World Apple Review
2016 Edition

Prospering in a Tumultuous World

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FOREWORD

Welcome to the twentieth edition of the World Apple Review. This publication was launched two decades ago to provide executives in the apple industry, and those who work with them as suppliers and customers, a convenient, but comprehensive, summary of the current situation and future outlook for this large and growing global industry.

During the last two decades, the world apple industry has gone through many changes, some triggered by initiatives within the industry, many forced upon the industry by external forces. These annual reviews have been proactive in attempting to provide readers with early warning signs of developments that were likely to affect their businesses, and in showing how the more progressive sectors in the industry were preparing to deal with these changes.

One of the greatest shocks to the industry was the Great Recession, which began in 2008, and whose aftermath lingers on in many countries. However, more recently, geopolitical upheavals in many parts of the world have the potential to alter the world apple trade, and many other produce businesses, even more significantly. The world in which internationally-oriented apple businesses now operate threatens to become even more tumultuous in the next few years than it has been in the last two decades.

The dominant themes of this edition of the World Apple Review are (1) identifying the key forces that are causing the tumult around the world, and (2) developing coping strategies that maximize the potential for profits and minimize the prevailing risks. The Review analyzes current and expected changes in the global environment as they are likely to affect production, trade, processing, consumption, marketing, pricing and profitability.

We are a success if your business is a success.

Desmond O'Rourke
President, Belrose, Inc.

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The Tumultuous World Ahead

A few events stand out in history as major disruptors of the current world order. Since the industrial revolution, they have included events like the French Revolution, the 1848 rebellions that swept Europe, the first world war, that lasted from 1914 to 1918, and the second world war, from 1939 to 1945.

What is currently happening around the world has the potential to be as disruptive to the world order as any of those past events. However, unlike those past events that had a common theme, much of the current tumult springs from many widely different sources.

First, a little background. The unprecedented level of destruction wrought around the globe by two, successive, world wars left only one major power, the United States, relatively unscathed. The U.S. devised a scheme, called the Marshall Plan, to help restore the economies of both allies and former enemies in Europe and Japan as rapidly as possible. It also championed global organizations like the United Nations (UN), the Organization for Economic Cooperation and Development (OECD), the World Bank, and the General Agreement on Tariffs and Trade (GATT), to foster democracy, development and trade, fight poverty and hunger, and renew support for traditional western values, that had been rejected by fascist regimes in Germany, Italy, Japan, Spain and Portugal, and by communist regimes in Russia, Eastern Europe, and China.

Among the traditional western values were democratic governments, respect for human rights and due process under law, and support for various freedoms, including freedom of speech, freedom of the press, freedom of religion, freedom of dissent, and free movement of people, goods, services and capital. Much of Western Europe, former European colonies like Australia, New Zealand and Canada, and Japan, committed to support these western values. In stark contrast, the communist regimes in Russia, and its satellites, and in China and Vietnam, disavowed this "western consensus" in favor of control by the Party, and chose to follow an isolationist path. A third group of countries, including large countries like India, Indonesia and Egypt, chose to align themselves with neither the western nor the communist blocs, and became known as the "non-aligned" nations. This division lasted for about 40 years during which countries supporting the western consensus made spectacular economic gains, while the non-aligned nations stagnated, and the communist-led countries became increasingly dysfunctional.

The western countries offered access to their markets to other countries willing to join GATT and adopt free market values. They were most successful in Asia, where export-driven policies helped a series of countries to achieve rapid economic growth on the model followed by Japan. The "Asian Tigers" of Hong Kong, Taiwan, Singapore and South Korea, were followed by the "Mini Tigers" of Indonesia, Malaysia, the Philippines and Thailand. In Latin America, Chile followed a similar, successful, export-oriented growth model. In Europe, the European Union welcomed many new members that were willing to accept its societal standards and remove barriers to trade.

Within the communist camp, mainland China was the first to abandon self-imposed isolation. After Chairman Mao's disastrous experimentation with collectivization, in 1978, President Deng Xiaoping began to open China to foreign investment, international trade and gradual privatization, while maintaining major state enterprises and Communist Party political control. The Deng initiatives succeeded beyond all expectations, ushering in a period of rapid economic growth unprecedented in such a large economy. In 30 years, China vaulted from one of the world's poorest countries to the second richest after only the United States.

In contrast, Russia and its satellites were forced to reform because the centrally-planned, communist system imploded at the end of the 1980s. Many of these countries then suffered through one to two decades of difficult transitions before developing functioning capitalist economies. In turn, the non-aligned nations, one by one sought to join the "winning" capitalist system. By 2010, almost all the nations of the world had joined the World Trade Organization (WTO), the successor to GATT, and had committed to the WTO's free trade philosophy.

The unspoken assumption among the traditional western countries was that former adversaries that accepted the WTO protocols on trade would gradually converge to the democratic processes and other values of the western consensus. It is becoming increasingly clear that this is not the case, and that the world is now on a path that could lead to new adversarial relations on trade, governance and society.

A number of developments have contributed to this crisis. The first is the economic malaise now afflicting many of the western powers. Their democratic governments had accumulated substantial debt to provide social safety nets for their poor, unemployed, disadvantaged and retired. Those debt levels exploded as governments increased spending to help their economies recover from the Great Recession. So far, recovery has not been fast enough to repair the damage.

Central banks, such as the U.S. Federal Reserve Board, the European Central Bank, the Bank of England and the Bank of Japan, have injected unprecedented levels of stimulus into their economies to speed recovery, so far with limited success. However, the efforts have had two major negative effects. They have driven interest rates so low that they no longer act as effective signals for either savers or investors, a key driver of a capitalist economy. The second negative effect has been to take the pressure off elected governments to make urgently needed economic reforms. Cumulatively, the reputation of democratic governance and capitalist systems has taken a beating, and, in their weakened economic state, their influence on other nations has been reduced.

The European Union faces the prospect of break up as it struggles to cope with a series of unique internal and external stresses. The euro currency came under attack in 2010 when one of its members, Greece, was no longer able to meet its debt obligations and had to be resuced by the triumvirate of the European Commission, the European Central Bank and the International Monetary Fund. There remains a real fear that if larger member countries, such as Italy or France, faced similar crises, there would not be enough resources to rescue them. In response, the European Commission has won permission to vet member country budgets before they are passed by the individual country governments. Member countries have also disagreed over the next steps to a single European market, how to deal with an increasingly aggressive Russian neighbor, how to deal with the flood of refugees from the Syrian crisis, and numerous other issues. This has greatly weakened the EU's desire and ability to promote its interests worldwide.

In the last few years, western values, and western leadership, have faced increasing challenges. First, after Vladimir Putin regained the presidency of Russia in 2012, (He had served as either President or Prime Minister since 2000.), and after Russia was accepted as a WTO member, Putin moved to squash internal opposition and gain dominance of the mass media. He then surprised the world by invading and annexing the Crimea and supporting insurgents in Eastern Ukraine. When the western allies responded by placing sanctions on prominent Russians, in August 2014, Putin announced an embargo on imports of perishable products from the European Union, Australia, Canada, the United States and Norway, in direct contravention of Russia's WTO commitments. In 2015, he moved Russian war planes into Syria to support the discredited Assad regime, and when Turkish forces shot down a wayward Russian plane, he placed a similar ban on imports from Turkey. Despite the fact that the Russian economy and Russian people have been hurt by these actions, Putin has been able to maintain his popularity through propaganda campaigns similar to those of his communist predecessors.

