The study, by Andrew Muhammad et al, looked at "The Influence of Income and Prices on Global Dietary Patterns by Country, Age, and Gender." The study was based on dietary intake data for 164 countries in six major world regions with income levels ranging from the lows of Sub-Saharan Africa to the highs of High Income countries like the United States and Germany. The first table below shows differences among regions in responses of fruit intake to changes in per capita incomes. In general, the fruit intake response was quite low, was lower for men than for women, and lower for younger than older persons of the same gender. The highest response was an increase in consumption of 0.27 percent for each one percent increase in income for 80-year-old women in Sub-Saharan Africa. The lowest was for 20-year-old men in High-Income countries. Indeed, in all but Sub-Saharan Africa, the intake response for 20-year-old men was one-tenth of a percent or less for each one percent increase in per capita income. The study also reported that intake response to income was weakest for countries with per capita incomes in the bottom 10 percent of all countries studied.

Major Regions: Income Elasticity[1] of Demand for Fruit, By Gender and Age

Region	Women, 20	Women, 80	Men, 20	Men, 80
Sub-Saharan Africa	0.19	0.27	0.13	0.24
Latin America & Caribbean	0.13	0.16	0.10	0.16
Former Centrally Planned	0.15	0.26	0.10	0.24
Southeast Asia/Asian Pacific	0.10	0.17	0.06	0.16
Mideast/N Africa/ South Asia	0.13	0.21	0.08	0.19
High income, rest of world	0.10	0.17	0.05	0.15

[1] Income elasticity measures the percent change in fruit demand for each one percent increase in per capita income. For example, in Sub-Saharan Africa, for 20-year-old women, a one percent increase in per capita income would be associated with less than one-fifth percent increase in fruit demand.

The table below shows the estimated response of fruit intake to a change in price by region, age and gender. Fruit intake in Sub-Saharan Africa was much more sensitive to price than in any other region. The second most price sensitive consumers were in the formerly centrally planned economies. These relationships held for both women and men, and for both younger and older consumers in these regions. Fruit intake was least sensitive to price changes in High Income countries, with young men there being by far the least sensitive to price changes.

Major Regions: Own-Price Elasticity[1] of Demand for Fruit, By Gender and Age

Region	Women, 20	Women, 80	Men, 20	Men, 80
Sub-Saharan Africa	- 0.87	- 0.77	- 0.91	- 0.86
Latin America & Caribbean	- 0.33	- 0.33	- 0.32	- 0.34
Former Centrally Planned	- 0.47	- 0.54	- 0.46	- 0.55
Southeast Asia/Asian Pacific	- 0.25	- 0.32	- 0.22	- 0.32
Mideast/N Africa/ South Asia	- 0.31	- 0.37	- 0.24	- 0.36
High income, rest of world	- 0.19	- 0.27	- 0.12	- 0.25

[1] Price elasticity measures the percent change in fruit demand for each one percent change in fruit price. For example, in Sub-Saharan Africa, for 20-year-old women, a one percent increase in price would be associated with a decrease in fruit demand of 0.87 percent.

Since 2008, per capita income growth has slowed in many countries at different levels of the income spectrum. Since then, income growth would have provided limited stimulus to higher per capita consumption of fruit in most countries. At the same time, fruit prices have risen relative to the prices of many competing foods, so the price reductions needed to boost consumption have not occurred. In addition, changes in lifestyles have reduced the number of occasions at which fresh produce is readily available. For example, fewer people eating breakfast means less consumption of fruit or fruit juices. Fewer people eating formal dinners mean fewer vegetables being served at home. At the same time, the increase in consumption of food away from home means fewer main meals with fruits and vegetables. Apple consumption, like that of other fresh fruit and vegetables, has been affected by these lifestyle trends. While some progress has been made in persuading restaurant owners and chefs to serve fresh salad vegetables, increasing use of fresh fruits has been a bigger challenge.

Data for individual countries tend to confirm the importance of income in boosting expenditure on fresh produce. For example, the 2015 Consumer Expenditure Survey for the United States showed that consumers with household income less than $15,000, on average spent $162 on fresh fruit and $158 on fresh vegetables. Consumers with household income between $70,000 and $99,999 spent $335 on fresh fruit and $278 on fresh vegetables. Consumers with household income of $200,000 or more spent $557 on fresh fruit and $487 on fresh vegetables. However, while the highest income households had more than ten times the income of the lowest income households, their expenditure on produce was only about three times as much. Real expenditures on fresh produce have been increasing faster over time for higher income households than for lower income households, and that gap is likely to continue to widen. In the privately funded 2016 Fresh Trends survey, U.S. consumers were asked “Are you buying a larger variety of produce today than you were 20 years ago?” Of respondents in households with household income less than $25,000, 68 percent said “Yes”, compared to 78 percent of those with household income of $50,000 or more.

The Japanese statistical agencies use different income groups to those used in the United States, so the results are not directly comparable. Their household expenditure survey for 2015 showed that yearly spending on fresh fruits for the highest income group was just 16 percent above spending for the lowest income group. The quantity purchased for the highest income group was actually 5 percent lower than for the lowest income group. However, the average price paid by the highest income group was 22 percent higher, indicating that they purchased higher quality or more expensive fruit. In contrast, for fresh vegetables, the highest income group spent 34 percent more, bought a 19 percent larger quantity, and paid an average price that was 12 percent higher. Fresh vegetable consumption in Japan was more responsive to income changes than was fresh fruit.

The Family Food survey for the United Kingdom does not report results for all different levels of household income. However, it compares results for low income households (the lowest 20 percent of households by equivalized income) and for all households. The United Kingdom experienced substantial food price inflation between 2007 and 2015, an increase of almost 32 percent for all food prices and of 35 percent for fresh fruit and 17 percent for fresh vegetables excluding potatoes. All income groups and the lowest income group responded by buying 15 percent less fruit and 3 percent less vegetables, and by substituting lower priced items.

The U.S. Fresh Trends survey contains much more information on the relationships between various socio-demographic factors and consumption of fresh produce. The only reservation about the findings is that the total sample is small, only about 1000 respondents, so the results for sub-groups have less statistical reliability. The table below shows the percent of the sample purchasing various major fruits in the past 12 months, by age group and ethnicity. Fresh apples and bananas were the most widely purchased fruits, over 80 percent in both cases, with oranges and strawberries next with over 60 percent purchasing. About half of all respondents purchased blueberries. The purchasing percentage fell off sharply for the three tropical fruits, pineapples, mangos and papayas.

Purchasing incidence for fresh apples was highest for the youngest age group, aged 21 to 39, and for Hispanics. Hispanics were also the heaviest buyers of fresh oranges. Strawberries were purchased most heavily by older, white respondents. Blueberries were purchased least by older, black respondents. The heaviest purchasers of pineapples, mangos and papayas were the youngest age group. Pineapples and papayas were most popular among Hispanic respondents, while Asians were the heaviest purchasers of mangos. Previous analyses have showed that higher income respondents were the heaviest purchasers of exotic and tropical fruit. Thus, these fruits have an advantage over mainstream fruits like apples and oranges in appealing to a younger, higher income, ethnic population.

United States: Socio-Demographic Factors Affecting Purchase of Selected Fresh Fruits, 2016

(Percent of Sample Purchasing)

Fruit	Total Sample	Age 21-39	Age 40-49	Age 50-58	Age 58+	White	Black	Hispanic	Asian	Other
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Apples	82.8	86.6	79.2	80.3	80.5	83.0	79.2	90.4	77.2	82.4
Bananas	82.3	80.7	79.8	83.0	86.3	83.3	78.2	79.5	78.9	85.3
Oranges	60.7	58.5	62.9	63.9	61.1	60.1	60.4	72.6	61.4	50.0
Strawberries	60.4	57.3	58.4	67.3	63.0	62.5	49.5	60.3	56.1	55.9
Blueberries	48.8	47.4	48.9	50.3	19.1	51.1	33.7	43.8	54.4	44.1
Pineapples	39.4	42.0	38.2	39.5	35.9	39.0	33.7	49.3	43.9	35.3
Mangos	24.4	29.6	24.7	21.8	17.2	21.3	21.8	16.4	49.1	14.7
Papayas	11.5	15.8	7.9	9.5	8.4	9.6	8.9	26.0	21.1	14.7

The Fresh Trends survey also includes details on purchases of major varieties of apples by different socio-demographic groups. The table below shows the 2016 results for eight major varieties of apples, for the same socio-demographic categories used in the previous table for major fruits. Almost 18 percent of all respondents reported having purchased Red Delicious in the past 12 months. Only four other varieties, Fuji, Gala, Granny Smith and Honeycrisp, were reported as having been purchased by more than 10 percent of respondents.

Above average purchases of Red Delicious were reported by respondents aged 50 to 58 and by white respondents. The most prominent purchasers of Fuji were the youngest age group (aged 21 to 39), and Asian respondents. Gala had the strongest appeal to the oldest age group (58+), and to Hispanics. Granny Smith were most popular with the middle age group (40 to 49) and to Hispanics. The relatively new variety, Honeycrisp, had its strongest appeal with younger respondents and with Asian and other ethnicities. McIntosh is most strongly associated with the Northeast region. Not surprisingly, McIntosh appealed most to an older, white demographic. Of the remaining two varieties listed, Braeburn was commercialized at about the same time as Gala and Fuji. However, its popularity has been waning. Its strongest appeal was to younger, white respondents. In contrast, Pink Lady was one of the first of the modern club varieties to be groomed as a premium apple. Its appeal has been quite diverse, to middle aged and older respondents, and to white and Asian respondents.

United States: Socio-Demographic Factors Affecting Purchase of Selected Fresh Apple Varieties, 2016

(Percent of Sample Purchasing)

Fruit	Total Sample	Age 21-39	Age 40-49	Age 50-58	Age 58+	White	Black	Hispanic	Asian	Other
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Red Delicious	17.8	14.9	19.1	26.3	17.1	19.5	16.3	10.6	11.4	10.7
Fuji	11.9	13.5	9.2	11.9	10.9	10.9	11.3	10.6	25.0	17.9
Gala	11.9	11.8	12.1	5.9	15.2	11.5	10.0	18.2	9.1	14.3
Granny Smith	11.6	11.0	13.5	11.0	11.8	11.5	13.8	15.2	4.5	10.7
Honeycrisp	11.3	14.0	12.1	7.6	8.1	11.2	8.8	12.1	13.6	14.3
McIntosh	6.2	3.0	7.8	8.5	9.5	7.2	5.0	1.5	4.5	3.6
Pink Lady	3.8	2.8	5.0	5.9	5.2	4.6	1.3	1.5	4.5	0.0
Braeburn	2.3	3.6	2.1	2.5	0.9	2.6	2.5	1.5	0.0	0.0

Future Prospects for Fresh Apple Consumption

The data presented previously in this chapter on per capita fresh produce consumption indicates that demand is static or declining in many developed countries despite efforts by medical and educational leaders to encourage increased consumption. One of the exceptions to this situation is in the United States where per capita consumption of fresh produce grew by 9 percent between 2010 and 2015. However, most of that growth has been due to increased consumption of off-season, tropical or exotic fruits and vegetables. Per capita consumption of traditional fruits, like apples, oranges or bananas, has been relatively static.

Numerous explanations have been offered for the stagnation in per capita consumption of fresh produce in general, and of fresh apples in particular. A major one is the rapid aging of the population in many developed countries. As they age, older consumers reduce the volume of all foods that they eat. On the other hand, with aging, their taste buds become less sensitive, and they may be willing to spend more per unit on items that they find more satisfying. In contrast, younger consumers are more likely to be attracted by the wide range of competing fruits, and snack foods and beverages that are now available. Competing "Super" foods now promise substantial health benefits for small volumes of consumption.

Increased urbanization of many societies in both developed and developing countries has led to longer commutes, and placed consumers under increasing time pressure. Riding in a car or in public transportation is less congenial for consumption of any fruits that create a mess or have problems with disposal of residues. Rising incomes should be associated with increased consumption of fresh fruits. However, the response of fruit consumption to increased incomes is small in many countries, and slower income growth since the Great Recession has further reduced that effect. Even in lower income countries, the response of per capita fruit consumption to increases in income remains relatively small.

Another concern has been the ineffectiveness of the various campaigns to promote general consumption of fresh produce, programs like Five-a-Day, More Matters, Eatwell, etc. It is not clear whether this is due to inadequate funding, or to campaigns that are not accurately focused on the main roadblocks to increased consumption. Persuading consumers to change ingrained habits remains difficult.

In many cases, individual produce items have their own promotional campaigns. This has made them less eager to invest in programs aimed at boosting consumption of all produce. For the apple industry, many countries have pulled back on generic promotion programs, both because of concerns about their effectiveness and from the desire of larger firms to promote their own branded products. Industry promotion has been further fractionated by increased diversion of promotion funding to club varieties and to organic products. This has given rise to what are termed “orphan” varieties, usually the mass of conventional apple varieties that receive little or no promotion. Not surprisingly, demand for many orphan varieties is beginning to fade. It remains to be determined whether promotion of selected parts of the apple mix will be sufficient to prevent overall per capita consumption of fresh apples from the current decline.

The challenge in boosting per capita consumption of fresh apples has become more difficult because of the increased number of varieties now being offered and the increasing complexity of the marketing structures being used by different firms. Many existing varieties appeal to similar socio-demographic segments of society, and a flood of new varieties on the horizon will struggle to find a profitable niche. Cannibalization is inevitable.

The changing nature of the marketing challenge demands new thinking from the leaders in the apple industry both on how to boost demand for their individual apple products and on how to boost demand for the apple category as a whole. If the entire category continues to erode, it will become more difficult to win retailer and consumer support for individual products.

V. Prices and Marketing Margins

Retail Prices Key to Prosperity

Most participants in the apple industry tend to focus on the prices received for raw product at the orchard or for packed fruit at shipping point. However, for fresh apples, as for most food products, the crucial point at which the general level of prices is determined is at the retail level, where retailers set the product's price and consumers decide how much of that product they will buy. The prices at shipping point or at the orchard are determined by the price at the retail level, after adjusting for the costs of moving the product from the orchard to the retail level. Such prices are called "derived" prices, and the costs deducted to derive them are referred to as the marketing margins.

Thus, understanding changes that occur at the shipping point or grower level requires understanding and interpretation of what is happening at the retail level and of how marketing margins are changing. For that reason, retail price behavior and marketing margins are discussed first in this chapter.

Retail prices in any period (daily, weekly, monthly, annual, etc.) are determined by two over-riding factors, the supply of any product that is presented for retail sale in that period, and the demand for that product in the period. Consumer demand tends to change very slowly from one year to the next because consumption habits are relatively constant. There used to be more variation between seasons, but even that variation has been reduced by retailers' efforts to carry many products twelve months a year. However, suppliers and retailers still cannot control the weather, so there can be sharp swings in supplies of crops like fresh apples from one year to the next. Those swings should lead to offsetting swings in prices, but again, large retailers tend to adjust retail prices fairly slowly because of the costs involved in changing price stickers in multiple outlets and because of fear of shocking the shopper if prices are raised sharply. For these reasons, retail prices for most food products, including fresh apples, have become increasingly "sticky." That does not mean that prices at shipping point or at the orchard level will be equally sticky. Indeed, the major way in which retailers adjust to changing supplies is by changing the prices they pay to suppliers. As will be seen below, shipping point and grower prices can change quite sharply from season to season, and occasionally within seasons.

Prevailing Economic Conditions

Retail prices in any country are affected both by economic conditions in that country, and increasingly by conditions in other countries around the world. To some extent world economic conditions are reflected in the trend in average export prices of fresh apples shown on page 75. Average export prices rose rapidly between the year 2000 and 2008, fell back after 2008 due to the Great Recession and the related global financial crisis, had a strong recovery through 2013, and then again fell between 2013 and 2016. While the rapid expansion of the world economy peaked in 2008, the world apple industry continued to prosper until 2013. Many segments of the world apple industry enjoyed one of the longest periods of favorable conditions seen in modern times.