An even more serious challenge has emerged from China under President Xi Jinping, who also assumed office in 2012. Like Putin, President Xi has moved to gain control of all the major levers of power, and of the media, in China. He has pressed China's territorial claims in the South China Sea, greatly perturbing his Asian neighbors. To increase China's influence in the region and the world, he has launched a China-led development bank to compete with the Asian Development Bank, an arm of the World Bank. He has promoted new "Silk Roads", one by land and one by sea, to link China to its Asian neighbors and the world. He has propounded a uniquely Chinese view of how the world should be ordered. In many respects, that world view is inimical to the western consensus represented by the United States and its allies. Internally, he has mounted a massive anti-corruption campaign that has ensnared top officials in the Communist Party, the military, government and industry, and moved to quash any public dissent.

These developments have led the United States to increase its military presence in Asia and increased international tensions in the region. What makes the situation more perilous for the world is that these leadership changes in China are occurring at the same time that China's economic miracle appears to be coming to an end. China's great industrial machine now suffers from severe over-capacity. Many large companies have been kept afloat by allowing them to roll over their debt. At some point, the cumulative debt could become unmanageable even for a country as rich as China now is. One option would be to close loss-making industries. However, that could involve layoffs of millions of Chinese workers and could cause social upheaval and create a threat to the Communist Party's control.

China's slowdown also threatens the economies of many other countries that had prospered by supplying China with its apparently insatiable demand for commodities, raw materials, machinery and equipment. Not alone has Chinese demand fallen, but the prices of many items China bought have plunged. Some of the largest countries in the world, including Brazil, Indonesia, South Africa, Canada and Australia, have been adversely affected by the Chinese slowdown.

Another challenge to the western consensus has gained force in the Middle East and North Africa. In 1979, Iran established an Islamic Republic that publicly derided the United States as the "Great Satan", and set out to undermine western influence in the region. The core of the Iranian philosophy, based on the Shiite branch of Islam, is that all rights derive from Allah, and that a priestly class, the Mullahs, (not democratic processes) can determine the extent and limits of people's rights. Iran has now gained substantial influence in Iraq, Syria and Lebanon.

Over the same period, Saudi Arabia supported a rival Sunni branch of Islam, in particular a strict version, called Wahhabism, that has also influenced many other countries. In addition to these state-sponsored versions, many other splinter groups, vaguely grounded in Islam, such as Al Qaeda, the Taliban, al Nusra and Boko Haram, have fomented armed rebellion against western values and against any governments deemed to be sympathetic to those values.

After the Arab Spring rebellions of 2011 toppled many dictatorial regimes across North Africa and the Middle East, these splinter groups have moved to further destabilize the region. Since rebellion against the Assad regime in Syria degenerated into a brutal civil war, both official regimes and splinter groups have taken sides in constantly changing alliances. One group, the Islamic State of Syria and the Levant (ISIL), seized a large chunk of oil-rich territory in Syria and Iraq, declared an Islamic caliphate, and demanded allegiance form Muslims everywhere. Chaotic struggles are now under way throughout this vast region. Russia briefly entered the fray by sending its air force to support the Assad regime. In the course of that action, Turkey shot down a Russian plane said to have violated Turkish airspace. In response, Russia extended its import ban to Turkish products.

Prior to these recent developments, both advocates and opponents believed that globalization was inevitable, and that soon ideas, goods, services, capital and people would be able to move freely around the globe. The World Trade Organization was continuing to pursue multilateral free trade agreements, while many individual countries were attempting to speed up the process by completing more limited bilateral or regional trade deals. However, the obstacles to globalization have been increasing. Indeed, polarization is rising both within countries and between countries over many different issues.

Within the EU, the Schengen agreement, which removed border controls between most member countries, is under threat as countries attempt to control the flow of African and Middle Eastern refugees into their territories. Disagreements between Russia and its neighbors have restricted the flow of goods, services and people across that region. Free movement across the Middle East and North and Central Africa is under both psychological and military threat. The Pax Americana, that kept the sea lanes of East and South Asia open for seven decades since World War II, and allowed many export-oriented economies in Asia to flourish, could be disrupted by further aggressive actions by China, especially if China needed an external threat to divert the attention if citizens made restive by the economic slowdown or increased internal repression.

The world could probably have accommodated any one of the above threats without loss of commitment to the western values that undergirded the great advances since World War II. Regrettably, those values are under simultaneous siege from many different sides. Given wise leadership from the United States and its allies, it would be possible to restore faith in those goals. However, even in the United States, the leading presidential contenders have all argued that the U.S. has been damaged by past free trade agreements. Likewise, the majority of both major political parties oppose future free trade agreements. Similar sentiments opposing free trade and international cooperation have become more widespread in Europe. At the same time, Japan is struggling with persistent economic problems. Thus, the countries best able to justify the western consensus around the world, appear to have little appetite for doing so.

In the tumultuous world that appears to lie ahead, it will be vital for leaders in the apple industry to understand the threats they will face, and the measures they might take to protect themselves. The rest of this Review looks at various aspects of the world apple industry and how they may be affected, including:

I. Past 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 issues critical to the future of the 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. Readers can quickly locate relevant information by searching the table of contents, the lists of tables and charts, and the country index.

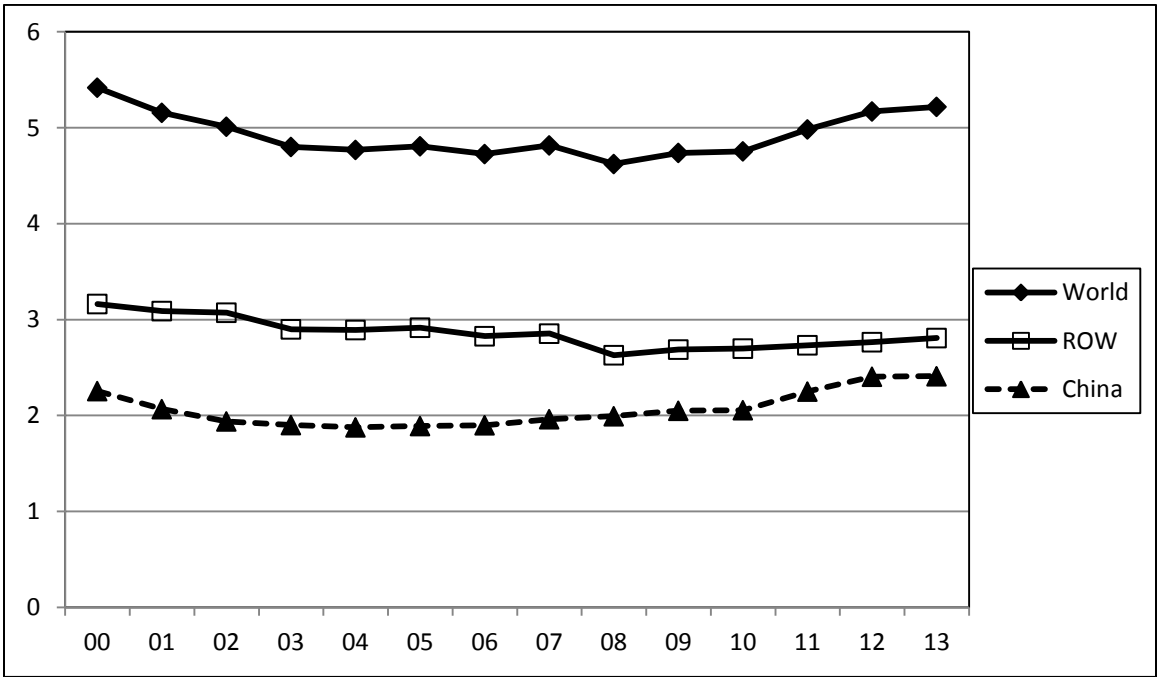
We apologize in advance for any errors or omissions. We hope that readers will bring these to our attention so they can be corrected in future editions.

I. Past World Apple Production

Modest Upswing in World Apple Area

The planting of apple trees in any period is heavily influenced by the cumulative experience of producers in previous years. Their enthusiasm for new plantings tends to vary from cautious, to confident to ebullient. Likewise, their eagerness to remove plantings varies from the cautious to the reluctant to capitulation. Just as these mood swings for individual producers play out over many years, so does the cumulative industry response. For example, in the first half of the 1990s, apple area expanded in most regions. In the second half of that decade, area gradually contracted as the widespread Asian financial crisis and other economic setbacks dimmed prospects. That mood of caution continued into the first half of the next decade. However, as shown in the chart below, by 2005, area in China was starting to increase again, and by 2008, the downward trend in the rest of the world came to an end. While official data are available only through 2013, it does appear that in the next five years, the world apple industry remained more positive than negative about the desirability of expanding apple area. Despite recent gains, apple area harvested still remains 17 percent below its 1995 peak.

World: Area of Apples Harvested, 2000-2013
(million hectares)



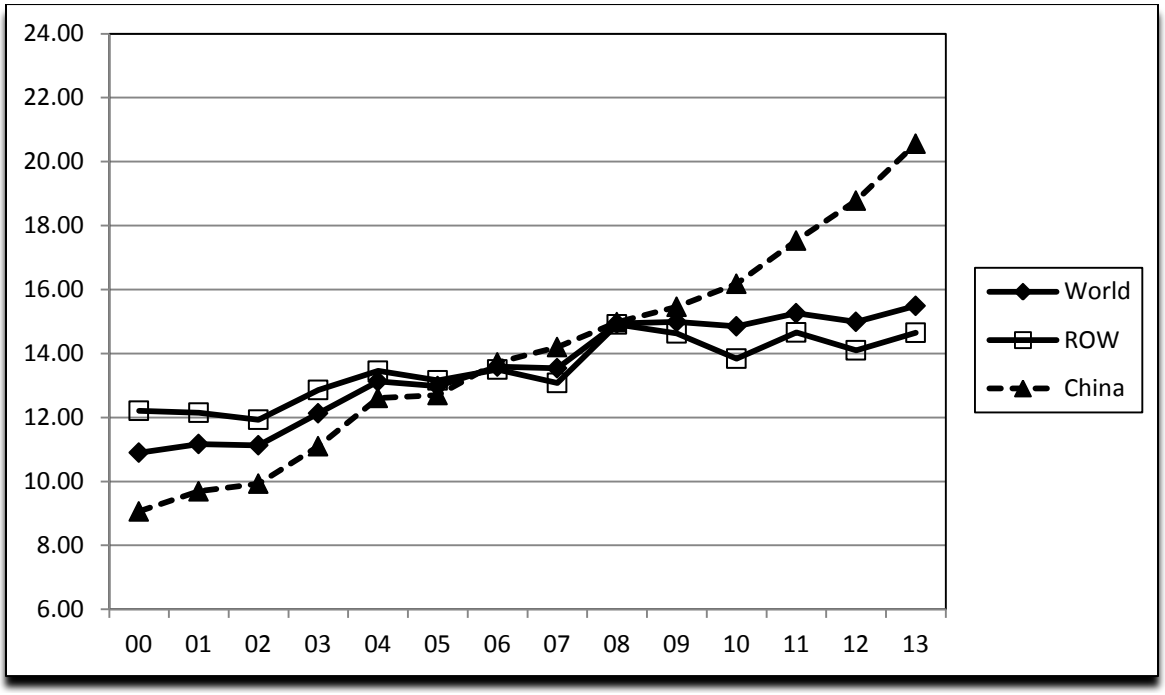
As one might expect, trends in area harvested have varied by region and country. The biggest absolute gains in apple area between 2001-03 and 2011-13 were in China and Other Asia. The biggest gainers in Other Asia included Turkey, as expected, but also included India, Pakistan, Uzbekistan and Tajikistan. The biggest absolute area declines were in the Former Soviet Union, including Russia, the Ukraine and Moldova, in Western Europe (primarily France and Germany), in Hungary and Romania in Eastern Europe, and the United States in North America. The net changes in the major Southern Hemisphere countries, both individually and collectively, were quite small. The biggest gain was an increase of over 7,000 hectares in Brazil.

The overall percentage change in world apple area harvested between 2001-03 and 2011-13 was a decline of 3.8 percent. The biggest percentage gains in area harvested were in Other Asia, lead by Afghanistan, Pakistan, the "stan" countries of Central Asia, Tajikistan, Turkmenistan and Uzbekistan, and a number of Middle Eastern countries, including Turkey. The biggest percentage losses were in Western Europe (spread across many major producing countries) and in the Former Soviet Union (mainly Russia and the Ukraine).

Boost from Rising Average Yields

A common experience in many traditional apple producing countries has been for increased orchard removals in marginal producing areas, and increased plantings in areas where the climate, terrain and water supplies make intensive production more effective. Accelerating this trend has been the increased concentration of production in large, well-financed, integrated grower-packer-marketer operations. These operations have the ability to acquire the best orchard sites and the latest rootstocks and cultivars, especially cultivars released under managed (club) systems. They can afford the latest production, packing and storage technology. Even more important, they can afford to hire experts in many aspects of their apple operations to ensure that the technology is applied most effectively. Less and less production expertise depends on the experience of individual managers and workers, while more and more depends on application of scientifically proven methods based on precise measurements at each stage of the operation. In addition, more and more of the machinery and equipment available to the industry has built in smart technology. That means that the devices themselves can monitor their own performance, self-correct when necessary, or alert the operator when that is more appropriate.

World: Trends in Average Apple Yields, 2000-2013
(metric tons per hectare)



The chart above shows trends in average yields of apples per hectare for China, the Rest of the World and the entire world for the years between 2000 and 2013. Over the entire period, world average yields have risen by over 42 percent, an astonishing rate of over 3 percent per year. In China, they have risen even faster, by almost 127 percent. In the Rest of the World, they have risen by almost 20 percent, still a commendable rate of growth. While statistics on China can be questionable, the overwhelming impression is that apple yields have been on a strong upward trend throughout the world.

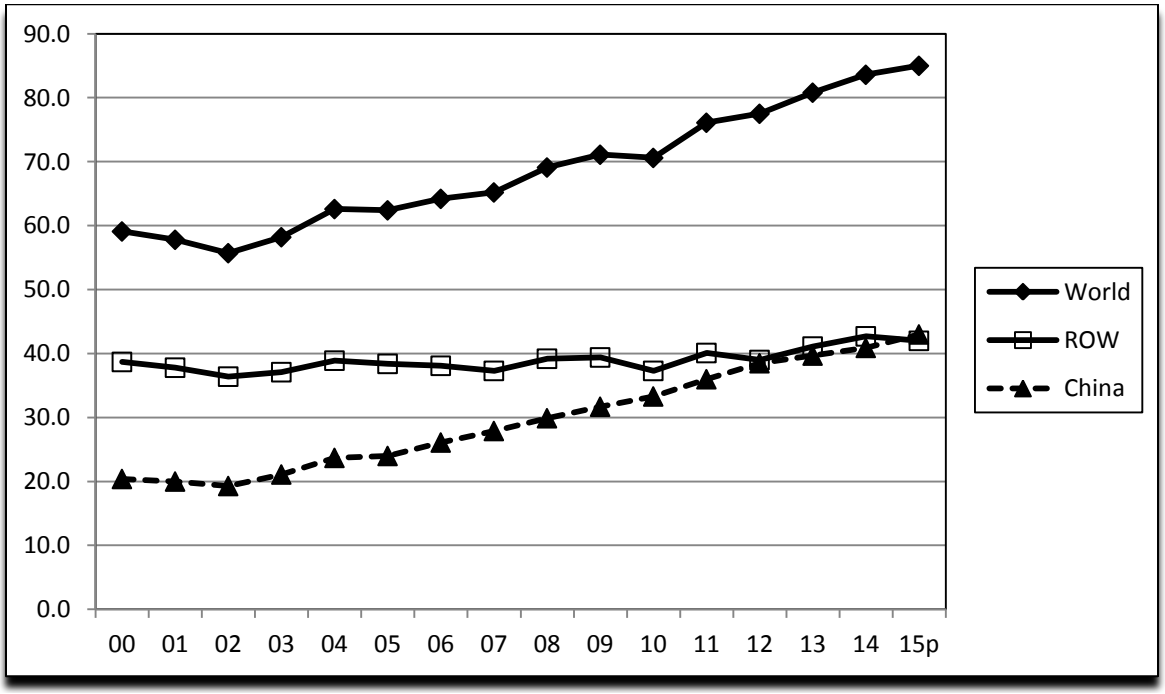
There remain wide differences in the average yields between major producing countries. For example, average yields in Western Europe have ranged between 34 and 36 metric tons per hectare, more than twice the world average, while those in the Southern Hemisphere have ranged between 27 and 32 metric tons per hectare. In contrast, average yields in Other Asia (excluding China) have remained below 10 metric tons. Conversely, the rate of improvement in average yields has tended to be greatest in those countries and regions that were furthest behind a decade ago. Thus, there is a strong imperative in every producing district to seek improvements in average yields in order to remain in the apple business.