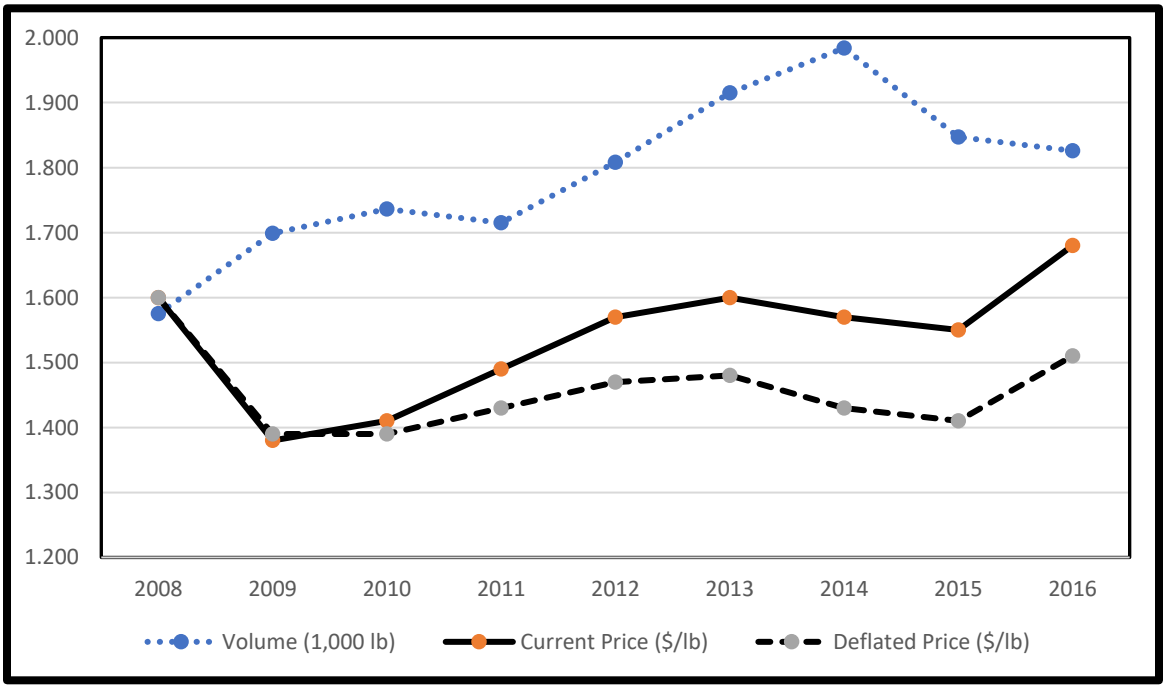
Two major influences have contributed to the decline after 2013. The first of these was the continuing fallout from the euro crisis, which began in Greece in 2010, and has since continued to disrupt the economies of many other European countries. The second was the setback in commodity demand from China. China recovered more rapidly from the Great Recession than most advanced countries and its booming demand for many commodities lifted the economies of supplying countries around the world between 2009 and 2011. Countries as diverse as Australia, Brazil, Canada, Indonesia and Nigeria, benefited from Chinese demand growth. However, many suffered matching setbacks when Chinese demand for commodities slowed dramatically after 2012. Total Chinese imports, that had risen by 38.8 percent in value in 2010, actually fell in 2015 and 2016. Uncertainty about if, or when, Chinese demand for commodities will recover has raised concern about how soon the economies of its major suppliers can recover.

While Chinese demand was slowing, the economies of western Europe, the United States, and Japan, the traditional drivers of global growth, were experiencing weaker and more erratic recovery from the setbacks of the Great Recession and the global financial crisis. Both the Federal Reserve Board in the United States, and the European Central Bank, continued highly-stimulative bond buying programs in order to get their economies moving again. Japan, under Prime Minister Shinzo Abe, introduced a bold set of measures to stimulate the Japanese economy and to end the deflationary cycle that had impeded progress. The jury is still out on how effective these stimulus programs have been. The best that can be said is that these economies might have been worse off if no action had been taken.

Retail Demand for Fresh Apples in the United States

The chart below shows how retail demand for fresh apples has fared in the United States since 2008. The data are drawn from the quarterly report, Fresh Facts at Retail, published by United Fresh. Unfortunately, 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 year. The middle (solid) line shows the actual average price paid per pound, and the lower dashed line shows the real (deflated) price at 2008 prices. The average weekly volume was affected little by the Great Recession. It rose by one quarter between 2008 and 2014 before slipping back in 2015 and 2016. In 2016, it was 16 percent higher than in 2008. The actual average price fell sharply in 2009 after the Great Recession, did not regain that level until 2013, nor surpass that level until 2016. However, after taking account of inflation, the real retail price of fresh apples declined by 13 percent in 2009, and remained depressed for the next seven years. By 2016, it was still 6 percent below the real price in 2008. After combining volume and price effects, the real value of weekly purchases of fresh apples in 2016 was 9.4 percent above the 2008 level.

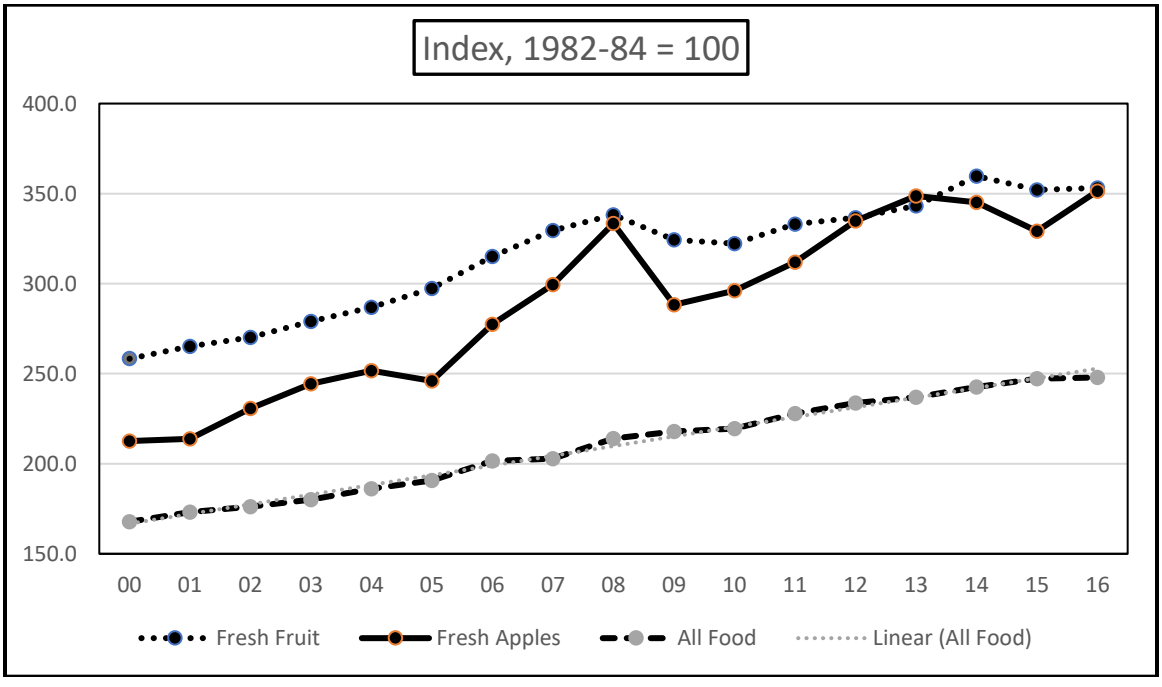
United States: Fresh Apples, Average Weekly Volume per Store and Average Retail Prices, Current and Deflated, 2008-2016



Annual data published by the U.S. Bureau of Labor Statistics in the Consumer Price Index allows us to compare indexes of retail prices of fresh apples with those for all fresh fruit and for all food (See chart below). The index of price of all food (lower dashed line) shows a slow, but steady increase in food prices in almost every year. The index of prices of all fresh fruits (upper dotted line) shows steady growth between the year 2000 and 2008. The 2008 level was not exceeded until 2014, and prices of all fresh fruits moved sideways in 2015 and 2016. The index of retail prices for fresh apples included the period covered in the previous chart, and the period between 2000 and 2008. Retail prices of fresh apples rose modestly between 2000 and 2005, and then grew very rapidly between 2005 and 2008. Between 2008 and 2016, fresh apple price movements mirrored those shown in the previous chart from the Fresh Facts at Retail data. The chart shows that there was an upward bias in all three indexes, and the indexes were most stable for all food and all fresh fruits. Between 2000 and 2016, the prices of all food rose by 47.7 percent, of all fresh fruits by 36.7 percent and of fresh apples by 65.3 percent. However, between 2008 and 2016, the rate of price increases slowed dramatically, to 15.8 percent for all food, 4.4 percent for all fresh fruit and 5.4 percent for fresh apples.

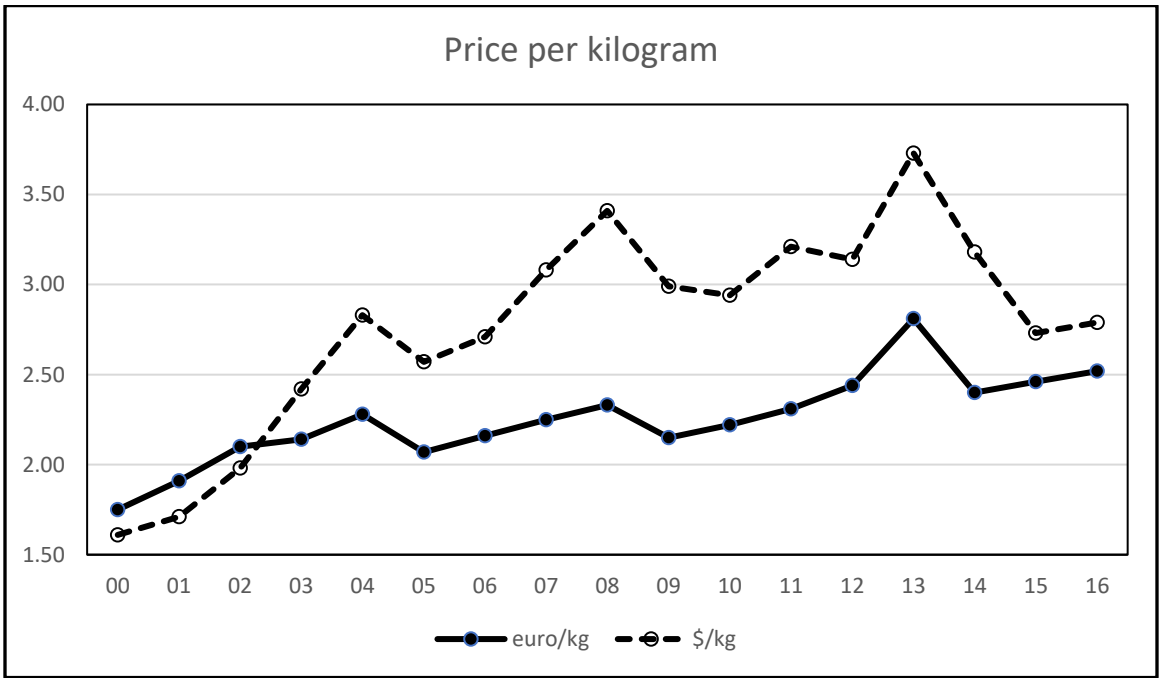
United States: Annual Average Retail Price Index of Fresh Apples, Fresh Fruit and All Food, 2000-2016

(1982-84 = 100)



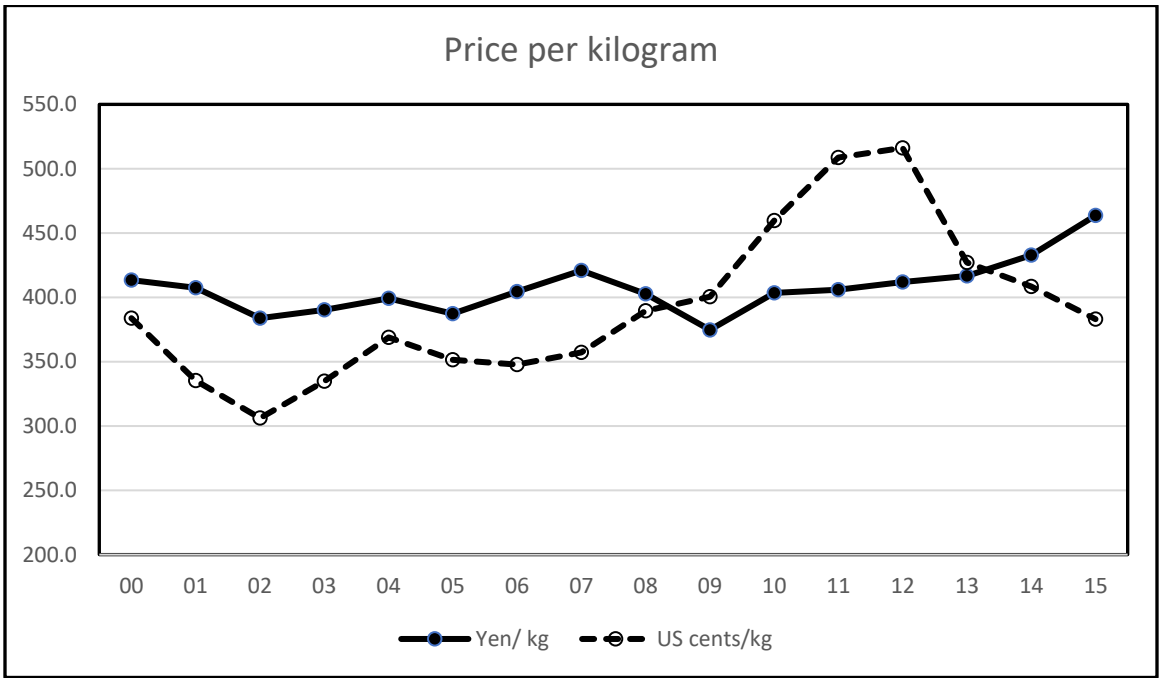
The retail prices of fresh apples in many countries appear to move in step. The chart below shows the average annual retail prices of fresh apples in France between 2000 and 2016, in both euros per kilogram and U.S. dollars per kilogram. Data in euros (solid line) had a similar pattern to those for the United States in the previous chart, with temporary peaks in 2004, 2008 and 2013. However, when the data were converted into U.S. dollars per kilogram, the gaps between the temporary peaks and dips were wider, and the variations between years were more similar to those for the United States. These links occurred even though direct trade between the United States and Europe, which might be expected to bring prices closer, has tended to be minimal.

France: Annual Average Retail Prices of Fresh Apples, 2000-2016
(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. dollars per kilogram. The results are shown in the chart on the next page. The price in Japanese yen was extremely stable until 2014 and 2015. However, when converted to U.S. currency at the annual average exchange rate, the price pattern resembled more closely those in the U.S. and France, even though trade between these three countries is virtually non-existent.

Japan: Annual Average Retail Prices of Fresh Apples, 2000-2015
(Japanese yen and U.S. cents per kilogram)



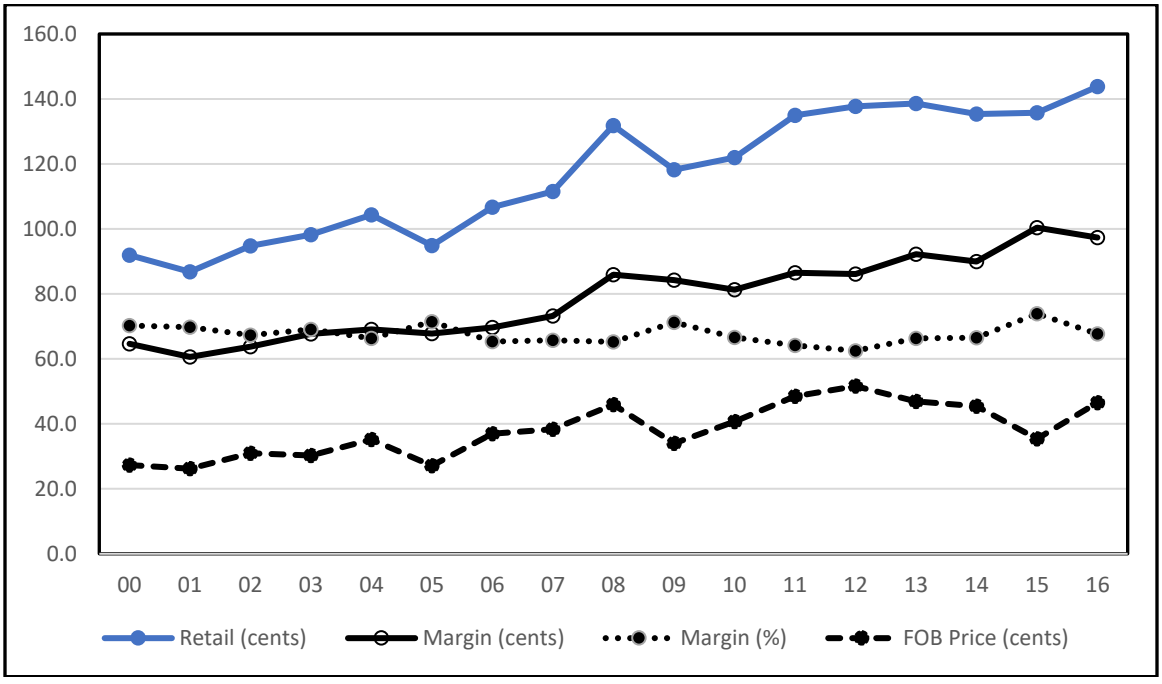
Transmitting Retail Prices Through the Marketing System

As previously noted, prices of fresh apples and other foods are initially set at the retail level. In the usual case, the retailer sets a price, and shoppers decide how much of any apple item they will buy. The pattern of retail prices is the result of the interactions between the retailer and the shopper as each adjusts their decisions over time. The share of the retail price passed back to the shipping point level, and ultimately to the grower, reflects deductions of all the costs involved in moving the product from the orchard to the retail shelf. Costs incurred between the grower and FOB shipping point include assembling, sorting, packing in inner and outer containers, and storage before and after packing. Between FOB shipping point and the retailer, many actors are involved in hauling large loads long distances, unloading in wholesale warehouses or retail distribution centers, breaking loads into smaller lots for hauling to individual stores, and, in store, breaking packed boxes into individual apples or consumer packs for display on store shelves. While major retailers strive continuously to squeeze costs out of the logistical system, physical movement of apples remains costly and time consuming.