World Production Still Rising

The trends in area harvested and in average yields, shown in the previous sections, are reflected in the trends in world apple production, shown below. Data for the years prior to 2014 are available from the United Nations, FAOSTAT database. Data for 2014 and 2015 have been compiled from miscellaneous reports of apple industry groups and national statistical sources.

Total world apple production is estimated to have grown by 44 percent between 2000 and 2015, and to have reached approximately 85 million metric tons by 2015. Preliminary estimates for 2015 indicate that China accounted for 43 million metric tons and the Rest of the World for 42 million metric tons. Apple production in China more than doubled between 2000 and 2015, while that in the Rest of the World grew by just 8.5 percent. The production increases in China are the result of a deliberate policy of the Chinese authorities to encourage production of apples in those areas with the greatest comparative advantage. In addition, China has been able to increase average yields in most of its major producing areas through better cultural practices.

World: Trends in Apple Production, 2000-2015
(million metric tons)



On the other hand, production changes in the Rest of the World reflect a wide array of factors, both positive and negative, that have impacted apple production in many different countries. In general, apple production has grown most rapidly in emerging countries where it has been seen as a powerful tool for increasing farmer's incomes and enhancing rural development, for example, through the erection of apple processing factories. In many of the countries that made the transition from central planning after 1990, disputes over land ownership and lack of capital had caused declines in apple production in the aftermath of privatization. Production has now begun to rebound. In the developed countries of Western Europe, North America, Asia and Oceania, apple production stagnated or was in decline for many years until higher prices in recent years brought renewed optimism and new sources of capital for expansion of area and production.

Apples in the Global Fruit Complex

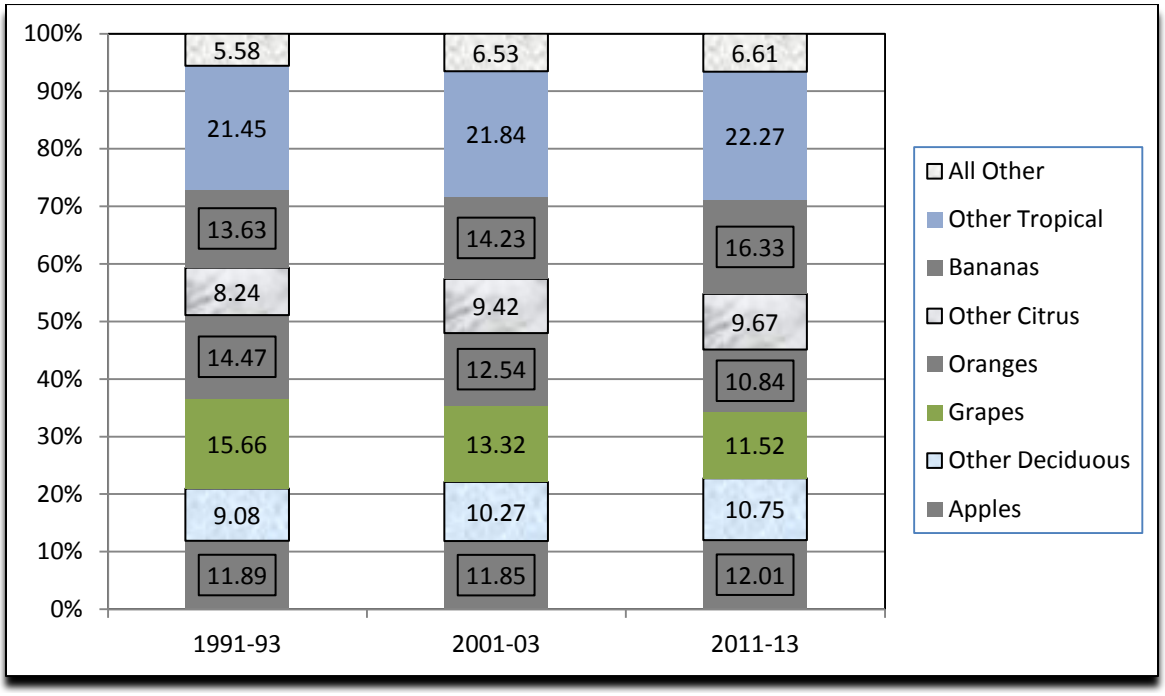
While world apple production has been expanding in the last two decades, so also has production of most other major fruits and fruit categories. The chart below shows that the apple share of world fruit production has increased by only about one-tenth of a percentage point between 1991-93 and 2011-13. The only other major fruit that has enjoyed an increase has been bananas. Its share of world fruit production rose by 2.7 percentage points in the two decades. Bananas are among the lowest-priced fruits in most markets. That means that they fit into the diets of persons of all ages and are a good introductory product for consumers wishing to diversify their diets. In contrast, the shares of both oranges and grapes in total world fruit production have fallen over the two decades. The decline has been over 4 percentage points for grapes. Most grapes are used to produce wine. That product has come under pressure from widespread government programs to limit drunk driving, and from the proliferation of competing alcoholic and non-alcoholic beverages. The decline in oranges has been almost as steep, with a loss of over 3.6 percentage points in the two decades. No single factor appears to have contributed to the relative decline of oranges, although they do appear to have been replaced in some cases by other citrus fruits.

The increase in alternative fruits in each category has been notable. The shares of total fruit production accounted for by Other Deciduous, Other Citrus, Other Tropical and All Other (including berries) have increased in each of the last two decades. The gains have included 1.67 percent for Other Deciduous, 1.43 percent for Other Citrus, 0.82 percent for Other Tropical, and 1.03 percent for All Other (including berries).

These increases in the diversity of fruit production are what might be expected as consumers in many countries become more affluent and seek different taste experiences. Until the setbacks of the Great Recession, economies in many parts of the world had enjoyed long periods of increasing affluence. In addition, many alternative fruits have unique nutritional attributes that tap into consumers' increased concerns about health, fitness and aging. In many ways, they pose a threat to the continuing popularity of mainstream fruits like apples and oranges, a threat that each industry has addressed in different ways.

The share of berries in total fruit production (not shown separately in the chart above) remains small. It rose from 1.21 percent in 1991-93 to 1.52 percent in 2001-03 and 1.63 percent in 2011-13. However, since the average price of berries is twice or more that of the average fruit, berries take a much greater share of consumer spending on fruit. In addition, because of the higher margins generated, they have also taken an increasing share of shelf space in produce departments. They have also benefited as their year-round availability has increased.