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. In addition, apple operations incur all the normal business costs of capital, labor, rent, taxes, and interest on borrowings.

Because there are so many moving, and inter-related parts in the marketing system, it has proven both difficult and expensive to measure marketing costs or margins. One short cut has been to estimate the value of a specific volume of fresh apples at different points of the marketing chain. In the United States, for many years, it has been possible to track the average retail price and average FOB price of fresh Red Delicious apples, still the most widely grown variety. The chart below shows these prices, the estimated margin between them, and the percentage that margin is of the retail price, for calendar years in the 2000-2016 period. 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 different levels of the marketing system.

United States: Red Delicious. Retail Prices and Marketing Margins, Annual, 2000-2016



The chart shows that annual average retail prices of fresh Red Delicious apples have been on a long upward trend since the year 2000, but a trend that has hit a plateau since 2011. Average marketing margins have also been on a long upward trend. However, percentage marketing margins have remained relatively stable during the sixteen-year period. For example, they were 69.1 percent for the three-year period 2000-2002 and 69.3 percent for the latest three-year period 2014-2016. The marketing margin between retail and FOB has been a fairly constant share of the retail price.

The bottom (dashed) line in the chart above shows that the average annual price for Red Delicious apples at the FOB shipping point level has also risen over time. However, the upward movement has been interrupted more frequently than that of the retail price or absolute marketing margin. It peaked in 2008, 2012 and again in 2016, and had large percentage declines in 2005, 2009 and 2015. However, it was close to 31 percent of the retail price in both the 2000-2002 and 2014-2016 periods. Thus, the impact of marketing margins on fresh apple FOB prices has changed little over the period studied. Retailers and other marketing agents do not appear to have exploited producers of Red Delicious in that period.

Changing Effects of Inflation

In the past, in many apple producing countries, inflation has been a disruptive economic force. In the narrow economic context, inflation refers to a general increase in price levels. Operators have needed to keep a watchful eye on the prices they receive for their products, the prices they pay for their inputs and the prices of other related products. For example, the prices operators receive for their fresh or processed apples provide the resources they can use to pay for their inputs and to support the lifestyles of their owners and employees.

If the prices of their inputs are rising faster than the prices of their products, operators get trapped in a cost-price squeeze. Essentially, the profitability of the enterprise is reduced. Operators who are aware of the situation can combat such a cost-price squeeze by either increasing the value of the products they produce, or by using inputs more efficiently. Both of these strategies require constant re-evaluation of the firm's operations, for example, in reviewing the need for each activity, and re-assessing the methods by which each activity is performed.

If the prices of various living expenses are rising faster than the profits and wages generated by the firm, owners and employees become worse off in terms of the standard of living that they can afford. For example, when the price of gasoline rises suddenly, as it has in the past, it takes a larger bite out of personal incomes, and reduces the funds available for all other expenditure. Rapid rises in general inflation have often led to agitation for higher wages and to labor unrest for operators that have not made appropriate wage adjustments for their employees.

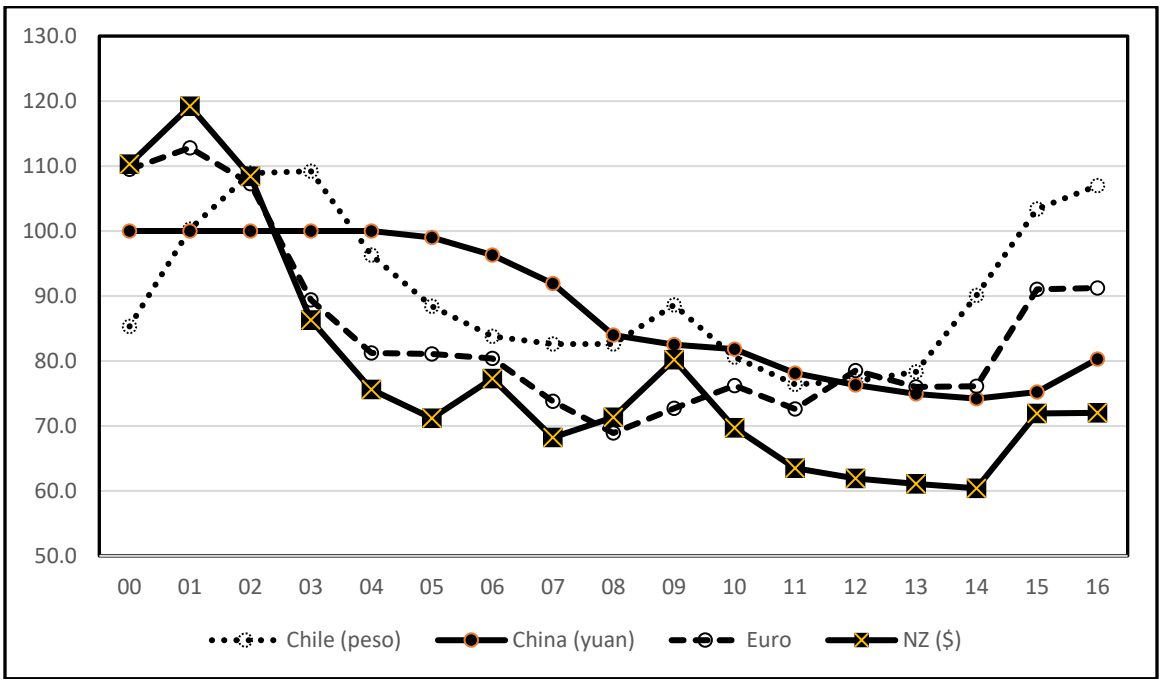
Inflation can be both a friend and foe to apple operations depending on the stage of development of any orchard unit. If operators borrow for orchard or facilities development at a fixed interest rate, they can repay in deflated dollars during a period of rapid inflation. On the other hand, in Japan and some European countries, those who borrowed at a fixed interest rate found themselves faced with having to repay in inflated dollars during a period of price deflation. Such a situation has tended to discourage new investment.

The most likely scenario in many countries going forward is low levels of general inflation. Most monetary authorities are aiming for “normal” rates of inflation of 2 percent. However, operators still need to be cognizant of how even such an apparently low rate of inflation can have a significant effect on prices and costs over time. For example, an annual average rate of inflation of just 2 percent will lead to cumulative inflation of 22 percent in ten years, a rate that is capable of distorting the outcome of many decisions by operators.

Distorting Effects of Exchange Rate Changes

Previous charts have shown how movements in exchange rates in countries like France and Japan alter the level and direction of price trends. However, changes in the relative exchange rates of major trading countries can also alter international competition for fresh apples and other products. They can alter what exporting countries receive for their products in their domestic currency and alter what importing countries pay for their products in their domestic currency. Currency exchange rates tend to be quite volatile over short periods of time. They can also change dramatically overnight as happened to the pound sterling after the British electorate voted in favor of leaving the European Union.

Value of Selected Currencies per U.S. Dollar, 2000-2016
(Index to Base 2000-04 = 100)



The chart above shows the relative changes in five currencies of key apple trading nations, the United States, China, France, Italy, Chile and New Zealand. It illustrates the wide swings in exchange rates that have occurred over time, and the, often abrupt, changes from year to year in all but the tightly managed Chinese yuan. Using the average exchange rate against the U.S. dollar in 2000-2004 as the base, it shows the value of the Chilean peso, Chinese yuan, Euro and New Zealand dollar against the U.S. dollar between 2000 and 2016.

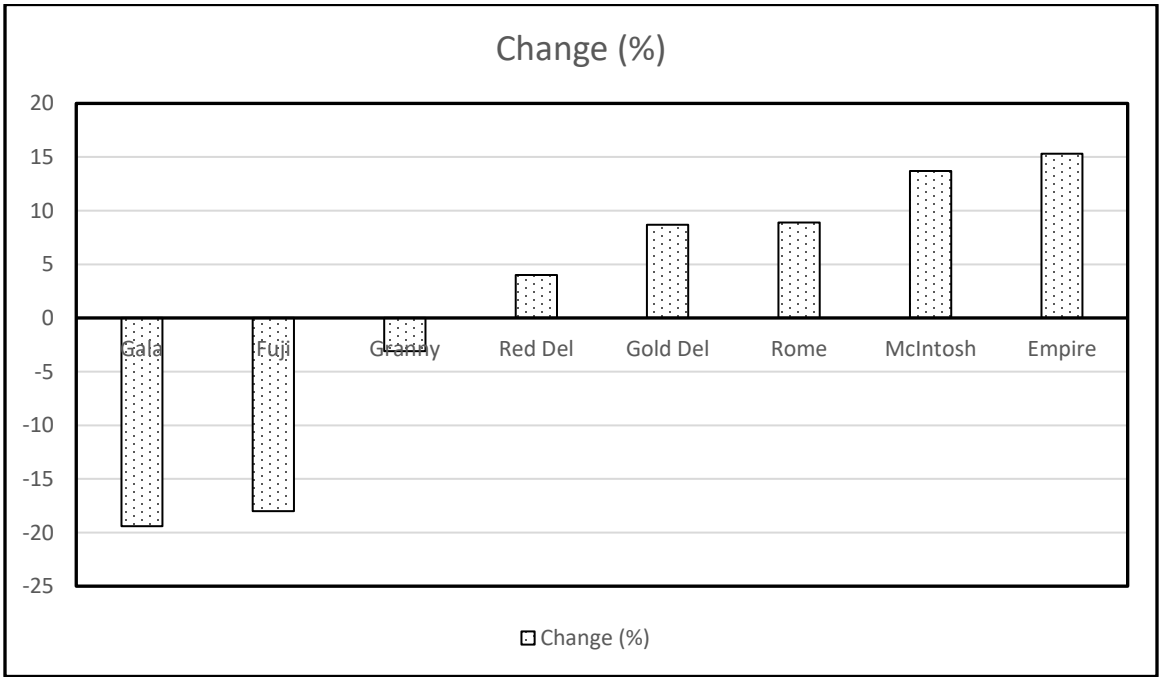
In general, all four currencies strengthened against the U.S. dollar between 2000 and 2012, meaning they lost competitiveness against U.S. exporters in that period. In general, the opposite has occurred since 2013. All four currencies have weakened against the U.S. dollar, meaning that they have gained competitiveness in recent years. The biggest gainer since 2013 has been Chile, with euro nations and New Zealand having the second biggest gain. However, it is notable that Chile was the only country that had a greater competitive advantage from its currency exchange rate against the U.S. dollar in 2016 than in 2000. Just as in the case of unfavorable inflation trends, operators need to prepare for adverse currency exchange rates by constantly increasing the efficiency of their operations.

Variations in Wholesale Prices

Information on the prices of fresh apples at the wholesale level have become increasingly scarce as more and more sales of fresh apples are negotiated directly between the marketer at shipping point and the retailer. One exception has been the Producer Price Index series published monthly by the U.S. Bureau of Labor Statistics. However, until recently, that series focused on five mainstream varieties that represented a decreasing share of U.S. fresh apple sales. These five varieties were Red Delicious, Golden Delicious, Granny Smith, McIntosh and Rome. In the last two years, data have been added for the Gala, Fuji and Empire varieties. Unfortunately, the Producer Price Index does not report actual prices, but an index of prices to a fixed base, and that base differs for different varieties. For that reason, the chart below shows the estimated percent changes in the index for each variety between the 2015-16 and 2016-17 seasons. These new price series will become more useful for analysis as more years of data are added.

United States: Estimated Changes in Producer Price Index for Selected Apple Varieties, 2016-17 versus 2015-16

(percent)



The price changes between 2015-16 and 2016-17 reflect the changes in supplies of these major varieties. In general, varieties grown primarily in the Western U.S., such as Gala and Fuji, had increased supplies in 2016-17 and sharply lower prices. In contrast, varieties grown primarily in the Eastern U.S., such as Rome, McIntosh and Empire, had lower supplies and substantially higher prices. The chart shows that wholesale prices of the established varieties listed here remain highly sensitive to changes in annual supplies. The U.S. apple industry no longer has promotion programs that are large enough to offset the effects of increased supplies of these varieties. It is still untested as to how effective promotions by club sponsors will be in supporting the prices of their chosen varieties as supplies increase over time.

Influence of Varieties and Promotional Claims

Most of the information on promotion of apple varieties remains proprietary and is not available to the general public. 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, a very large sample of retail food stores.

The number of apple varieties covered has grown over time, enabling comparison between varieties and within and between seasons. Data are reported separately for apples grown using conventional methods and those labeled as organic. Other USDA,AMS data show that in 2016-17, organic apples were approaching 8 percent of U.S. fresh apple shipments. The table below shows average weekly number of stores with ads for each major variety sold per pound in the three complete seasons, 2013-14, 2014-15 and 2015-16, and for two-thirds of the 2016-17 season. Twenty percent or more of fresh apples are not sold loose per pound, but in bags. However, to simplify presentation, only loose fruit is discussed here. The table shows that the weekly total number of ads for fresh apples varied widely from year to year. However, there was a clear tendency for the number of ads for both conventional and organic apples to increase over time. Increases were recorded for both conventional and organic apples in every season for the two highest-priced varieties, Honeycrisp and Cripps Pink. The least growth was experienced for fading varieties, such as Braeburn, Golden Delicious, Red Delicious and McIntosh.

United States: Average Weekly Number of Ads for Major Varieties, sold per pound, 2013-14 to 2016-17 Seasons

Variety	2013-14	2013-14	2014-15	2014-15	2015-16	2015-16	2016-17	2016-17
	Conv.	Org.	Conv.	Org.	Conv.	Org.	Conv.	Org.
Braeburn	782	51	935	132	799	105	904	168
Fuji	2,167	346	2,541	842	2,039	754	3,124	1,467
Gala	3,683	702	4,387	1,558	3,011	937	5,324	2,069
Golden	1,148	108	1,765	408	900	139	1,043	204
Granny	1,735	156	2,278	359	1,809	264	2,749	580
Honeycrisp	1,129	159	1,793	250	2,262	287	3,598	706
McIntosh	416	0	424	1	405	1	401	0
Cripps Pink	570	26	627	94	864	124	1,193	180
Red Delic.	2,890	324	3,459	669	2,063	354	2,840	629
Total	14,519	1,872	18,208	4,313	14,153	2,965	21,177	6,004

The table below shows weekly average advertised prices for the same varieties and seasons. Advertised prices were generally lower in years with largest fresh apple supplies. Advertised prices for all varieties of conventional apples tended to move up or down in step from season to season. Advertised prices for organic apples were less likely to conform to this pattern.

United States: Average Weekly Advertised Prices for Major Varieties, sold per pound, 2013-14 to 2016-17 Seasons

Variety	2013-14	2013-14	2014-15	2014-15	2015-16	2015-16	2016-17	2016-17
	Conv.	Org.	Conv.	Org.	Conv.	Org.	Conv.	Org.
Braeburn	1.409	1.792	1.193	1.850	1.331	1.935	1.339	1.996
Fuji	1.458	2.016	1.277	2.041	1.457	2.302	1.334	2.084
Gala	1.443	2.031	1.268	2.010	1.393	2.254	1.236	2.029
Golden	1.224	2.201	1.176	2.122	1.225	2.286	1.252	2.028
Granny	1.349	2.064	1.327	2.166	1.352	2.349	1.342	2.224
Honeycrisp	2.412	3.046	2.240	3.145	2.447	3.086	2.331	3.540
McIntosh	1.344	n.a.	1.174	n.a.	1.188	1.710	1.120	1.990
Cripps Pink	1.693	1.949	1.557	2.163	1.701	2.487	1.693	2.220
Red Delic.	1.235	2.014	1.154	1.920	1.222	2.076	1.124	1.833
Total	1.456	2.114	1.346	2.090	1.540	2.332	1.464	2.223

The table also shows that advertised prices for Honeycrisp tended to be about 60 percent above the average for conventional apples and about 50 percent higher for organic apples. Cripps Pink also earned a premium over average advertised prices for both conventional and organic apples. The biggest laggards in advertised prices for both conventional and organic apples were Braeburn, Golden Delicious, McIntosh and Red Delicious. The results suggest that the higher-priced varieties are becoming of increasing importance to retailers for their contribution to gross margins, and that other varieties are likely to continue to lose favor with retailers.

Influence of Processing Options

The volume of apples demanded for processing uses continues to have an influence on grower prices and returns in many countries. In the past, many orchards were dedicated primarily to production of apple varieties suitable for processing that were demanded by local processing plants. In addition, some orchards produced "dual purpose" apples that were suitable for either fresh or processing uses. Often, such deliveries were covered by preharvest contracts that provided growers with a guaranteed return. However, increased returns from fresh apples, an expanding market for locally sourced fresh fruit, and the closure of many local processing plants, persuaded apple producers to aim more of their output at fresh markets.