World: Share of Production for Major Fruit Groups, 1991-93, 2001-03 and 2011-13
(percent)



Factors Affecting World Fruit and Berry Production

A number of factors have contributed to the continued expansion of world fruit and berry production. Clearly, a major contributor has been the willingness of consumers around the world to welcome fruits from other parts of the world. As their incomes increase, consumers shift some of their purchases of fruit from traditional supplies to those that provide novelty or variety. In temperate climates, consumers welcome semi-tropical or tropical products. In tropical climates, as their incomes increase, consumers are more willing to enjoy temperate products. At the same time, medical and educational authorities encourage greater consumption of fresh fruits regardless of the type or source, while food writers promote the enjoyment consumers can gain from eating or serving novel fruits. Retailers have facilitated this trend by making more space available for an ever-wider array of fresh fruits. As long as total world demand for fruit continues to rise, production of temperate, semi-tropical and tropical fruits can continue to rise.

For suppliers, the main motivation for increasing production is that expansion continues to be profitable. In many countries, producers have small farms on which production of grains provided only subsistence living. In contrast, production of fruits or vegetables could lift farmers out of poverty. The main stumbling block to making the transition was the availability of capital. However, governments and national and international development agencies, and private sector firms like wholesalers and exporters have been increasingly willing to provide that capital. Development agencies see this as an effective way to promoted development in rural communities, both from increased value of farm production and the generation of ancillary supply, processing and marketing businesses. Private firms see the opportunities for expansion of their own businesses.

Expansion has also been facilitated by the advancements in communication, transportation and storage. Suppliers and buyers in different continents can be linked instantaneously, not just by audio, but by video, so buyers can see the actual products they are ordering. There have also been major advances in the speed of transportation and in storage techniques that preserve the quality of the products over large distance and time gaps. This has meant that consumers have become accustomed to having supplies of all types of fruit available for twelve months a year. Initially, such availability was common only in developed countries. However, supermarkets, supercenters and hypermarkets have become increasingly common in many developing countries, so consumers that so desire can have the same twelve-month supply of multiple fruits.

Imports as Indicator of Changing Consumer 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. This is particularly relevant to fresh fruit, since change in fruit markets most often comes in the form of products shipped from different climatic zones. Thus, trade data are a good indicator of how fruit preferences are changing. The following three tables show the trends in imports of major categories of fruit in three of the world's largest consumer markets, the EU-15 (the more affluent segment of the European Union), the United States, and China, the largest potential market in the world.

The tables provide details under the 4-digit harmonized system for eight broad fruit categories. They include data at five-year intervals between 2000 and 2010, and annually since 2012. This enables us both to see long-term trends and to track the most recent developments. The tables include products like bananas, that cannot be grown domestically, apples and pears, that complement domestic production, and grapes and stone fruits, that meet seasonal niches. In some cases, foreign products may be preferred to domestic production because of quality or price differences. Because the volume of bananas imported far outweighs that of other individual items, totals are also shown with bananas excluded.

EU-15: Imports of Selected Fruits, 2000-2015
(1,000 metric tons)

Fruit Group	2000	2005	2010	2012	2013	2014	2015
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)
Bananas	5,057	5,093	6,198	6,242	6,719	6,879	7,031
Melons/Watermelons	1,124	1,445	1,662	1,682	1,727	1,801	1,974
Dates, Figs, Pineapples	973	1,661	2,171	2,158	2,194	2,448	2,386
Grapes	1,474	1,724	1,719	1,653	1,708	1,679	1,684
Citrus Fruits, Fresh	5,017	5,304	5,451	5,428	5,616	5,262	5,615
Fruits, NES, Fresh	1,085	1,366	1,425	1,515	1,499	1,509	1,628
Apples/ Pears	3,383	4,082	3,540	3,381	3,585	3,260	3,185
Stone Fruit	1,210	1,354	1,284	1,349	1,428	1,390	1,466
TOTAL	17,996	22,029	23,441	23,408	24,476	24,228	24,969
Total, exc. Bananas	12,939	16,936	17,243	17,166	17,757	17,349	17,938

The European Union (EU), and particularly the affluent member countries in the EU-15, has long been a major importer of fruits from around the world. In the past, European imperial powers had encouraged production of selected fruits in the colonies. For example, the apple industries in Australia, New Zealand and South Africa were focused heavily on supplying the United Kingdom market, and received preferential treatment in that market. After the European empires dissolved, many former colonies were given preferential access to the EU markets under the Lomé Convention. Preferential access has also been provided to non-aligned countries as part of evolving trade deals.

Between 2000 and 2010, imports of selected fruits by the EU-15 rose by over 30 percent. Imports of bananas rose by 22.6 percent, while imports of all other fresh fruits rose by over 33 percent. In addition, imports in every individual fruit category rose during the period. However, the Great Recession and its aftermath have severely dampened import demand for fresh fruits in the EU-15. Total imports grew by only 6.5 percent between 2010 and 2015. Imports of bananas, the cheapest fruit, grew by 13.4 percent, while imports of all other fruit grew at only half that rate, 6.5 percent. Imports of fresh grapes and of fresh apples and pears actually declined between 2010 and 2015. This suggests that imports of fruits not grown in the EU-15 have continued to increase faster than imports of fruits like apples that supplement EU-15 domestic supplies.

Imports of bananas have had an even heavier weighting in total fruit imports by the United States than in total imports by the EU-15. However, U.S. banana imports grew by only 2.7 percent between 2000 and 2010, but by 13.3 percent between 2010 and 2015. This suggests that even in the United States, after the Great Recession the demand for the cheapest fruit actually rose. Bananas continue to be used as a loss leader by many retail food chains.

Imports of all fresh fruits excluding bananas rose by over 60 percent between 2000 and 2010, and by a further 36 percent between 2010 and 2015. Thus, the Great Recession and its aftermath have had less impact on imports of fresh fruit in the U.S. than in the EU-15. There was strong growth between 2010 and 2015 in imports of melons and watermelons, tropical fruits like dates, figs and pineapples, citrus fruits, and miscellaneous other fruits. The last three categories had the fastest rate of growth. In contrast, the volume of imports of grapes, apples and pears, and stone fruit was lower in 2015 than in 2010. In the period since the Great Recession, it appears that U.S. imports of tropical or specialty items have continued to grow fast, while imports of items traditionally produced in the U.S. have lagged.

United States: Imports of Selected Fruits, 2000-2015
(1,000 metric tons)

Fruit Group	2000	2005	2010	2012	2013	2014	2015
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)
Bananas	4,246	4,089	4,361	4,645	4,868	4,892	4,939
Melons/Watermelons	963	1,028	1,226	1,207	1,381	1,426	1,531
Dates, Figs, Pineapples	645	1,120	1,505	1,833	2,014	2,202	2,358
Grapes	484	636	611	555	579	511	595
Citrus Fruits, Fresh	362	522	652	746	799	835	983
Fruits, NES, Fresh	188	265	428	601	609	653	708
Apples/ Pears	258	201	254	246	280	290	243
Stone Fruit	72	123	99	78	78	51	77
TOTAL	7,218	7,984	9,136	9,911	10,608	10,860	11,434
Total, exc. Bananas	2,972	3,895	4,775	5,266	5,740	5,968	6,495

Many exporters of fresh fruit have viewed the potential import demand in China as a major reason for optimism about their future. Indeed, imports of fresh fruit by China have risen rapidly from a very low level in 2003 when only 386,000 metric tons of bananas and 233,000 metric tons of other fresh fruit were imported. Between 2003 and 2010, China's total fresh fruit imports rose by 130 percent. Imports grew fourfold between 2010 and 2014, largely due to increased imports of specialty fruits like dragon fruit, longan and durian from Southeast Asia.