United States: Quantities of Apples in Major Alternative Uses, Selected Years, 1991-2016

(1,000 metric tons)

Use	1991-93	1997-99	2003-05	2009-11	2012-13	2013-14	2014-15	2015-16
Fresh	2,621.5	2,755.1	2,754.4	2,853.6	2,991.4	3,127.7	3,575.4	3,109.7
Processed	2,016.4	1,998.4	1,580.0	1,407.6	1,057.6	1,562.5	1,491.7	1,392.0
Canned	626.6	608.0	553.0	509.6	339.7	573.5	509.4	492.2
Juice/cider	1,065.6	1,072.0	759.0	584.2	504.4	689.3	663.7	557.8
Frozen	123.3	125.5	120.7	95.6	30.2	108.5	100.9	105.5
Dried	149.6	132.2	86.8	78.6	101.2	73.0	82.1	81.2
Fresh slices	n.a.	n.a.	34.4	79.2	58.0	85.5	86.9	84.6
Other	51.3	60.6	26.1	30.3	23.9	32.5	48.7	70.7
Total	4,637.9	4,753.5	4,334.3	4,080.6	4,049.0	4,690.1	5,067.0	4,501.7

Unfortunately, data on processing uses and prices are limited in most countries. The best historical information is for the United States. Because of the interconnectedness of global markets, what has happened to the processing sector in the United States mirrors somewhat developments in other major apple producing countries. These are discussed in more detail in the next chapter.

The table above shows apple production and use for the United States for three-year seasons between 1991-92 and 2011-12 and annually since the 2012-13 season. Thus, it illustrates both long-term trends and recent experience. Total apple production in the United States peaked in the late-1990s, and declined through 2012-13 before bouncing back sharply in 2014-15. However, fresh use climbed steadily, and total processed use eroded steadily, over the total period. The share used fresh also rose, from 56.5 percent in 1991-93 to almost 70 percent in both 2014-15 and 2015-16. By 2014-15, fresh use was almost one million metric tons higher than in 1991-93, while processed use was more than one half million metric tons less.

The largest processed category for the entire period studied was that for juice and cider. However, the volume processed into juice and cider had shrunk by almost one half between 1991-93 and 2015-16. A major contributor to that decline was increased competition from imported apple juice concentrate, primarily from China, which led to the closure of many smaller concentrate plants in the United States and in many other apple producing countries. Canned uses have been consistently the second largest outlet for U.S. processed apples, although they too have suffered a steady decline over time. Canned uses fell by over 20 percent between 1991-93 and 2915-16. Uses in frozen and dried processed products were quite similar in the 1990s. However, over the longer term, frozen uses fell by only 15 percent, whereas dried uses fell by almost one half.

There was much optimism in the early 2000s that use of apples in fresh slices would become a major processed apple category. This was triggered by aggressive promotion by McDonald's and other fast food chains of fresh apple slices as a healthy option. However, devotees of traditional hamburgers have been difficult to woo to heathier menu items. And, even though sliced apples are now available in many traditional food retailers, total use of sliced apples has stalled below 90,000 metric tons. There appears to have been a recent resurgence of use of apples in other miscellaneous uses. However, little documentation is available on these uses.

United States: Prices of Apples in Major Alternative Uses, Selected Years, 1991-2016

(1,000 metric tons)

Use	1991-93	1997-99	2003-05	2009-11	2012-13	2013-14	2014-15	2015-16
Fresh	460.12	444.17	520.36	758.64	998.68	892.86	720.90	992.07
Processed	149.04	136.61	125.78	195.22	309.75	217.15	196.20	221.56
Canned	167.96	178.00	166.11	219.20	435.41	245.81	222.66	262.35
Juice/cider	130.52	109.17	86.97	158.50	243.61	159.83	134.48	143.30
Frozen	193.13	182.70	176.72	216.07	361.55	256.84	257.94	267.86
Dried	159.39	110.11	109.45	154.49	194.00	210.54	167.55	205.03
Fresh slices	n.a.	n.a.	235.55	390.33	332.89	422.18	468.48	450.84
Other	141.76	169.53	186.07	344.93	267.86	298.72	210.54	230.57
Total	324.87	314.87	375.95	682.93	817.91	667.99	566.58	753.97

Trends in the prices of different categories of processed apples over the period also help to explain why processing uses have fallen in both absolute and relative terms. The grower prices of fresh apples were about 3 times processing prices in 1991-93. By 2015-16, fresh prices were almost 4.5 times processing prices. The prices for the different processing uses have tended to move in the same direction from season to season. They have also lagged general inflation, which rose by about 69 percent between 1991-93 and 2015-16. Fresh prices beat inflation with an increase of 216 percent, while processed prices lagged inflation with an increase of only 49 percent. Prices for juice and cider uses fared even worse with an increase of less than 10 percent in the period. While prices for canned, frozen and dried uses were generally higher than prices for juice and cider use, and have grown more in absolute dollars, they were still low relative to fresh grower prices.

Prices for apples used for fresh slices were almost twice those for all other processing uses, except in 2012-13, when processing states, such as Michigan, lost most of their apple crop. Prices for uses in apple slices have also generally risen over time. Their highest level was in 2014-15 when the total U.S. apple crop was a recent record, and processing prices generally were depressed. However, because the volume utilized in apple slices remains low, that market has limited ability to help lift general price levels for processed apples.

Influence of Trade on Apple Prices

Trade remains a powerful equilibrating force in shaping apple prices in different countries. The most direct effects are seen in bilateral trade between any two countries. An increase in exports removes supply from the exporting country and lifts domestic prices above what they would otherwise be. An increase in imports adds supply in the importing country and depresses domestic prices below what they would otherwise be. Decreases in exports or imports have the opposite effects. In theory, trade between any two countries will continue until prices in the importing and exporting countries are equal except for the costs of transferring the product from the exporting to the importing country. In practice, trade may continue beyond that point for reasons such as preserving goodwill, maintaining a market position, or supporting ongoing promotional efforts.

Indirect effects of trade on prices are less obvious, but equally powerful, because of network effects. For example, when the United States exports fresh apples to two different countries, that creates a link between the prices in those importing countries. Conversely, when Germany imports fresh apples from two different suppliers, that affects all other countries that receive apples from the same two suppliers. In practice, many fresh apple exporters deliver supplies to many importing countries, while importing countries draw supplies from many different exporting countries. Such networks transmit price effects around the world.

The major justification for international trade is that when different countries have a comparative 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 surplus. An obvious example would be where a tropical country specializes in bananas and a temperate climate country specializes in apples, and the diets in both countries are enhanced by trade. The process of specialization has progressed far beyond products. In the case of many manufactured products, the principle of comparative advantage means that different inputs for the same product are drawn from different countries, and different stages of processing or assembly are conducted in different countries so that the final product reaches the highest quality standards and is achieved in the most efficient manner. Trade has become intrinsic to the world's progress. However, trade also attracts lots of opposition, for example, from individual producers that resent loss of market share to foreign products, and from social thinkers that fear the introduction of foreign ideas.

Because opposition to freer trade is so ingrained and so persistent at the national level, the promoters of freer trade have been forced to build international institutions that can coordinate their efforts across countries. Much of the basis for the current level of free trade was built painstakingly after World War II through the operation of the General Agreement on Tariffs and Trade (GATT). Beginning with just a few countries, GATT used negotiating rounds among member countries that were willing to lower barriers to trade in selected products in return for concessions from other members. Key to GATT's influence was its application of the Most Favored Nation (MFN) principle. Member countries agreed to extend their best (most favored) trade concessions to all other member countries. Over time, as the GATT process helped to stimulate the economies of member countries, it attracted more members, and freed up trade in more goods and services. By the 1980s, GATT had reduced tariffs on most industrial products around the world.

However, by then the limitations of the GATT process were becoming more apparent, while limited progress had been made in liberalizing free trade in agricultural products, services or intellectual property, or facilitating free movement of capital. Under the urging of U.S. President Ronald Reagan, GATT mounted a last major negotiating round, known as the Uruguay Round because of where it was first convened. The Uruguay Round led to major breakthroughs in trade liberalization, and entrusted a replacement body, the World Trade Organization (WTO), with completing the unfinished agenda. For numerous reasons, completion of that agenda was frequently postponed, but never quite abandoned. However, rather than wait for comprehensive global trade liberalization, many countries sought to gain the benefits of freer trade through bilateral or regional agreements. Hundreds of these have now been completed, and many others are at the discussion, negotiation, or ratification stages.

While such limited agreements are better than a comprehensive global agreement, they have numerous pitfalls. They can lead to further distortions to trade if the most efficient producing countries are not participants. When a small number of countries are involved, agreements tend to be dominated by stronger partners like the United States, the EU or China, and weaker partners are forced to accept protections or restrictions demanded by the stronger partner that would not be permitted within a global agreement. The United States, the EU and China have recently proposed more comprehensive trade agreements, but the environment for agreement has become less favorable.

The sustainability of the WTO method of trade liberalization depends on all member countries making a good faith effort to follow WTO rules. In general, the authoritarian regimes that have emerged in China, Russia, Iran, Turkey, Hungary, Poland, Venezuela and other countries have been inclined to pick and choose which rules to follow. Their goal is to manage trade to meet internal political goals. At the same time, even in the advanced countries that once led the GATT and WTO efforts, opposition against freer trade has arisen from groups that believe that they have not received the promised advantages of freer trade, but instead have suffered losses of jobs, incomes and prospects. Political leaders are still trying to come to terms with these conflicting attitudes.

Despite all these problems, trade liberalization continues to move ahead, if at a slower pace than its promoters would like, because it continues to provide mutual benefits to participants. It allows countries to specialize in the activities that they do best. It remains one of the best tools a government can use to stimulate competition among domestic industries, and to help make those industries stronger through innovation and adaptation. These principles apply equally well to the global apple industry. Both consumers and producers continue to benefit from freer trade, and to sustain losses when trade is impeded.

The table below shows fresh apple export prices in euros per metric ton for the total EU-28, and for the ten member countries with the largest exports of fresh apples, for the calendar years from 2009 to 2016. The period covered emergence from the Great Recession, and the years since. Average EU-28 export prices fell by over 20 percent between 2008 and 2009, regained the 2008 level in 2013, but then slipped back below that level after 2013. There was a strong tendency for export prices for the individual countries in any year to move together. For example, between 2015 and 2016, when average EU-28 export prices rose by 8 percent, eight of the ten countries also experienced increases in average export prices.

In general, prices were highest for major exporting countries in Western Europe, like France and Italy, and by far the lowest for those in Eastern Europe, such as Poland and Czechia. Next lowest prices were those for Greece. This suggests that buyers recognized substantial quality differences between fresh apples from different sources. Export prices for Austria, Belgium and the Netherlands are difficult to interpret, since an unknown share of their exports is fruit in transit.

EU-28: Average Fresh Apple Export Prices of Major EU Exporters, 2009-2016

(Euros per metric ton)

Exporter	2009	2010	2011	2012	2013	2014	2015	2016
Austria	398.32	523.35	671.83	647.95	771.78	643.04	584.66	681.41
Belgium	510.51	548.93	556.78	699.21	781.24	626.00	540.71	570.83
Czechia	172.40	238.16	364.69	219.34	292.18	232.53	206.32	236.86
France	696.71	690.42	729.76	855.05	900.39	777.66	875.76	928.70
Germany	546.92	565.74	670.30	582.37	774.10	635.34	596.69	647.25
Greece	402.46	379.63	474.90	479.08	522.90	460.56	415.39	376.23
Italy	652.35	680.89	731.25	780.61	892.65	753.52	757.37	789.79
Netherlands	629.39	676.51	729.80	812.03	1,148.31	962.90	957.18	1,046.41
Poland	259.17	281.49	375.43	355.36	360.40	321.05	317.99	289.85
Spain	496.88	501.89	602.41	659.10	687.22	664.80	703.86	759.10
All EU-28	522.39	550.22	628.14	632.24	676.51	594.92	572.81	619.76

In addition to being the world's largest fresh apple exporter, the EU-28 has also been the world's largest fresh apple importer. The table below shows the average price of fresh apples sourced from 10 major supplying countries outside the EU-28, four off-season suppliers from the Southern Hemisphere, two from Asia and two from North America. Again, one can observe some of the same phenomena with import prices as with export prices. The average for the EU-28 fell by over 100 euros per metric ton between 2008 and 2009, and only exceeded the 2008 level in 2013 before falling back in the subsequent years. That average included large volumes of apples from within the EU-28 that were sold generally at lower prices than apples from third countries. For that reason, the prices of imports from third countries did not closely follow the average for the entire EU-28. Prices recovered much more rapidly after the decline between 2008 and 2009. Prices for each supplying country were also much more sensitive to the volume of imports from each country.

Among third country suppliers, Australia has consistently been the highest priced supplier with its small volume of specialty club varieties. New Zealand and the United States have generally had the next highest prices, again selling specialty varieties not readily available in Europe. Argentina, Chile, South Africa and Canada have generally been in the middle range of prices. Brazil and Turkey provided the lowest priced apples. This was also true for China between 2009 and 2014, but has been less true in 2015 and 2016 as the volume of Chinese imports has fallen.

EU-28: Average Fresh Apple Import Prices of Exporters to the EU, 2009-2016

(Euros per metric ton)

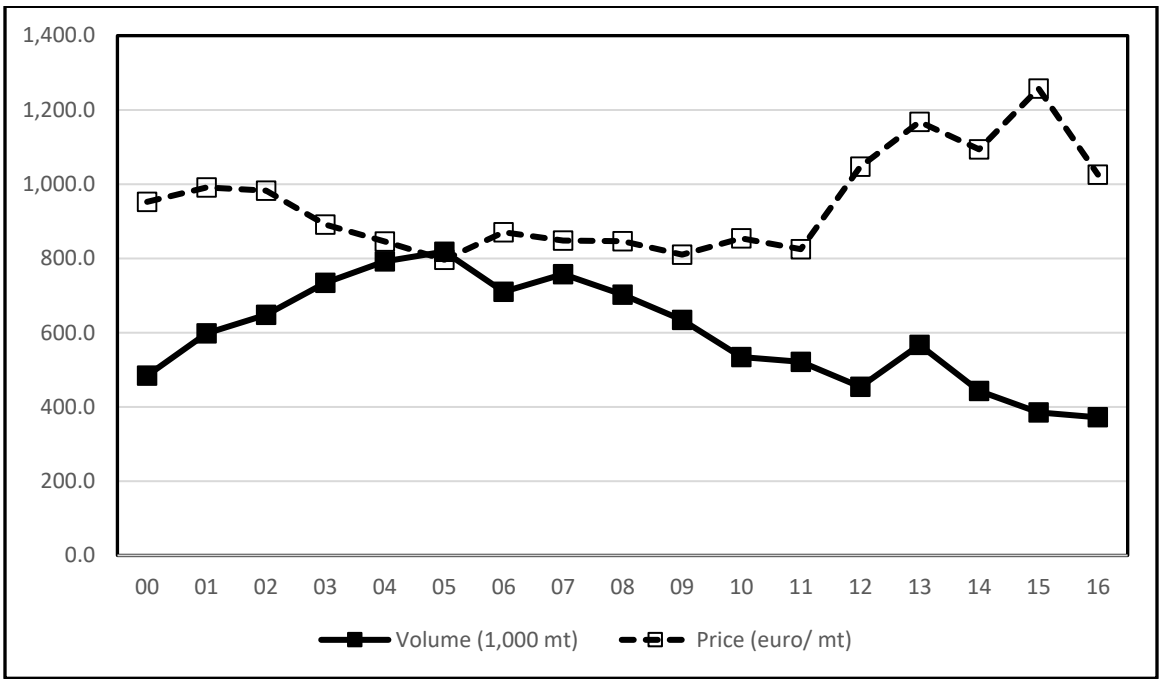
Exporter	2009	2010	2011	2012	2013	2014	2015	2016
Argentina	851.07	912.22	904.75	1,087.06	1,259.93	1,042.33	1,224.76	1,195.77
Australia	967.85	1,541.86	1,282.33	1,285.97	1,637.52	2,746.62	2,107.08	1,989.82
Brazil	750.93	815.91	798.45	848.09	959.12	895.29	967.94	949.34
Chile	906.79	890.97	876.08	1,008.70	1,214.76	1,027.28	1,259.08	1,238.26
N Zealand	984.80	1,096.27	1,083.15	1,234.31	1,321.26	1,301.97	1,408.51	1,352.93
South Africa	791.92	925.51	881.90	995.84	1,089.90	1,130.82	1,184.26	1,024.81
China	741.43	769.13	935.15	963.94	908.86	977.38	1,401.98	1,025.49
Turkey	656.08	686.10	639.80	973.27	750.58	761.15	1,084.28	647.04
Canada	1,025.66	883.53	1,038.86	1,163.83	1,184.57	1,133.17	1,746.82	1,174.58
Unit. States	1,041.50	1,089.93	1,173.07	1,318.09	1,435.31	1,267.62	1,430.55	1,408.47
All Sources	633.74	663.03	693.00	725.72	804.86	710.25	663.71	727.53

Recent Developments in World Fresh Apple Trade

A number of other developments in world trade in fresh apples continue to shake up the competitive situation. One of the most significant is the decreasing importance of the EU-28 market for Southern Hemisphere exporters of fresh apples. The chart below shows that the volume of Southern Hemisphere fresh apple imports received by the EU-28 peaked in 2005, and has fallen in nine of the subsequent eleven years. The volume in 2016 was less than half of that imported in 2005. For countries that have long viewed the EU-28 market as one of the main props to their export trade, this reduction in apple volume received by the EU-28 threatens the viability of many Southern Hemisphere exporters. Adding insult to injury was the fact that real prices paid for Southern Hemisphere imports fell from an average of 975 euros per metric ton in 2000-02 to 837 euros in the 2004-11 period. Thus, Southern Hemisphere suppliers suffered a fall in both volume and price, a classic example of falling demand. Most of that fall was due to increased competition from domestic EU-28 supplies. The average price for Southern Hemisphere suppliers rose sharply after 2011. This probably reflects both the fact that many Southern Hemisphere suppliers have switched to higher-priced specialty apple varieties, and have targeted more product towards alternative markets.