China: Imports of Selected Fruits, 2003-2015
(1,000 metric tons)

Fruit Group	2003	2008	2010	2012	2013	2014	2015
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)
Bananas	386	362	665	626	515	1,127	1,074
Melons/Watermelons	41	223	334	457	277	215	201
Dates, Figs, Pineapples	3	19	28	171	51	94	95
Grapes	48	52	82	168	185	211	216
Citrus Fruits, Fresh	70	80	105	126	129	162	218
Fruits, NES, Fresh	23	62	115	1,216	1,476	4,145	1,598
Apples/ Pears	37	48	67	64	55	59	96
Stone Fruit	11	12	28	134	64	82	123
TOTAL	619	858	1,424	2,962	2,752	6,095	3,421
Total, exc. Bananas	233	496	759	2,336	2,237	4,968	2,347

While overall growth in China's fresh fruit imports has been impressive, that growth has been erratic over time. For example, in the case of bananas, imports fell between 2010 and 2013, before again doubling in 2014. Similar setbacks occurred in imports of melons and watermelons, tropical fruits like dates, figs and pineapples, citrus fruits, apples and pears, and stone fruits. Some of these setbacks can be traced to specific actions by the Chinese authorities to restrict imports on phytosanitary, geopolitical or other grounds. China has been involved in trade disputes over different products with the United States, Australia, New Zealand, the Philippines and other countries. Some of these disputes appear to have been in response to protectionist forces within China. It is also clear that fewer barriers have been erected to off-season imports of items like sweet cherries or kiwifruit than to items that compete in season with Chinese producers.

In all three major import markets examined above, demand for lower-priced bananas has shown strong growth. However, import demand for higher-priced imports has been more sensitive to general economic conditions. Other studies have shown that in the absence of barriers to trade, import demand for fresh fruits is strongly related to income growth. Sluggish economic growth in the EU-15 and the potential economic slowdown in China could slow import demand for fresh fruit in the near future. In addition, barriers to imports are more likely to arise when domestic producers are facing slowing markets.

External Competition for Fresh Apples

The most common use of fresh apples is as a snack. Over time, the number of main meals consumed per day by the average person has continued to decline, while the proportion of foods and beverages consumed as snacks has continued to rise. While fresh apples are well positioned to share in this growing snack market, the range of competing products continues to grow in number and diversity. As a result, competition for fresh apples from other snacks has intensified.

That competition includes numerous products developed by some of the world's largest processors of manufactured snack foods and drinks. These companies have large research, development and commercialization divisions geared to expand, adapt or strengthen their snack product lines. They have powerful logistical arms, dedicated sales teams, deep pockets for promotion, and close relationships with all the major retailers of snack food and drink items. At the same time, numerous small companies have been able to develop innovative products that offer attributes, tastes or formats different from those of the large manufacturers.

Retailers have been willing to stock such innovative products as a way to bring added excitement to their snack segments. In addition, retailers have been able to reduce any risks to their profits from new products through use of slotting fees and other guarantees provided by potential suppliers. In turn, small suppliers have been willing to bear such costs during the initial introduction phase because of the large potential payoff if their product can find a permanent place on the shelves of one or more large retail chains. Often, once the small firms are successful, their products are rapidly imitated by their larger rivals, so the segment is in continuous ferment.

Another major battle being fought in the snack segment is that between health and indulgence. The large multinational snack manufacturers have come under attack in many countries because their salty or sugary snacks have been blamed for contributing to obesity, especially childhood obesity. Obesity, in turn, has been linked with diabetes, heart problems, cancer, increased medical costs, and shortened life spans. As a result, there have been many efforts to reformulate snack foods and beverages to make them appear more healthy while at the same time maintaining their wide appeal to consumers. The product development activity in the snack segment can be described as frenetic as manufacturers attempt to stay one step ahead of their critics while maintaining the dollar value of their sales.

Fresh apples, that have been associated with healthy eating for millennia, should have an advantage in this changing milieu. However, apples have been targeted by critics, for example, by inclusion in the Environmental Working Group's "Dirty Dozen" list of fruits and vegetables most heavily contaminated with pesticide residues. It does not appear to matter that the USDA and other reputable authorities disagree with that description and strongly recommend increased consumption of fresh apples. At the same time, a number of other foods and beverages have been touting their health benefits. Many claim to be "super foods" that can deliver large health benefits from consumption of small amounts. This includes items like blueberries, kale, or pomegranate juice.

In previous issues of the World Apple Review, we have attempted to provide some measure of the size of the snack market in which fresh apples and apple products must compete. The most complete data are available for the United States. The Annual Census of Manufacturers provides dollar estimates of the value of shipments of many different food and beverage items. The table below shows the value of shipments for some of the most important snack categories for selected years between 2002 and 2014.

United States: Value of Shipments of Selected Snack Foods and Drinks, 2002-2014
($ million)

Item	2002	2008	2009	2010	2011	2012	2013	2014
	($m)	($m)	($m)	($m)	($m)	($m)	($m)	($m)
Breakfast Cereals	7,833	9,134	9,899	9,286	9,455	9,560	9,794	9,094
Confectionery	18,216	19,423	19,978	21,172	21,987	24,065	24,579	25,672
Ice cream/pies/cakes	14,481	15,664	15,938	15,334	15,394	15,064	15,866	16,471
Cookies and Crackers	9,380	11,095	11,500	10,785	10,934	11,151	10,632	11,503
Other snack foods	17,428	25,239	25,507	26,369	28,773	30,940	31,983	34,824
Total snack foods	67,338	80,555	82,822	82,946	86,543	90,780	92,854	97,564
Soft drinks	29,174	34,786	32,725	32,599	34,679	36,701	36,684	34,129
Breweries	17,789	19,479	23,941	25,119	26,178	27,864	31,327	34,185
Wineries	9,026	12,584	14,291	14,299	14,982	14,699	14,986	16,421
Total snack drinks	55,989	66,849	70,957	72,017	75,839	79,264	82,997	84,735
Bottled water	n.a.	6,789	6,491	6,422	6,446	7,188	7,322	6,608

While not a complete accounting of all snack categories, the table does give an indication of the changing size and make-up of the U.S. snack food and beverage market. Included are five categories of manufactured snack foods, (1) breakfast cereals, (2) confectionery, (3) ice cream, pies and cakes, (4) cookies and crackers, and (5) other snack foods, including nuts and peanut butter. The four main snack beverages listed include (1) soft drinks, (2) breweries, (3) wineries, and (4) bottled water. Not included, were shipments of coffees, teas and other plant-based beverages that are often served with main meals, as well as being sipped between meals, or hard liquor, which is not normally considered to be a snack beverage.

In 2014, total shipments of the five main snack food categories were valued at almost $97.6 million, almost 45 percent above the level 12 years prior in 2002. Total shipments of the three main snack beverages were valued at $84.7 million in 2014, more than 51 percent above the 2002 level. Shipments of bottled water rose almost 21 percent between 2007 and 2013 before falling by about 10 percent in 2014. In general, growth in the value of shipments has been erratic for most categories between 2002 and 2014. Growth slowed in a number of categories after the onset of the Great Recession in 2008. For example, the value of shipments of ice cream, pies and cakes, cookies and crackers, soft drinks and bottled water all fell between 2008 and 2011.

The value of shipments of breakfast cereals peaked in 2009. In contrast, the value of shipments of confectionery rose by 32 percent between 2008 and 2014, that of other snack foods rose by 38 percent, of breweries by 75.5 percent, and of wineries by 30.5 percent. It appears that shipments of adult products like beer and wine have done better than have more youthful products like breakfast cereals and ice cream.

At the equivalent point of sale, the value of fresh apples shipped in the United States in 2014 was about $5 billion, and the value of fresh bananas about $2 billion. Together, this was about equal to the average shipments of bottled water in 2013 and 2014, and about 7 percent of the value of all snack food shipments. Clearly, the fresh apple business constitutes quite a small part of the total U.S. snack food business.