EU-28: Imports of Fresh Apples from Southern Hemisphere Suppliers, 2000-2016

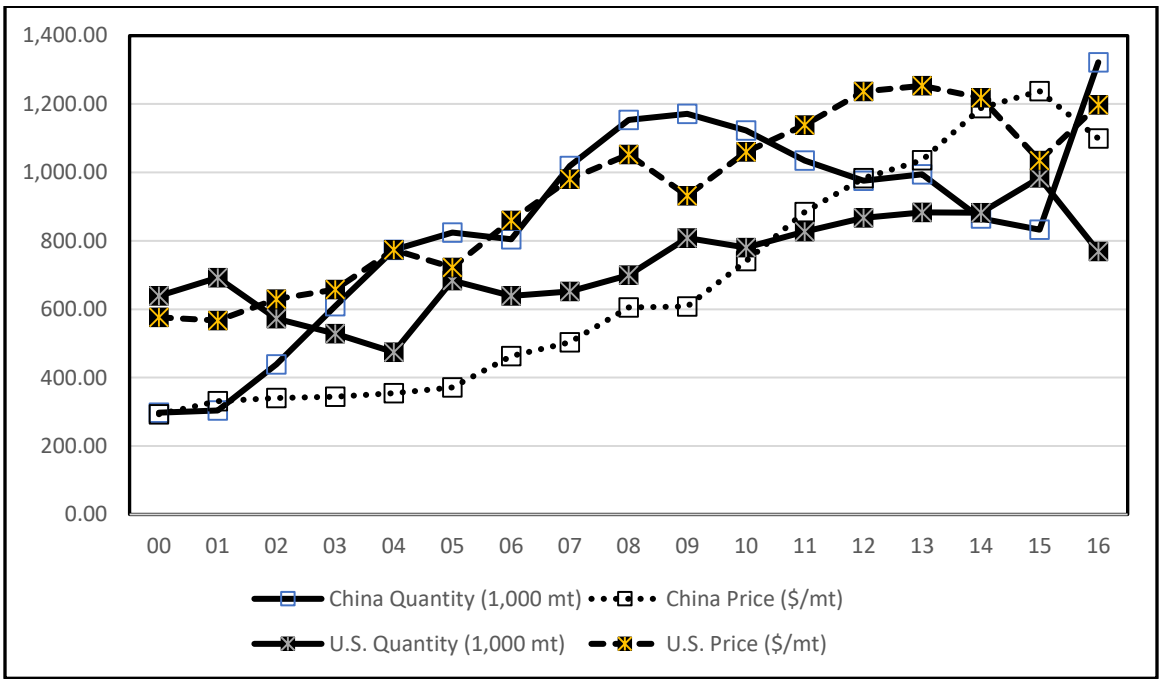
(Quantity, 1,000 metric tons, and Price, deflated euros per metric ton)



Another development with global implications is the swing 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. Prices were kept artificially low as China sought to penetrate more markets. Between 2008 and 2015, Chinese export prices more than doubled in terms of U.S. dollars. Part of this was due to an upward revaluation of the Chinese yuan, and part was a result of China selling its apples close to the prevailing world market price. Between 2007 and 2011, Chinese fresh apple exports stalled at close to one million metric tons. They then declined between 2011 and 2015 as demand in the Chinese domestic market remained strong. However, as the Chinese economy slowed, exports surged by almost 60 percent between 2015 and 2016. U.S. exports of fresh apples moved up erratically over this 16-year period at steadily rising prices. Exports fell off sharply in 2016, but it is too early to say how much this was due to the increased supplies from China. However, it suggests that competition between these two leading exporters could intensify in the near future, especially in Asian markets.

China and United States: Volume and Average Prices of Fresh Apple Exports, 2000-2016

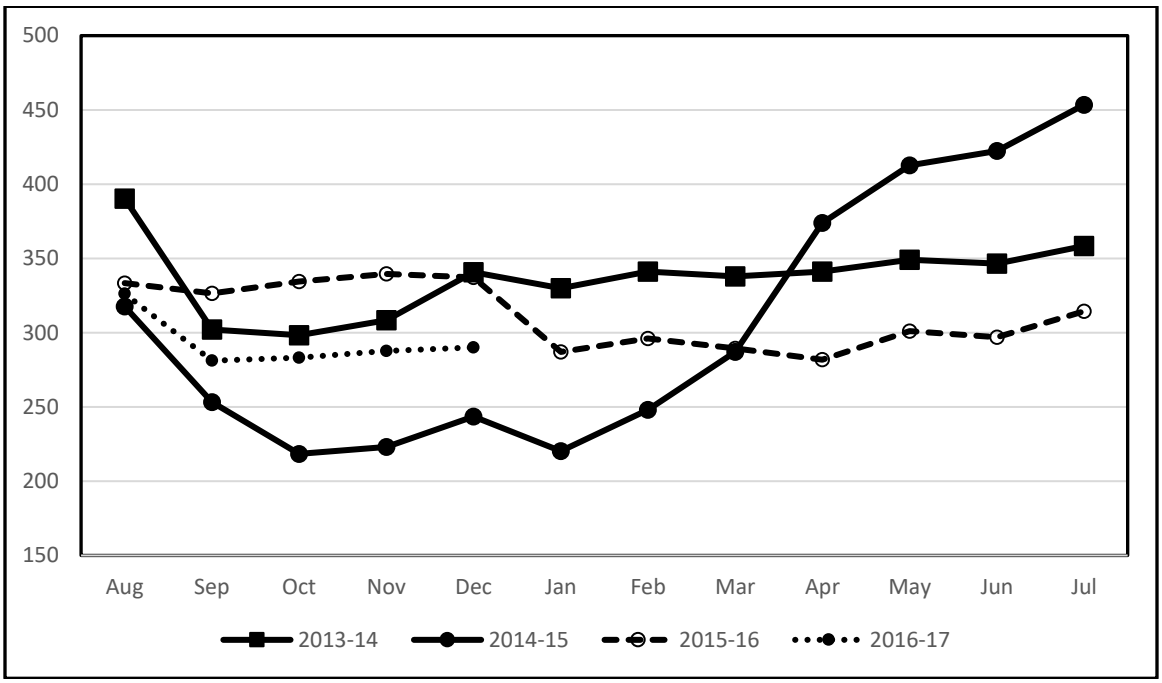
(Quantity, 1,000 metric tons, and Price, US$ per metric ton)



The last major development in the global fresh apple market is the continuing Russian ban on apples from countries it deems unfriendly, especially those in the EU-28. That ban was imposed in August 2014, and the country most affected by this ban has been Poland, once the largest single supplier of fresh apples to Russia.

The chart below shows the average monthly price of fresh apple exports from Poland in the 2013-14 marketing year, before the Russian ban was imposed, and the prices since the ban took effect. The solid black line with square markers in the chart below shows Polish export prices in 2013-14. They averaged close to 300 euros per metric ton for the months of September through November 2013, and close to 350 euros between December 2013 and July 2014. The solid black line with circular markers shows monthly prices in the 2014-15 season when the ban first hit. Prices stayed well below the 2013-14 level through March of 2015, and rose above the 2013-14 level for the next four months. Prices in 2015-16 started above the 2013-14 level, but fell to about 300 euros per metric ton for the rest of the season. Prices so far in the 2016-17 season have remained below the 2013-14 level.

Poland: Monthly Export Prices of Fresh Apples, 2013-14 through 2016-17 Seasons
(Euros per metric ton)



The chart above shows that in the third year after the Russian ban was imposed, the Polish apple industry was still suffering adverse effects. As noted previously, these adverse effects continue to be relayed to many other countries through trade.

Future Prices Face Challenges

A number of factors discussed in this chapter are likely to keep long-term downward pressure on fresh apple prices. These include sluggish economic growth in many markets, general protectionist barriers to trade, specific obstacles like the Russian ban, and the need for countries like Poland, China and the United States to increase their exports. Temporary relief might occur in the 2017-18 crop year as the apple crop in many European countries has been hit by hard frosts. However, it would be unwise for major apple producing countries to rely on such misfortune to improve their economic position. They need to objectively assess the long-term threats that the world apple industry faces, and take steps to make the needed adjustments.

VI. The Processed Apple Sector

Apple Processing Under Stress

The processing segment of the world apple industry continues to be under stress on many fronts. On the demand side, per capita consumption of higher-value processed apple products remains either stagnant or declining. Consumers have switched increasingly to fresh fruits and vegetables in preference to processed products. Consumption of apple juice, which had enjoyed a period of rapid growth, has faltered as it has suffered from concerns about food safety and health benefits.

On the supply side, as shown in chapter V, returns from apples destined for the fresh market have substantially outdistanced those for processing apples. As a result, there has been little effort put into breeding improved apples for new, or innovative, processed products. The apple industry has focused on breeding, planting and marketing apple varieties that will perform best in the fresh market. However, because overall apple production has continued to grow, and the share aimed at the fresh market has expanded, the volume of rejects diverted from fresh apple packing lines has continued to grow. Most of these rejected apples end up being processed into apple juice or dried apple products from which growers receive low returns. The apple juice industry has, in one sense, become a large, accidental, industry, that would not be viable if its raw materials were not subsidized out of the higher returns on the fresh market. In most cases, the prices paid to growers for these processing apples cover only part of the full costs of production. At best, they offset some of the fixed costs growers incur. However, growers with a high proportion of apples diverted to processing see their profit margins squeezed.

This situation has been exacerbated by several developments. One is the explosion of apple production in China and Poland, that has accelerated the supplies available for processing. A second is the Russian ban on imports of apple juice and apple juice concentrate from Poland. A third is the difficulty marketers of apple juice concentrate have faced in finding new markets for their expanded supplies. This has put downward pressure on prices, not just of apple juice, but of all processed apple products.

The outcome of all these developments is that the volume of apples processed has fallen from the peak levels reached in the 2006-08 period, but has stabilized around 12 million metric tons in the major apple producing countries for which data are available. The table below shows Belrose, Inc. estimates of the volume of apples available for processing in 31 major producing countries, divided by major regions, for three-year periods between 2000 and 2014 and for the two most recent seasons, 2015-16 and 2016-17.

World Apples for Processing, by Region, Selected Periods, 2000-2017
(1,000 metric tons)

Region	2000-02	2003-05	2006-08	2009-11	2012-14	2015-16	2016-17
EU-15	2,173	1,958	2,118	1,720	1,629	1,767	1,459
Other Europe	2,216	2,315	1,924	1,825	2,423	3,014	2,920
Russia	916	1,277	949	686	485	335	348
North America	1,890	1,793	1,735	1,763	1,587	1,631	1,655
Asia	2,515	4,418	6,755	5,488	4,278	4,235	4,645
Southern Hemisphere	1,337	1,470	1,399	1,417	1,201	1,007	1,047
Total, 31 countries	11,047	13,231	14,881	12,899	11,602	11,988	12,074

The peak in processed apple supplies in Asia in 2006-08, and the subsequent decline, was driven largely by supplies in China. The industry there has sharply reduced capacity since the peak period. Supplies in Other Europe have surged in recent years, driven largely by expansion in Poland. However, unlike China, production and processing volumes in Poland have been much more erratic from year to year. The general trend in all other areas has been downward. In the EU-15, North America and Southern Hemisphere, part of the decline has been due to increased focus on planting of apple varieties suitable for the fresh market. There has also been shrinkage in overall apple production in countries such as Canada, France and Argentina.

The table below shows trends in the volume of apples available for processing in the top ten apple processing countries. It reflects similar trends to those discussed above for broader regions. The biggest percentage declines between 2000-02 and 2016-17 were for Russia and Argentina.

Top Ten Apple Processing Countries, Selected Periods, 2000-2017
(1,000 metric tons)

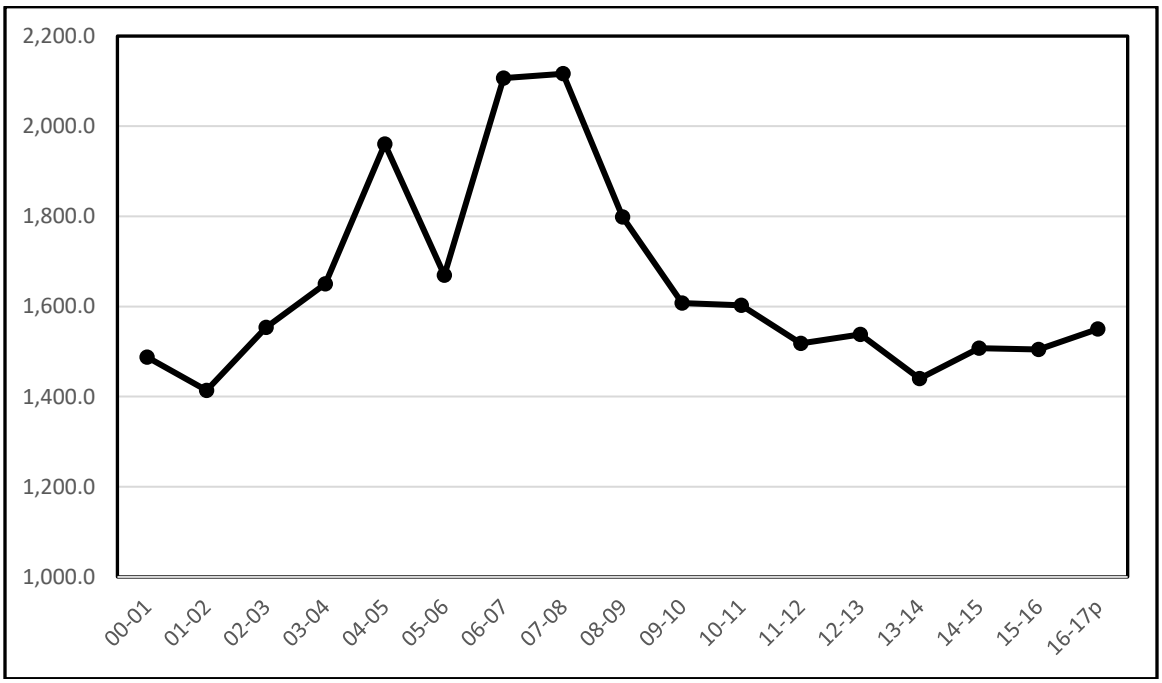
Rank		2000-02	2003-05	2006-08	2009-11	2012-14	2015-16	2016-17
1	China	2,357	4,152	6,520	5,253	4,083	4,000	4,400
2	United States	1,634	1,576	1,460	1,506	1,363	1,392	1,409
3	Poland	1,521	1,466	1,309	1,182	1,520	2,217	2,285
4	Germany	853	773	850	648	656	663	727
5	Hungary	464	393	270	307	440	393	325
6	Russia	916	1,277	1,309	686	485	335	348
7	Chile	367	396	391	393	340	320	357
8	Argentina	531	587	436	443	319	293	296
9	France	312	266	292	284	252	300	267
10	Brazil	0	0	219	307	144	20	21
-	TOP TEN	8,855	10,886	13,056	11,009	9,602	9,933	10,435
-	% of total	80.2	82.1	87.7	85.3	82.8	82.9	86.4

The supplies of processing apples remain highly concentrated in a small number of countries. The top ten countries have consistently supplied over 80 percent of apples for processing among the 31 major apple producing countries. The top three, China, Poland and the United States, have consistently supplied over 60 percent of the total. This has given these three countries substantial influence in the world market for processed apple products.

Trends in Production of AJC

The most highly traded, and most influential, product in the world of apple processing is apple juice concentrate (AJC). Trade in AJC grew erratically after processing and transportation systems were developed in the 1970s. However, the biggest explosion in production and trade resulted from China's entry into the business on a large scale after 2000. The chart below shows the estimated total volume of AJC produced in major apple producing countries between the 2000-01 and 2016-17 seasons. The volume increased by almost 50 percent between 2000-01 and 2007-08, but has generally been on a downward trend since. There has been a recent uptick since 2014-15.

Selected Countries: Trends in Production of AJC, 2000-2016
(1,000 metric tons)



The outlook for AJC supplies is clouded by uncertainties, such as the Russian ban on Polish imports, discussed previously. That ban has not yet led to reductions in production capacity in Eastern Europe, but it has made it more difficult to track actual disappearance because of the increase in smuggling. Since AJC can be stored from one season to the next, changes in inventories can cause price turbulence.

The table below shows a snapshot of the decision-making process for producers, packers and marketers in major apple producing regions in the 2016-17 season about how much product they will divert to AJC production. Of the almost 72.5 million metric tons of apples produced in the 31 major producing countries, just one sixth was sent to processing. However, that figure was pulled down by the results for Asia. Over half of the apple production in Other Europe went to processing, while over 20 percent went to processing in all other regions, except Russia. Not all apples for processing are sent to the manufacturers of AJC. The exact data are elusive. However, our best estimates suggest that over 80 percent of apples for processing enter the AJC system. The major exception is North America, where less than half of all apples for processing are made into AJC.