Fresh apples face both advantages and disadvantages in the snack food and beverage markets. While apples have a favorable nutritional and health profile, they are generally eaten whole, so mobile consumers face problems with storing half-eaten fruit or disposing of waste. Pre-sliced apples resolve some of these problems, but are relatively expensive, and remain a small segment of total apple consumption. The apple category was once limited in terms of choice of color, taste and texture when fresh apple supplies were dominated by a few varieties, like Red Delicious or Golden Delicious. However, consumers' options in fresh apples have widened dramatically as new varieties have proliferated. The challenge for the apple industry is that producers of manufactured snacks can roll out variations of new snacks within months, compared to the one or two decades needed to commercialize a new apple variety.

As noted previously, manufacturers of snack foods and beverages have faced unrelenting criticism for the high content of sugar, salt or artificial ingredients in their products. However, it has proved challenging to reduce the level of these ingredients without damaging the mouth appeal of their final products. Nonetheless, most snack food manufacturers, including large multinationals, and small, niche players, have been making significant changes in their formulations to show reductions in the most criticized ingredients. They have also been broadcasting claims that their products are natural, organic, authentic, artisanal, locally sourced, GMO-free, gluten-free, etc., in an effort to deflect further criticism, or improve their "healthy" image. Many major snack manufacturers have acquired smaller companies or product lines that better fit the "healthy" image.

Among beverage manufacturers, both breweries and wineries have been able to broaden their appeal by tailoring different products to different market segments. Boutique wineries and craft beers have gained market share at the expense of mass market products. They have made major inroads in the restaurant business as a complement to good food. However, because of their alcohol content, both wines and beers face increasing restrictions due to tighter drink-driving laws. Ironically, bottled waters, which have no ingredient problems, have faced criticism from another direction. Environmentalists complain that the bottled water industry uses scarce local water resources, and uses plastic bottles that cause littering. It is also accused of wasting energy by hauling bottled water long distances when the same refreshment could be found at the nearest tap. These criticisms appear to have blunted the growth of the bottled water industry.

Despite these challenges, most of the competitors to fresh apples in the snack food and beverage section have one great advantage, namely, their ability to marshal large promotional budgets to promote their products. In contrast, the fresh apple industry has allowed industry promotion programs to lapse.

Trends among Major Producing Countries

The trend is continuing for the countries that have been the world's largest producers of apples to expand production and to increase their share of total world production over time. The table below shows total world apple production, and production by the 15 countries that were the largest producers in 2015, for selected years between 1995 and 2015. Data through 2013 are drawn from the UN,FAO FAOSTAT online database, while data for 2014 and 2015 are drawn form miscellaneous sources, and are more likely to be revised in the future. Data for Germany may be understated, since UN,FAO reports only commercial apple production, and does not include Germany's very sizable backyard (non-commercial) production.

Of the 15 top apple producing countries in 2015, 12 had experienced increases in production since 1995, while 10 had experienced increases in production since 2005. The poorest performing countries were France, the Russian Federation and Argentina. Iran and Germany suffered minor reductions in the last decade. As previously noted, the reported growth of apple production in China has been spectacular. It has almost tripled between 1995 and 2005. It has been difficult to verify the accuracy of the Chinese statistics. However, China now occupies a unique place in the world apple picture.

Top Apple Producing Countries in 2015: Volume of Production, Selected Years, 1995-2015
(1,000 metric tons)

Rank 2015	Country	1995	2000	2005	2010	2013	2014	2015
1	China	14,017	20,437	24,017	33,265	39,684	40,923	43,112
2	United States	4,798	4,682	4,409	4,215	4,082	5,075	4,561
3	Turkey	2,100	2,400	2,570	2,600	3,128	2,289	2,740
4	Poland	1,288	1,450	2,075	1,878	3,085	3,750	3,280
5	Italy	1,940	2,232	2,192	2,205	2,217	2,456	2,210
6	India	1,200	1,050	1,739	1,777	1,915	2,200	2,200
7	France	2,516	2,157	2,241	1,788	1,737	1,687	1,740
8	Chile	850	805	1,300	1,624	1,710	1,678	1,700
9	Iran	1,990	2,142	2,662	1,662	1,693	2,500	2,500
10	Russian Fed.	1,200	1,832	1,786	992	1,572	1,409	1,390
11	Argentina	1,146	833	1,206	1,050	1,245	640	720
12	Brazil	686	1,153	851	1,279	1,231	1,266	1,240
13	Ukraine	1,046	648	720	897	1,211	1,082	1,254
14	South Africa	518	574	680	724	812	793	865
15	Germany	572	1,131	891	835	804	1,116	885
-	WORLD	49,309	59,052	62,388	70,586	80,823	83,623	85,027
-	China %	28.4	34.6	38.5	47.1	49.1	48.9	50.7
-	World, exc China %	71.6	65.4	61.5	52.9	50.9	51.1	49.3
-	Top Five %	49.0	52.8	56.5	62.6	64.6	65.2	65.7
-	Top Ten %	64.7	66.4	72.1	73.7	75.3	75.3	75.0
-	Top 15 %	72.7	73.7	79.1	80.5	81.8	81.2	80.8

The United States has continued to fall far behind China, but has retained its clear leadership over all other major producing countries. Production in the United States was on a downward trend between 1995 and 2010, but has rebounded strongly in recent years. Two other countries, Poland and Turkey, have produced more than 3 million metric tons of apples in some recent years, and have the potential to surge above 4 million in the near future. Three other countries, Italy, India and Iran are capable of producing over 2 million metric tons in any year. All the remaining countries in the top fifteen have the potential to produce one million metric tons each. One measure of the growing clout of the major producing countries is to note that the top seven countries currently have the potential to produce a combined total of 62 million metric tons of apples, as much as was produced by the entire world just a decade ago.

Assuming the accuracy of the production data for China, that country alone now accounts for half of all world apple production, up from 28.4 percent in 1995. China's massive output has tended to skew upwards the apparent level of concentration in world apple production. For example, the share of the top ten has risen by over 10 percentage points between 1995 and 2015. Excluding China, the rest of the top ten have consistently produced about half of all apples in the rest of the world, so the level of concentration in the rest of the world has remained relatively stable and relatively high.

Many factors, both common and unique, have contributed to the changes in apple production in individual countries. These factors are discussed in detail in the next section.

Common Factors Affecting Key Apple Producing Countries

The viability of the apple industry in any producing district, region or country is influenced by many different common factors, and by other factors that are unique to a particular location. These factors also tend to vary over time. For example, the comparative advantage of one growing district over another can be altered by developments in irrigation, pest management, new cultivars, or new technologies. Some of these factors are specific to the apple industry, while others can be affected by conditions in all of agriculture, or in the local, regional, national or international economies.

Quality of the Natural Environment

A major underlying factor in the success of any apple producing district, or of any orchards within that district, is the favorable attributes of the natural environment that make apple growing easier and more productive. These attributes occur without any effort being required from the orchard owner or operator. They include factors such as soil quality and orientation, slope, air movement, ready water availability, long growing seasons of frost free days, adequate natural heating and cooling, and low pest pressures. Apples can still be produced, stored and marketed in environments that are not as naturally favorable. However, the costs of alleviating any disadvantages act like an extra tax on the apple operation. Such a tax makes the operation less competitive versus those that have more favorable natural conditions. For that reason, the initial choice of site can be critical to the competitiveness of both individual operations and of entire growing districts.

Enhancing Nature

While a favorable natural environment has been one of the main triggers for historical apple plantings, plantings have also been influenced by political decisions, such as efforts to resettle military veterans or refugees, or promote agribusiness in rural areas, or utilize newly-developed irrigation systems. In addition, through errors in judgment, apple plantings may have been established in areas where one or more natural conditions were less favorable. For example, blocks may have been too small to be economically sustainable, or too hilly or widely dispersed. In many cases, producers have been forced to take various remedial measures that will offset these natural limitations. Such measures add to the costs of production, and are a threat to profitability. In some cases, producers may have been able to secure financial assistance from local, regional or national governments that bear some of the costs of remedial measures.