World: Production of All Apples, Apples for Processing, Apples for AJC and AJC Produced, by Region, 2016-17p
(1,000 metric tons)

Region	Production of All Apples	Total Apples for Processing	Apples Processed into AJC	AJC Produced
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)
EU-15	7,726.0	1,459.0	1,011.0	147.1
Other Europe	5,431.0	2,920.0	2,452.0	367.0
Russia	1,337.2	348.3	348.0	70.0
North America	5,830.1	1,654.6	711.6	93.6
Asia	47,230.0	4,645.0	4,420.0	728.8
Southern Hemisphere	4,891.5	1,046.9	952.0	143.6
Total, 31 countries	72,445.8	12,073.8	9,894.6	1,550.0

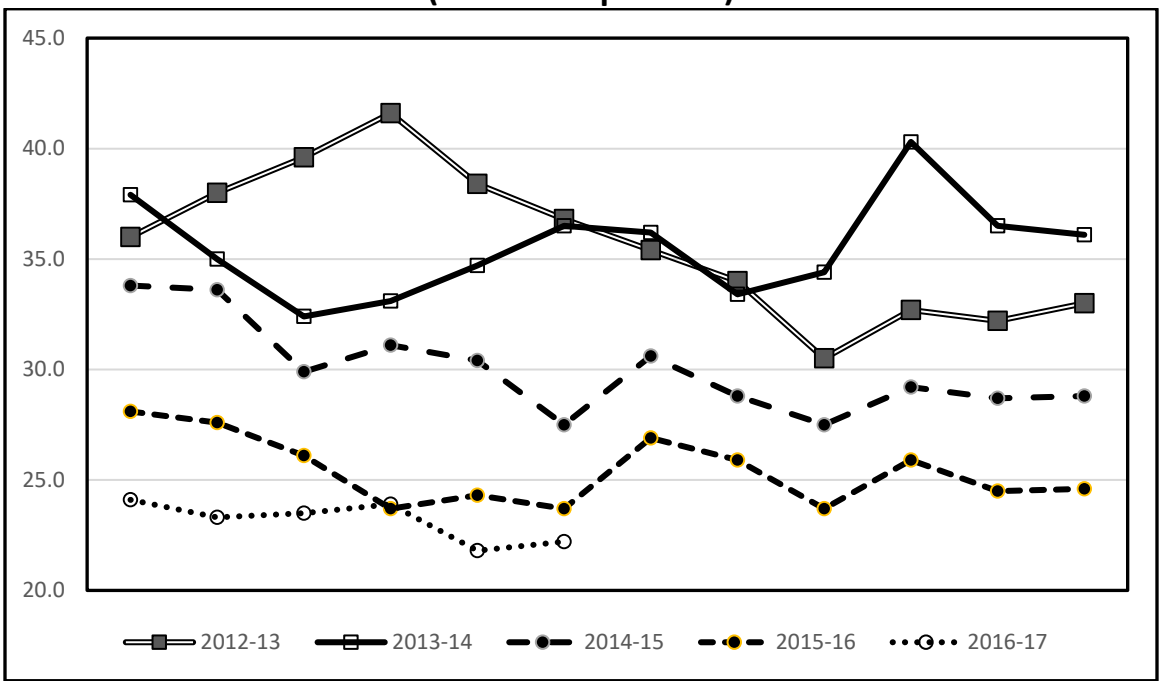
Battle over AJC Prices and Imports

Prices of AJC in international markets are highly sensitive to the supplies available from the major exporters in Europe, Asia and the Southern Hemisphere. The continuing Russian ban on AJC imports from the EU has affected the flow of product and level of competition in many markets, and the resultant price swings. As the largest single importer of AJC, prices in the United States have become a reasonable proxy for world prices of AJC.

The chart below shows average monthly prices of imported apple juice in the United States between 2012-13 and the 2016-17 season, the period before and during the Russian ban. All seasons ran from September to the following August. For both 2012-13 and 2013-14, the average price of AJC imported by the United States registered well above 30 cents per liter. The Russian import ban was imposed in August 2014, just before the beginning of the 2014-15 season. Prices opened lower in September 2014, and moved down below the 30-cent range for the rest of the season. A similar pattern occurred in 2015-16, with prices gradually falling to about the 25-cent range. The fall continued in the first half of the 2016-17 season, with prices falling to an average of 22 cents per liter in the first two months of 2017. The Russian ban has had a driven down U.S. prices for imported AJC.

United States: Monthly Average Prices of Imported AJC, 2012-13 through 2016-17 Seasons

(U.S. cents per liter)



The Russian import ban has also had an effect on world trade in AJC. However, that effect has been muted by the long-established dominance of Chinese product in the U.S. market, and by the increased costs faced by European suppliers in transporting AJC far from their nearby European and Russian markets.

The table below tracks U.S. imports of AJC between 1995 and 2016. Total imports averaged close to one trillion liters between 1995 and 2002. However, after 2002, it moved steadily upward, coming close to 2 trillion liters in 2007 and 2008. The dominant contributor to that increase was China. Its exports to the United States increased more than sixfold between 2002 and 2008. During that time, China's share of U.S. AJC imports more than tripled. Between 2008 and 2013, China's share averaged more than 80 percent. Most of this increase was driven by low prices, and occurred at the expense of traditional South American suppliers like Argentina and Chile. As China's share increased, their share decreased. Beginning in 2014, supplies of AJC from China declined temporarily, and South American suppliers claimed back some of their former market share. In 2015, they were joined by many exporters from Europe that were seeking to replace the lost market in Russia.

United States: Imports of AJC, Calendar Years, 1995-2016
(Volume in million liters, Prices in $ per liter)

Year	China	China	Other	Total	China	Other	Total
	(m. liters)	(%)	(m. liters)	(m. liters)	(cents/l.)	(cents/l.)	(cents/l.)
1995	8.2	1.0	832.8	830.9	0.387	0.334	0.335
1996	16.9	1.8	939.2	956.0	0.516	0.380	0.382
1997	77.2	7.9	905.3	982.5	0.380	0.320	0.322
1998	203.8	19.3	849.5	1,053.2	0.146	0.188	0.180
1999	144.9	12.9	982.4	1,127.2	0.164	0.192	0.188
2000	190.8	17.1	925.1	1,115.9	0.194	0.246	0.240
2001	202.1	16.1	1,051.6	1,253.7	0.149	0.173	0.169
2002	231.9	23.8	741.7	973.6	0.142	0.174	0.166
2003	486.9	36.9	831.4	1,318.3	0.152	0.171	0.164
2004	853.0	56.8	649.3	1,501.7	0.164	0.213	0.186
2005	902.6	58.3	644.5	1,547.2	0.169	0.164	0.167
2006	808.9	55.3	654.1	1,463.0	0.198	0.199	0.199
2007	1,454.5	74.8	489.9	1,944.3	0.255	0.237	0.250
2008	1,552.6	81.2	360.4	1,912.9	0.378	0.359	0.374
2009	1,558.8	83.2	314.2	1,873.0	0.188	0.252	0.199
2010	1,502.6	86.3	239.1	1,741.7	0.194	0.211	0.196
2011	1,221.8	73.3	446.0	1,667.8	0.385	0.356	0.378
2012	1,303.9	84.2	244.5	1,548.4	0.413	0.460	0.426
2013	1,393.5	84.0	265.6	1,659.2	0.332	0.399	0.343
2014	918.2	66.2	469.7	1,387.9	0.343	0.354	0.347
2015	834.3	53.1	736.3	1,571.7	0.271	0.290	0.279
2016	1,107.4	68.3	514.2	1,621.6	0.222	0.291	0.244

The table below shows how the battle for the U.S. AJC import market has fared during the three calendar years, 2014, 2015 and 2016. As noted above, Chinese supplies had continued their downward trend in 2014 and 2015. Southern Hemisphere suppliers were not able to capitalize on that because supplies from Argentina and Chile were cut due to smaller total apple crops. In contrast, supplies from many European countries increased dramatically from previous very low levels. The most notable percentage gains were for Italy, Poland, Germany and Austria. Total supplies from Europe more than tripled between 2014 and 2015. However, the average price for European product fell by more than one-third between 2014 and 2015. In 2016, Chinese supplies increased by about one-third. More significantly, the average price of imported Chinese AJC fell to 22.2 cents per liter. In response, there was a one-third reduction in supplies from Europe.

United States: Imports of AJC, by Major Suppliers. Calendar Years, 2014, 2015 and 2016

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

Supplier	2014	2014	2015	2015	2016	2016
	Quantity	Price	Quantity	Price	Quantity	Price
	(1,000 l)	($/l)	(1,000 l)	($/l)	(1,000 l)	($/l)
China	918,166	34.3	834,277	27.0	1,107,437	22.2
Chile	258,821	29.8	232,766	26.2	185,201	23.5
Argentina	87,579	26.4	119.800	24.3	80,211	25.4
Italy	23,347	91.4	46,275	38.9	39,958	45.4
Turkey	25,589	39.5	79,745	38.5	69,853	34.4
France	3,175	29.3	3,075	27.6	2,755	29.1
Poland	14,883	28.6	132,217	22.9	58,104	22.2
Germany	11,342	31.8	28,528	25.1	695	47.9
Austria	10,766	24.0	18,976	23.4	17,072	24.1
South Africa	8,996	27.5	6,711	25.9	3,957	26.7
Hungary	8,184	29.9	12,894	20.9	1,006	26.8
Spain	8,989	27.2	11,147	24.0	13,403	33.8
All Other	8,048	116.6	48,295	35.7	41,964	30.0
TOTAL	1,387,885	34.7	1,571,706	27.9	1,621,616	24.4
Asia	945,127	28.9	917,273	28.2	1,177,387	23.0
Europe	81,594	46.6	264,906	29.5	166,923	34.1
S Hemisphere	358,688	29.0	373,995	26.8	276,669	24.4

The Russian embargo, and the temporary shortfall in supplies from China, encouraged many other countries to expand their exports of AJC to the United States. For example, Turkey became the fourth largest U.S. supplier in 2016. Other countries not listed separately in the table above, like the Ukraine, Macedonia, Moldova and Brazil, dipped their toe in the U.S. AJC market. However, few countries can viably serve the U.S. market at the price at which China can deliver. Unless prices in the European continent remain low, these countries cannot deliver to the U.S. at competitive prices Under the regime of President Xi, China has renewed its efforts to increase exports of many products, including agricultural products. In both fresh apples and AJC, this is being accomplished at below market prices. However, China has been able to operate at such prices for years in the past, and will continue to do so until the goals of the Chinese government change. For that reason, China's dominance of U.S. AJC imports is likely to continue.

EU-28: Imports of AJC, by Major Suppliers.
Calendar Years, 2014, 2015 and 2016
(Volume in metric tons, Prices in euros per metric ton)

Supplier	2014	2014	2015	2015	2016	2016
	Quantity	Price	Quantity	Price	Quantity	Price
	(mt)	(euros/mt)	(mt)	(euros/mt)	(mt)	(euros/mt)
Argentina	30.5	1,531.15	0	0	0	0
Brazil	82.1	634.12	126.4	845.96	46.9	1,063.60
Chile	6,253.0	1,179.52	4,697.7	1,249.08	2,732.8	1,130.64
South Africa	905.1	1,301.22	548.7	1,522.13	378.1	1,223.22
Austria	82,852.5	1,161.82	75,147.1	854.43	72,834.4	1,122.05
Belgium	3,762.2	1,106.39	3,507.5	1,277.28	3,608.2	1,016.94
France	9,160.0	2,013.44	7,959.9	2,051.78	5,464.1	2,047.46
Germany	44,082.9	984.53	62,552.3	735.41	78,440.1	693.19
Italy	46,152.5	854.28	39,719.3	737.62	34,262.2	799.00
Netherlands	28,073.8	1,141.33	27,975.5	1,031.29	29,321.0	1,236.41
Spain	18,735.8	967.71	14,886.4	866.80	7,677.6	824.46
Czechia	2,141.1	737.22	2,110.4	1,023.52	2,044.9	993.53
Hungary	38,924.1	1,015.94	25,065.8	834.75	24,752.1	1,054.23
Poland	181,863.1	972.45	189,646.5	898.88	200,788.1	1,046.94
Moldova	40,224.7	702.91	36,385.8	782.65	31.806.2	677.16
Ukraine	83,698.6	448.17	73,052.0	530.75	43,547.3	836.51
China	11,204.2	1,034.04	20,539.8	1,051.69	19,057.1	993.26
Turkey	48,421.2	1,220.32	45,265.7	1,191.76	35,546.8	1,218.72
All Other	42,831.7	961.93	51,450.2	1,341.03	49,003.3	1,259.15
TOTAL	689,399.1	950.46	680,617.0	873.09	634,401.9	981.19
Asia	59,625.4	1,185.13	65,805.5	1,148.04	54,603.9	1,140.03
S Hemisphere	7,270.7	1,189.99	5,372.8	1,267.48	3,157.8	1,147.41

In contrast, as the table above shows, EU-28 imports of AJC continue to be dominated by European suppliers, or by close neighbors like Turkey. Even then, less than 9 percent of AJC supplies in 2016 came from Asia, and less than one percent from the Southern Hemisphere. While Poland was the dominant supplier, accounting for almost one third of EU-28 imports, there were numerous other substantial European suppliers. Competition in the EU-28 market remains intense. Competition also remains quite varied. For example, AJC from France sold at close to twice the average price, while that from Germany and Moldova sold at 30 percent below the average price. Clearly, quality differences also affect demand.

Challenges for Exporters

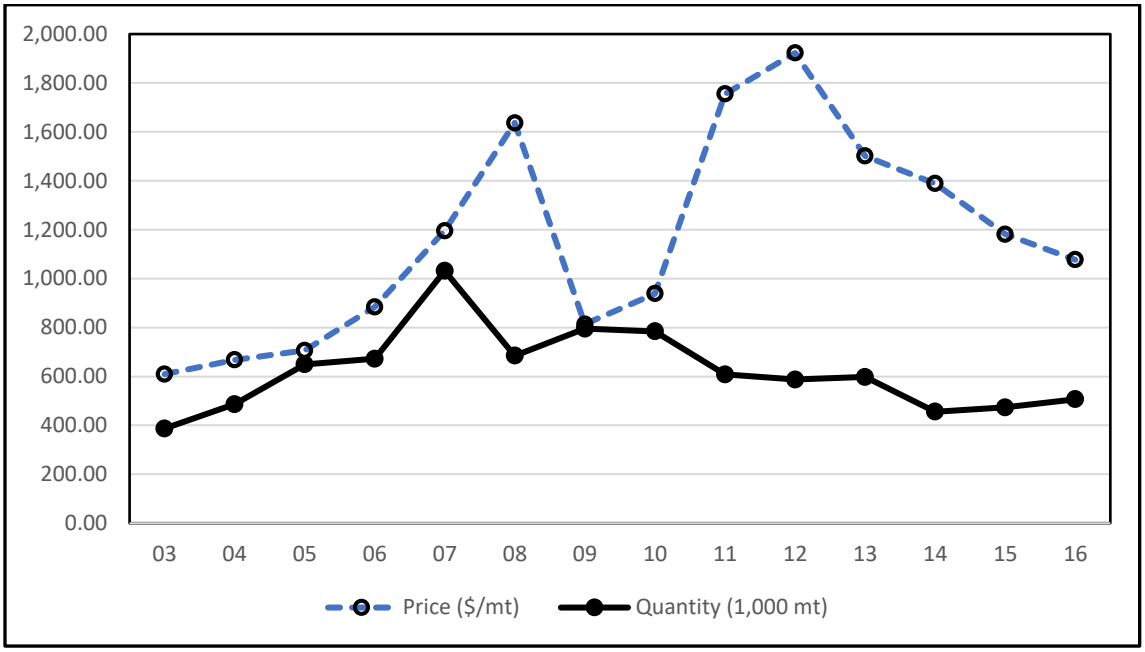
Weaker demand, increased apple production, and intense competition are also increasing the challenges facing AJC exporters. The table below shows estimates of AJC exports for the top ten exporters for the 2007-08 to 2016-17 seasons. Many of these estimates are tentative because there is much intra-European trade in single strength and semi-processed apple juice and in AJC. It is uncertain how accurately customs officials distinguish AJC from single strength juice or semi-processed juice, and borders between EU member countries tend to be "leaky." Six of the top ten countries are in Europe, and all are members of the EU's single market.

The general picture is of current volume now running well below past peaks and of little growth over the long term. Possible exceptions to this are Poland and Hungary, but both have been affected by wide swings in their apple production from year to year. While the top ten exporters consistently account for close to 90 percent of known world exports of AJC, just two countries, China and Poland, account for two thirds of world AJC exports. For this reason, our primary focus in this section is on those two countries.

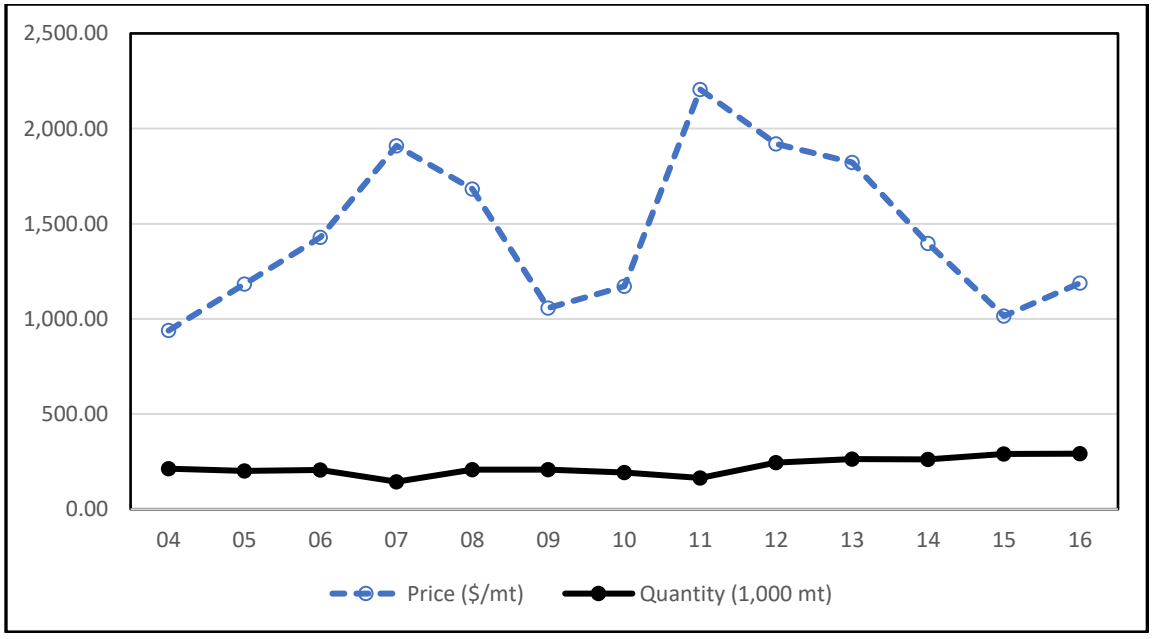
Top Ten AJC Exporting Countries, 2007-08 to 2016-17
(1,000 metric tons)

Rank	Country	2007-08	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17p
1	China	893.7	549.7	597.4	540.0	440.0	550.0	600.0
2	Poland	186.5	165.0	232.0	233.0	327.5	270.0	292.0
3	Austria	77.4	77.3	65.0	75.0	75.3	74.6	70.3
4	Hungary	19.2	33.0	48.0	50.7	51.0	78.0	35.2
5	Germany	125.0	58.0	57.0	34.0	48.0	40.0	30.0
6	Chile	38.7	55.3	38.7	35.0	40.1	38.8	42.2
7	Italy	70.0	28.5	47.5	47.0	42.1	33.2	39.0
8	Turkey	39.9	34.0	32.0	34.0	34.0	33.5	36.8
9	Argentina	43.0	28.5	25.7	23.7	21.0	33.0	32.7
10	Netherlands	28.4	47.0	22.5	20.0	17.5	16.5	12.5
-	TOP TEN	1,521.8	1,076.3	1,165.8	1,092.4	1,096.5	1,167.6	1,190.7
-	% of Total	91.4	86.0	89.0	88.3	87.6	94.3	91.3

China: Exports of Apple Juice Concentrate, 2003-2016
(Quantity, metric tons, and Price US$ per metric ton)



Poland: Exports of Apple Juice Concentrate, 2004-2016
(Quantity, metric tons, and Price US$ per metric ton)



The charts on the previous page compare the volume and average price of AJC exports from China and Poland between 2003 and 2016. The volume exported by China shows rapid growth prior to 2007 and the subsequent slow decline. In contrast, the volume exported by Poland climbed gradually, from a lower base, over the entire period. Of special interest is the strong correlation between average AJC prices in China and in Poland. Both have shown similar wide swings, with tops in 2007-2008 and 2011-2012, and valleys in 2009-2010 and, most recently in 2015-2016. Clearly, the prices for both are intimately linked.

The table below shows how Chinese exports of AJC have varied over time. The major growth phase for Chinese AJC exports occurred between 2000 and 2005. While volume has fallen since, in 2016, it was still more than 3.5 times the 2000 level. Most of the growth between 2000 and 2005 was in North American and Western European markets where demand for apple juice was firmly established. North America has remained an important market, although at levels well below the 2010 peak, but the market in Europe has shrunk dramatically. Some of that loss has been made up with increased sales to Asia.

China: Exports of AJC, by Volume and Destination, 2000-2016

(metric tons)

Destination	2000	2005	2010	2013	2014	2015	2016
Germany	9,710	91,219	40,039	8,878	2,594	16,664	7,121
Italy	2,237	550	62	0	0	0	0
Netherlands	14,000	73,430	58,977	7,736	3,593	4,218	3,290
Spain	342	6,630	626	561	0	308	990
Russia	4,288	62,031	76,441	49,080	57,031	35,925	50,700
United States	39,747	227,206	387,578	318,549	215,939	239,840	256,883
Canada	7,190	27,164	40,632	32,750	22,359	23,131	24,262
Japan	19,435	63,468	52,101	68,236	59,167	60,881	49,237
Taiwan	1,981	3,022	3,643	3,302	3,382	3,701	3,884
South Korea	837	3,954	2,908	3,198	3,297	2,898	2,975
Australia	11,519	29,616	33,266	26,625	25,407	25,400	23,814
South Africa	4,912	9,669	30,149	33,625	25,561	16,086	37,857
Others	16,117	51,504	57,722	75,557	37,470	44,777	45,538
TOTAL	142,315	649,463	784,144	597,838	455,800	473,829	506,551
North America	46,937	254,369	428,210	351,500	238,299	262,971	281,395
Western Europe	41,988	197,288	110,178	14,275	8,369	18,692	10,685
Asia	30,504	74,949	70,546	106,902	91,864	102,056	89,236

The table below shows how Poland's exports of AJC have varied over time. Poland has remained heavily dependent on exports to the richer EU-15 countries, especially Germany. However, Germany has been taking a declining share of Poland's exports as sales have increased to countries like Austria, France, the Netherlands and the United Kingdom. Despite the embargo, exports to Russia increased in 2015. There have also been big percentage gains in the volume being shipped outside the EU-28. There was a big spike in exports (previously noted) to the United States, and also to all other countries outside the EU-28. However, Poland has continued to struggle to diversify its AJC exports.

Poland: Exports of AJC, by Volume and Destination, 2005-2016
(metric tons)

Destination	2005	2010	2012	2013	2014	2015	2016
Austria	14,904	10,975	28,382	7,893	13,482	14,710	26,841
Belgium	1,247	2,202	3,078	2,590	2,563	1,985	1,579
Denmark	242	4,803	5,691	4,071	5,341	4,856	5,605
France	788	4,461	6,076	7,158	3,680	6,362	10,225
Germany	142,339	126,056	143,890	154,788	138,446	144,354	140,974
Italy	726	296	572	540	845	470	591
Netherlands	8,241	7,051	15,687	18,975	27,457	18,299	26,935
Spain	1,202	1,102	1,616	4,785	2,165	2,958	5,257
Sweden	1,826	3,178	4,368	4,765	4,504	4,901	5,450
United Kingdom	18,106	20,419	24,478	41,245	23,034	28,848	23,865
Other EU-15	2,872	4,762	3,222	3,895	7,302	8,146	6,028
Total EU-15	192,493	185,305	237,060	251,228	228,819	233,226	253,350
Russia	1,285	3,178	4,368	458	11,971	14,911	9,806
United States	122	43	102	65	8,727	24,918	7,158
Canada	183	4	0	0	2,761	5,708	81
All Other	8,795	4,815	3,266	11,705	9,654	17,325	21,371
TOTAL	202,878	193,345	244,796	263,456	261,932	290,888	291,766

Future Prospects for the Processing Apple Sector

The processing apple sector has had difficulty in adjusting to changing supply, demand and competition factors in the world market. New complications have been added with the impact of the Russian embargo and the recent variations in supplies and prices from China.

Apple production is likely to grow substantially in both China and Poland over the next few years, That will mean increased supplies of AJC available on world markets. Competition between the two giants could keep downward pressure on AJC prices. AJC prices have been shown to affect prices for all other processed apple products around the world, so they too will come under pressure. On the other hand, lower prices of raw materials should allow apple processors to become more profitable if demand for processed apple products does not slip further.

If the industry is to expand in the future, it will have to bring a much higher level of innovation to the products it produces. Without such innovation, the industry could continue to shrink.

VII. Critical Issues Facing the World Apple Industry

Improved Efficiency Critical

The world apple industry is being squeezed from many different angles. Its final purchasers, consumers, are undergoing continual change, and in many countries a wide dichotomy has developed between the higher income (protected) classes and the lower income (unprotected) classes. The former has benefited from rapid economic change and globalization, while the latter have suffered losses in jobs and incomes that have offset much of the benefits of freer trade.

The retail food industry is in turmoil as more and more of the foot traffic in its stores is being replaced by, or at least influenced by, online giants like Amazon. The battle for share of bricks and mortar retailing has become intense, as new, discount formats seek a share of that shrinking market. Many smaller, weaker food chains and independents have gone out of business, or have been absorbed into bigger chains through acquisitions or mergers. The surviving chains have become bigger and more diverse.

In response to the retail consolidation, firms in the supply sector, such as apple growers, packers and marketers, have joined networks, or formed integrated operations, that can control each step of the supply system, and meet the more demanding requirements of the large retailers for supplies of a wide range of apple varieties twelve months a year. Often firms from other hemispheres are included in these networks. The stronger integrated operations have been able to acquire the rights to club varieties that can be sold at a premium, while most mainstream apple varieties are still being produced by smaller growers. However, many of the public support systems that used to promote mainstream varieties have been eliminated or curtailed. This suggests that these varieties will face decreased demand in the years ahead. The only way producers of these varieties will remain profitable is if they improve the efficiency of every aspect of their operations.

Countries, growing districts and individual growers vary widely in their level of efficiency, and in changes in efficiency over time. For many years, Belrose, Inc. has developed efficiency rankings for major producing countries. These can be used as a basis for evaluating efficiency at the district or firm level.

Measuring International Competitiveness

The Belrose, Inc. rankings of international competitiveness among 33 apple producing countries have been updated for 2017, and are presented here. 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 the criteria used are listed in the table below. Each producing country was scored on each criteria 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 receive was 230 points. Wherever 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 investors, owners or managers. The raw data is summarized in the table on the next page. Infrastructure and inputs are influenced both by private-sector decision-makers and by public agencies, like water boards. Financial and market factors are outside the control of the apple industry and most heavily influenced by decisions of national or international government bodies.

Apples: Comparative Performance Measures, 2017

Production Efficiency	Industry Infrastructure & Inputs	Financial & Market Factors
1. Percent change in production, 2008-10 to 2014-16.	7. Adequacy of storage.	16. Long-term interest rates, 2017.
2. Relative variability of production, 2006-2016	8. Modern packing facilities.	17. Inflation rate, 2017.
3. Percent of acreage non-bearing, 2016	9. Efficiency of distribution.	18. Exchange rate in 2016, relative to 2001-2005 average.
4. Percent of production that is newer 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, 2014-16, metric tons.	12. Water availability.	21. Percent of production exported, 2014-16.
	13. Labor availability.	22. Average export price, 2014-16, US$ per metric ton.
	14. Capital availability.	23. Average distance to market, miles.
	15. Input costs.	

Major Apple Producing Countries: Comparative Performance Measures of Production Efficiency, Raw Data, 2017

Country	Percent change in production, 2008-10 to 2014-16	Relative variability of production, 2006-2016	Percent of Acreage non-bearing, 2016	Percent of new varieties in production, 2016	Planting density, trees per hectare, 2016	Average yield per hectare, 2014-16
	(%)	(ratio)	(%)	(%)	(#)	(mt)
Austria	- 5.1	1.44	13.5	46.68	2,688	30,42
Belgium	- 13.4	1.63	2.1	69.23	3,286	41.37
France	- 2.4	1.45	2.4	40.98	1,563	35.38
Germany	+ 2.0	1.45	7.4	52.47	2,164	34.22
Greece	+ 6.1	1.37	3.2	14.29	459	19.40
Italy	+ 5.8	1.27	7.5	32.30	2,351	46.17
Netherlands	- 8.2	1.49	4.5	42.47	2,989	40.52
Portugal	+12.2	1.49	9.1	25.86	1,591	13.78
Spain	+ 1.5	1.66	6.2	26.83	500	16.80
United Kingdom	+14.5	1.54	9.2	47.20	1,242	27.62
Russian Fed.	+24.6	1.56	24.2	18.53	705	8.49
Hungary	- 1.3	3.64	8.8	19.15	972	18.26
Poland	+55.3	3.77	11.5	22.65	1,206	23.29
Canada	- 7.9	1.63	11.6	25.65	990	23.97
Mexico	+32.5	2.00	7.9	7.95	225	13.26
United States	+12.6	1.28	11.5	39.47	1,100	36.03
China	+34.1	1.75	14.7	72.78	420	21.38
India	- 0.6	1.65	3.7	0.00	230	6.57
Japan	+ 0.7	1.37	5.5	66.70	1,130	20.90
South Korea	- 3.6	1.30	28.3	77.00	1,020	21.12
Turkey	- 0.1	1.26	22.4	4.21	400	15.45
Argentina	- 33.3	1.66	10.3	33.38	1,140	30.79
Australia	+12.9	1.21	5.2	57.24	605	16.21
Brazil	- 12.8	1.32	2.5	92.30	875	32.12
Chile	- 14.3	1.43	6.9	64.71	1,125	37.65
New Zealand	+18.4	1.33	2.1	80.54	1,175	62.02
South Africa	+24.8	1.38	9.7	42.35	1,257	43.65
Bulgaria	- 13.1	2.84	29.6	6.64	1,140	12.36
Czechia	+21.3	2.01	9.9	20.35	1,279	16.43
Romania	- 7.0	1.60	13.7	3.77	577	7.51
Slovakia	- 15.8	3.27	13.7	35.29	1,153	5.82
Slovenia	- 29.4	6.88	5.0	46.83	2,539	5.85
Serbia	+62.3	2.24	7.0	6.90	900	4.71
AVERAGE	+5.31	1.91	10.0	37.66	1,242	23.92
Exc. China	+4.41	1.92	9.9	36.56	1,268	24.00

The table on the previous page provides individual data points for the 33 countries, and overall averages, for six production criteria. To simplify comparisons, it is useful to compare each country's performance on each criterion with the overall average for the 33 countries (with or without China) and with the best and worst performance on each criterion. For example, the average increase in production between 2008-10 and 2014-16 was 5.31 percent, including China. However, the worst performer was Argentina with a decline of 33.3 percent, while the best performer was Poland with an increase of 55.3 percent. Seventeen of the 33 countries, just over half, enjoyed increased production in the period. Of those, eleven enjoyed double-digit percentage increases. Seven countries experienced double-digit percentage decreases.

The relative variability of production between 2006 and 2016 is an indicator of the stresses on the packing, storage and marketing system as crop size varies from year to year. The average score of 1.91 meant that on average the largest apple crop in the period was twice the smallest crop, so capacity was either underutilized or under severe stress. Slovenia was an outlier with a score of 6.88. However, three other countries had ratios above three. On the positive side, five countries had ratios of 1.3 or less, suggesting very low variability.

The percent of acreage non-bearing is regarded as a good indicator of how well a country is renewing its orchards. The average figure of 10.0 has traditionally been viewed as the minimum needed for effective orchard renewal. Two of the highest non-bearing percentages were for Russia and Serbia, which also may include old, non-productive orchards as non-bearing. Two other countries with non-bearing percentages above 20.0 were South Korea and Turkey. Eight countries had non-bearing percentages between 10.0 and 15.0. In contrast, eight countries had non-bearing percentages of 5.0 or less, well below the recommended level.

A key measure of innovation in apple 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. On average for all countries, more than one third of production was in new varieties. Three countries, China, South Korea, Brazil and New Zealand, had 70 percent or more new varieties. In contrast, three countries, India, Turkey and Romania, had less than 5 percent new varieties.

The fifth criterion shown in the table is for planting density, in trees per hectare. This is an indicator both of the progressiveness of orchardists in any country and of their ability to tap the needed capital for orchard renewal. The average for all countries was 1,242 trees per hectare, with the highest, in Belgium, at 3,286 trees per hectare, being more than 14 times the density in India and Mexico. For 14 countries, density ranged between 1,000 and 1,600 trees per hectare, close to the overall average.

The final criterion in the previous table relates to the average yield per hectare in the three most recent seasons, 2014 to 2016. Even though three-year averages are intended to reduce the impact of unusual crops in any year, a number of countries suffered severe crop losses in at least one of those seasons, so this criterion needs to be treated with caution. However, New Zealand again stood out with an average yield of over 62 metric tons per hectare, almost 2.6 times the global average. Four countries, Belgium, Italy, the Netherlands and South Africa, had average yields above 40 metric tons per hectare. In contrast, six countries, the Russian Federation, India, Romania, Slovakia, Slovenia and Serbia, had average yields of less than 10 metric tons per hectare, less than half the global average. Five of these six countries have been in transition from a centrally planned, but outdated apple industry, to one that responds to market signals.

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 these performance criteria would require the apple industry and its organizations in each country to work with national and regional bodies that manage infrastructure, and national and international governments that write and administer laws that regulate national and regional economic activity. In many cases, the apple industry will need to cooperate with other agricultural and non-agricultural industries to effect change.

The table on the next page shows the competitiveness rankings of all 33 countries for 2017, in overall rankings and in rankings for all three main subcategories. The overall rankings or 2017 are also compared with the rankings for 2016. New Zealand retained its position in first place with an overall points score of 171 out of 230 points. The United States moved ahead of Chile in 2017 with an overall score of 165 points. Chile was in third place with 162 points.

Major Apple Producing Countries: International Competitiveness Rankings, 2017

Rank, 2017	Rank, 2016	Overall Ranking	Production Efficiency	Infrastructure & Inputs	Financial & Markets
1	1	New Zealand	South Korea	Chile	Netherlands
2	3	United States	Belgium	United States	Japan
3	2	Chile	Italy	New Zealand	Belgium
4	10	Netherlands	New Zealand	Canada	France
5	8	Belgium	South Africa	South Africa	Italy
6	4	Italy	Austria	Brazil	South Korea
7	7	Japan	Germany	France	Austria
8	6	South Korea	Netherlands	Argentina	Germany
9	8	Austria	United States	Austria	United Kingdom
10	5	France	China	Italy	New Zealand
11	11	Canada	United Kingdom	Turkey	Canada
12	12	Germany	Japan	Japan	Slovakia
13	13	South Africa	Chile	South Korea	Slovenia
14	14	United Kingdom	France	Belgium	United States
15	15	Australia	Russian Federation	Netherlands	Spain
16	16	Spain	Australia	Australia	Australia
17	20	Poland	Brazil	Germany	Chile
18	18	China	Portugal	Spain	Serbia
19	22	Argentina	Canada	United Kingdom	Poland
20	19	Portugal	Turkey	China	Portugal
21	21	Brazil	Argentina	Poland	Mexico
22	24	Turkey	Czechia	Portugal	Greece
23	23	Mexico	Poland	Mexico	Bulgaria
24	17	Slovenia	Spain	Greece	South Africa
25	25	Greece	Bulgaria	Hungary	Czechia
26	26	Slovakia	Greece	Slovenia	Romania
27	27	Czechia	Romania	Slovakia	Hungary
28	29	Serbia	Serbia	Czechia	China
29	28	Hungary	Mexico	India	Argentina
30	30	Bulgaria	Slovakia	Serbia	India
31	31	Romania	Slovenia	Bulgaria	Russian Federation
32	32	Russian Federation	Hungary	Romania	Brazil
33	33	India	India	Russian Federation	Turkey

For most countries, rankings changed little between 2016 and 2017. Two exceptions were the Netherlands, that jumped up six spots to fourth place, and France, that fell five spots to tenth place. Three other countries, Belgium, Poland and Argentina, moved up three spots, while Slovenia fell seven spots.

The 33 countries can be conveniently divided in rankings into equal thirds. Among the top third countries, five countries were from Western Europe, two from Asia, two from North America and two from the Southern Hemisphere. All these countries, with the exception of Chile, are middle or high-income countries, suggesting that such countries have an advantage in intensive orchard production. The middle third countries included four from Western Europe, four from the Southern Hemisphere, two, China and Turkey, from Asia, and one, Poland, from Eastern Europe. All of these countries have the potential to move into the top one third. The bottom third included eight countries that are still in transition from the centrally-planned system, and one each from North America (Mexico), Western Europe (Greece) and Asia (India). All these countries face formidable obstacles in moving into the top tier for competitiveness.

The countries with the highest overall rankings also tended to rank highly in several of the subcategories. For example, New Zealand, Italy and Austria were in the top one third in all three subcategories, while seven of the remaining top third overall, were in the top third in at least two subcategories. The single exception was Chile, which was in the top third only in infrastructure and inputs. The countries in the lowest third of the rankings also tended to rank poorly in most subcategories. Five of these, Czechia, Hungary, Bulgaria, Romania and India, ranked in the bottom third in all three subcategories, while the rest ranked in the bottom third in at least two subcategories. This indicates the formidable obstacles these countries face in improving their international competitiveness.

While production efficiency is usually associated with a country's natural advantages, it is noteworthy that nine of the highest ranking countries in the production efficiency subcategory were also rich, developed countries. The exceptions were South Africa and China. However, the fruit industry in South Africa has long been part of the more developed segment of the South African economy. China represents a special case, that would be difficult to duplicate in any other political or social system. The Chinese apple industry was fortunate to pin its hopes on an outstanding variety, Fuji, and by concentrating production in the most favorable locations, it has made dramatic gains in average yields over time. Most of the countries that ranked low in production efficiency have been struggling with the legacy of old orchards that were shielded from international competition as they were being developed. They have had difficulty finding the capital needed to develop modern orchards and adopt newer varieties.

The top rankings for the infrastructure and inputs subcategory showed greater variation in the countries included. Six were developed countries, five were in the Southern Hemisphere, and one, Turkey, was a developing country in the Middle East. The more developed countries tended to have advantages in facilities and capital, while the developing countries had advantages in land, water and labor availability. In contrast, the countries ranked lowest in this subcategory had both weak infrastructure and shortages of key inputs.

The final subcategory, financial and markets, was the one most affected by a country's past and present economic policies. Not surprisingly, all the countries in the top third in this subcategory were developed countries. In contrast, many of the countries in the bottom third have been suffering economic struggles because of both past and present policies. Clearly, the economic, political and social environment in a country can help or hinder an industry like the apple industry where orchard establishment and maintenance is a long-term endeavor.

While these international competitiveness rankings are of interest in their own right, their greatest value is in providing guidance to an industry on the aspects of their operations or environment that need to be improved to increase competitiveness. While major operators like to emphasize the importance of the individual firm, that is only half the battle. Many of the other issues that help or hinder an industry come from outside, and can only be tackled on an industrywide, or even multi-industry basis. For example, industry organizations, field services, research, extension, teaching, inspecting and auditing activities need to be focused in the areas that need greatest improvement. Governments at every level, local, regional, national, and even international, need to be alerted to the policies and regulations that impede or advance the health of the apple industry. Too often, governments assume (wrongly) that their activities are beneficial to every sector of society, but press on regardless.

As in every part of life, a business that is not improving is more vulnerable to displacement by a competing foreign business, or by an unexpected domestic threat. On the other hand, a business that is constantly seeking to improve its competitiveness will learn from every challenger, whether domestic or foreign. Competition can either make a firm or industry stronger, or can destroy it. Which outcome occurs depends on how the firm or industry responds.

Is Financial Engineering in Your Future?

The prevailing view of the apple industry is that it is comprised of many, small firms that rely on local banks for their funding from year to year. However, that view is becoming more and more outdated. Many apple orchards have themselves become large businesses with thousands of hectares under common ownership or management. Other firms have grown large through integration of production, packing, storage and marketing activities. In many cases, they have become highly profitable during the last few favorable years for the world apple industry.

These larger firms have been leaders in introducing new technologies in every facet of their business, a policy that has led them to become major users of capital. Those capital needs have outgrown the ability of local banks to fund. In many cases, a local lender is only willing to take the lead in providing such capital if it can hive off some of the capital risk to lenders in other states, or even other countries.

With increased size, these firms have gained increased influence in the apple supply system. At the same time, consolidation in the retail sector has given large retailers increased influence over the demand system, specifically consumer choice over the apples that they buy. Together, these larger supply firms and larger retailers command the main channel between producers and consumers. The strength of the relationships of the supply firms with retailers have themselves become valuable assets, separate from the value of the supply firm's physical and intellectual assets in production, packing and storage.

The result is that many of these large apple operations have become attractive takeover targets both for financially strong competitors within the industry, and for outside investors interested in increasing their stake in the food system. The outside investors include many that already have a stake in other parts of the food system and simply want to extend their activities. They include firms in other countries that see better prospects for growth of the apple industry in the target country than in their home base. They include firms, such as insurance companies, hedge funds, or investment companies, whose main goal is to acquire entities that will provide an above average return on capital. Many of these have been attracted by the recent favorable conditions in the apple industry and may not be adequately discounting the inevitable down years that occur in the tree fruit industry.

The net effect is that many large firms in the apple industry, particularly in the developed world, may face choices that have not been common in the industry in the past.

The first dilemma is predicting how the retail food system will evolve over the next few years. Will major retailers become even more closely linked with a single major supplier? Or, will they have one primary supplier, but a small number of supplementary supplier? Or, will they seek regular bids from a wide selection of suppliers, giving favoritism to none. Present trends suggest that the first option is the most likely.

A second dilemma related to any type of merger is how to marry the operations and cultures of organizations that have evolved separately over many years. For example, who will be the CEO of the merged unit? And, which physical facilities will be declared redundant? Inevitably, there will be established interests within the merged firm that oppose any reduction in their pet projects.

A third dilemma is the extent of interference that the acquiring financial institutions will seek in the everyday operations of the acquired company. Some financial institutions prefer to be passive investors, and to allow the existing management, staff and facilities to operate as before the acquisition. However, other financial institutions may intrude in ways that the takeover target finds uncomfortable. For example, they may wish to generate cash by selling off key operations, or by firing key personnel. At worst, there may be direct conflict between the goals of the acquirer and the traditional goals of the acquired company.

A fourth dilemma surrounds the existing relationship between the acquired firm and its former production, packing and storage network. It may be difficult to retain the loyalty of that network if the policies of the acquired firm change too drastically.

Judging from experience in many other countries, the era of financial engineering in the apple industry could bring many additional, and often unpleasant, dilemmas. While present favorable conditions last, possible acquirers will continue to find attractive targets in the apple industry, but existing apple firms will have an incentive to remain independent. However, if a downturn occurs and existing firms' need for capital continues to grow, financial engineering could come to play an even bigger in the apple industry in developed countries.

Private Marketing Initiatives Spread

Many of the generic promotional programs, that once carried much of the apple industry's marketing and promotional initiatives, are now a distant memory. However, as individual integrated grower-packer-marketers have become bigger, more and more of them are introducing their own, proprietary marketing programs. They face two related challenges. One is how to raise the funds needed to mount a viable program. The second is deciding to what activities those funds should be allocated so they get the best return on investment while satisfying their biggest retail customers.

Most major marketers now have both generic, mainstream varieties, and proprietary club varieties. Club varieties usually have a marketing charge per packed box built into the grower-marketer agreement. However, within the club format, the volume of apples produced and marketed is curtailed. This puts a limit on the marketing funds that can be generated. For example, a firm whose club variety sells one million boxes per season, with a $3 per box marketing fee, could generate a total of $3 million for all marketing activities. That would cover the cost of one 30-second television advertisement during the broadcast of a prime sporting event. If the same firm also had nine million boxes of generic varieties, with a marketing fee of $1 per box, it could generate an additional $9 million for marketing activities. That would cover three additional 30-second television commercials during the broadcast of a prime sporting event. While the marketing fees used here as an example do not represent the actual fees raised by any one firm, they are a good indicator of the level of fees growers would currently be willing to pay.

A number of marketers have been tempted to create a recognizable consumer brand for all their products. However, most well-known consumer brands for produce items, like Dole or Del Monte, were established in an era when a small number of mass media, in magazines, radio and television, dominated communications. In recent years, very few produce-related items have succeeded in becoming recognizable national brands. One major exception has been the case of Pom Wonderful in pomegranate juice. However, the Pom Wonderful firm is owned by a billionaire couple, Stewart and Lynda Resnick, who have spent lavishly to create a new product category that makes extravagant health claims. It is not a model that could be followed by most apple marketers.

In deciding how it might best utilize the marketing fees that it can raise, a marketer would face two major constraints. First, club sponsors would expect all the fees raised by the club to be spent exclusively on the club variety. Second, retailers would have a strong influence on the type of marketing support that they would like. For example, more and more retailers want apples to be presented in glossy, transparent consumer packs. However, retailers differ in whether they want the packs to hold 2 lbs, 3 lbs, 4 lbs, 5 lbs, or even larger sizes, or their metric equivalents. Retailers differ in what signage they want on the different packs. Each pack type that the marketer must offer carries a burden of extra design costs, and extra costs for holding that pack in inventory.

Retailers also differ in the marketing support they demand from their suppliers. Some want in-store demos, others do not permit such demos. Some want point of sale material, others forbid such material. Some demand contributions to the cost of newspaper ads or weekly fliers. Others demand various discounts, referred to in polite circles as “slotting allowances”. Many marketers have sought to replace dollar expenditures on expensive promotions with a greater use of social media. However, social media present a chicken or egg situation. A major brand like Coca Cola can generate a large number of “followers” on social media, and can track how many of those followers are persuaded to become more active users of Coke products. However, it is difficult to determine what payoff a club variety or an apple brand needs to generate to be a commercial success.

A final conundrum arises when an increasing number of apple marketers are mounting their own variety or brand promotions. As more compete for the attention of retailers and consumers, the level of expenditure required to have an impact is likely to rise. On a fixed volume of fruit, the only way to generate the needed funds will be by increasing the marketing charges per packed box. That approach is likely to generate resistance from growers unless they can be assured that the extra fees will eventually lead to higher returns at the orchard.

Our general conclusion at this time is that apple marketers will not be able to generate the promotional budgets they would need to gain the necessary economies of scale in marketing. However, seeking such economies of scale could be one additional factor driving firms to become substantially larger through mergers and acquisitions, like those discussed in the previous section.

The Trump Factor

The ascendancy of Donald Trump to the presidency of the United States has raised uncertainty on many fronts around the world, some with direct bearing on the future of the apple industry. The uncertainty has been increased by contradictory statements from Trump himself, and contradictions between Trump and some of his key ministers.

The first issue is Trump's "America First" policy. In its most extreme interpretation, it would mean that U.S. firms and citizens would always be given priority over foreign firms and citizens, contrary to previous international commitments. However, its scope has become narrowed over time to mean Trump will oppose any relationships with foreign countries that disadvantage American citizens.

A related issue is Trump's attitude to trade agreements. As he promised voters, Trump has rescinded U.S. acceptance of the Trans Pacific Partnership (TPP). The TPP would have significantly reduced trade barriers among twelve Pacific Rim nations, and seized the initiative from China in setting global trade rules. Trump threatened to end NAFTA, calling it the worst trade agreement ever made by the United States. However, he has since recognized the importance to the U.S. economy of NAFTA trade partners, Canada and Mexico, and the three partners have agreed to open negotiations to "improve" NAFTA.

Trump also campaigned against the number of illegal immigrants now resident in the United States. Blaming Mexico for most of the illegals, he planned to build a 30 foot wall to keep Mexican illegals out, and to make Mexico pay for the wall. However, it appears that work on such a wall is likely to be quite limited, and will be mostly for symbolic purposes.

More worrying for agriculture was Trump's threat to send large numbers of illegal immigrants back to their home country. That would have devastated much of the agricultural work force, especially in permanent crop production. However, under President Trump, the Homeland Security Agency has focused on expelling criminals in the U.S. illegally. He has also softened his stance on sending back children or young adults brought to the U.S. illegally by their parents, and appears willing to allow them to continue their education in the United States.

However, by campaigning so forcefully against immigrants, President Trump will have a very difficult time acceding to the requests from many in agriculture, construction and services for needed construction of a legal immigration system.

During his campaign, Trump railed against excessive regulation and high taxes in the U.S. He issued several executive orders that would review existing regulations for possible reform or elimination. He has worked with the U.S. Congress to repeal and replace the Obamacare health program and to sharply lower individual and business taxes. However, the final outcome of those efforts will not be apparent for months. Any change in U.S. tax rates would affect numerous other countries.

Candidate Trump was also highly critical of a number of international bodies, including the North Atlantic Treaty Organization (NATO), the Paris Climate Change agreement, and the European Union. As is common with many Trump statements, there was considerable truth, but also considerable exaggeration. For example, many NATO member countries had failed to meet their funding obligations, while both NATO and the EU had failed to anticipate, or try to prevent, President Putin's illegal actions in Eastern Europe. However, both NATO and the EU have become more willing to oppose further Russian aggression.

Candidate Trump also frequently stressed that countries should be left to resolve their own problems, and that U.S. military or other resources should not be spent in foreign endeavors. However, his diplomatic team, led by Secretary of State Rex Tillerson, has moved to renew U.S. commitments to many existing international alliances. Trump has also taken aggressive actions in destroying chemical weapons in Syria, and in moving a U.S. fleet closer to North Korea in response to their continued missile testing program.

While some of candidate Trump's statements, and those of now President Trump, appear counter to established U.S. foreign policy, Trump has shown himself ready to listen and learn. He has also been forced to work within the U.S. constitution with its separation of powers between the presidency, the Congress and the courts.

While his comments will continue to be unpredictable, U.S. foreign policy is likely to settle into a pattern that other countries can relate to and deal with. The protections in the U.S. constitution should reassure other countries that U.S. actions will only occur after strenuous internal debate.

Country Index