Critical Role of Public Infrastructure

The success of the apple industry in any district is heavily influenced by the quality of the public infrastructure provided, and by how that infrastructure is maintained and enhanced over time. Among key elements of the infrastructure needed for an effective apple industry are utilities, such as power, water, communications and waste disposal, dams, and energy grids, farm roads to make it easy to bring in needed inputs and ship out finished products, and long-distance roads, railroads, bridges and ports to facilitate sales of products to the rest of the nation and the world. In many cases, this infrastructure is provided by different types of public entities. Not only is the quality of the initial systems critical, but also their maintenance and reliability. In many developed countries, the availability of continuous public power and water can be taken for granted. However, in some countries, supplies can be interrupted at any time. Firms that have to invest in back-up systems for functions that are essential to protecting their crop, whether irrigation systems, or packing or storage activities, face added costs that must be allocated across all of their production.

Those utilities that are funded from user fees, such as power, water and telephone, can usually acquire the resources needed to maintain and upgrade services. However, in many countries, farm roads, or irrigation systems, are supported from general government funds. The funds available for upkeep of roads, bridges and aqueducts continue to be squeezed by competing demands on the public purse, such as schools, hospitals, pensions and welfare payments. Unless politicians and government officials recognize the benefits of a healthy apple industry to the local economy, they may not be willing to give the industry's infrastructure needs sufficient priority.

Not all publicly supported infrastructure involves physical assets. Increasingly, the competitiveness of apple operations depends on research applied to a wide array of industry problems and transmitted to operators through extension and teaching programs.

Advancing Technology

Where any apple district or region stands relative to competitors around the world is increasingly dependent on its ability to understand and incorporate new technologies in every facet of its operations. The technical specifications of each technology determine what functions it can perform. However, how effectively those functions can be performed is increasingly influenced by the knowledge of the operator. The more knowledgeable and better trained the operator, the better the technology will meet its intended goal. Increasingly, there is an additional step in effective use of technologies. That is the ability to monitor performance in real time, usually through appropriate software applications. Thus, the knowledge content of technologies is becoming increasingly important to successful operations.

Handling Facilities

Handling facilities, such as hauling, storage, packing and processing are usually provided by private sector operators. In many traditional systems, numerous, small producers continue to send their apples to independent storage, packing or processing companies that help prepare the product for fresh market. Over time, as some producers became larger, they had enough volume to operate their own storage, packing, marketing or processing facilities. More recently, an increasing share of fresh apple volume is handled by firms that carry out the four functions of growing, storing, packing and marketing. Because of the economies of scale involved, most apple processing is now dominated by very large, specialized firms. A few fresh packers process limited quantities for artisanal or niche markets.

While some integrated grower-packer-marketers handle only their own apple production, mixed systems are much more common. A large packer will handle both own product and product supplied by other growers. A large marketer will handle both own product, and product coming from other packing houses. Effectively, beyond the orchard, the apple industry has become organized in loose networks centered around one dominant firm that has affiliations with smaller packers and growers. The system is relatively efficient, it retains an element of competition, and it reduces the risk for all parties involved in the network.

The larger packing and storage operations have been able to implement the latest technology in dumping, washing, waxing, sorting, packing and loading packed boxes for shipments. They have been able to increase labor productivity by substituting mechanical and electronic equipment for hand labor. With ever more precise controls over the quality of the product emerging from their packing lines and storage rooms, they have been able to meet more exacting quality demands from customers and government regulators. That ability has become a key factor in their ability to compete effectively in world markets.

Marketing Infrastructure

Since fresh apples can be packed and stored successfully for at least 12 months a year, marketing organizations have also become year-round operations. Many are now large enough to supply entire divisions of large retail chain stores from their own networks. Many also supplement their own supplies from partners in neighboring states, or in the Southern Hemisphere. As they have become bigger, the focus of their activities has changed. Formerly, their focus was on selling at the wholesale level in order to get apple products on the retail shelves. Now, many are working closely with retailers to move product off the retail shelves to consumers. Thus, they have become more intimately involved with consumer packaging, demonstrations, promotions and contests to arouse consumer interest. This has changed the mix of personnel and expertise that they need in their employees. Finally, because of their changing roles, they have become important interpreters of information on changing consumer tastes and preferences, and key conduits in transmitting that information back to their network of producers and packers.

Capital Availability

Because of the high cost of new plantings, and the long gestation period before orchards are profitable, the apple industry has always been a heavy user of capital. In addition, some of the trends discussed above in apple production, storage, packing and marketing demonstrate how the industry has become increasingly dependent on purchased technology, both to increase efficiency and to meet ever higher quality standards from customers. That has demanded further infusions of capital into the industry. In periods of high profitability, much of that capital can come from retained earnings. However, in more normal conditions, much of that capital must be borrowed from private sources. This can include long-term loans from banks or insurance companies, or even direct infusions of capital through ownership of some part of the equity. Ironically, those capital sources are least likely to be available to the firms, districts or countries that are in the most urgent need. Capital availability continues to be one of the great dividing lines between successful and struggling apple industries.

Labor Availability

The fresh apple industry continues to be a heavy user of unskilled or semi-skilled labor, especially in its orchard operations. However, many countries report the same story. Domestic workers are unwilling to endure the hardships of orchard work if they can find a non-agricultural job with equivalent pay, or if they can extract similar incomes from welfare or unemployment benefits without the need to work. Workers from foreign countries are willing to do the work at the prevailing wage rates, but many have difficulty in getting work permits. As a result, half or more of the orchard workforce are illegal immigrants that can be expelled from the country with little prior notice. One alternative being pursued in many countries is employing foreign workers under special "temporary guest worker" schemes that control the number of workers admitted, their rates of pay, their requirements for housing, transportation and medical care, and the duration of their stay. While the requirements of guest worker programs are burdensome, the employer is at least guaranteed to have a workforce available when harvesting or other tasks need to be done.

In general, larger growers have been better able to navigate the multiple bureaucracies, complex regulations and increased costs of guest worker programs. However, few see such programs as the long-term solution to their labor needs. This has, in turn, led them to seek ways to reduce their labor needs through altering the architecture of their orchards, use of picking platforms, or (ultimately) fully automated mechanical harvesting. All these solutions will require more capital, and are likely to further disadvantage smaller growers.

Purchased Inputs

As apple industry operations at every level become more complex and sophisticated, the industry must acquire an increasingly wide range of purchased inputs, such as chemicals, fertilizers, energy, lumber, steel, wire, netting, irrigation systems, wind machines, electronics, computers, telecommunications, tablets, smart phones and supporting software. In advanced market economies, such inputs are usually in plentiful supply and at prices determined by the combined demand of many industries. Expenditures on such inputs can only be justified in the apple industry as long as the return to apple production is competitive with that in all other industries. This is one of the main reasons why marginal firms exit apple production, namely, because they cannot generate economy-wide competitive returns. However, it does imply that the surviving firms are competitive with the norms of an advanced economy.

In many emerging economies, access to the needed inputs is neither plentiful nor cheap. In some cases, key inputs are in short supply, or are not regularly available. In many cases, their costs are increased by high import taxes and internal taxes. However, lack of access to those inputs on favorable terms, makes apple production in emerging economies less competitive in terms of productivity or quality.

Access to the most effective chemicals remains a problem in most countries. In many cases, broad spectrum chemicals that controlled entire species of weeds or insects have been banned as possible human carcinogens, food safety hazards, or threats to the environment. Developing alternative treatments tends to be slow. In addition, alternatives often involve use of a complex of chemicals to attack the target pest or disease from multiple angles. This tends to be more costly and to require greater knowledge inputs and management skills. Another problem has been discrepancies between major importing countries on what chemical treatments are permitted and what levels of chemical residues are acceptable. This complicates treatment options for a exporter wishing to supply a number of different markets. In many cases, it leads exporters to forgo markets with the most restrictive standards. In this way, regulation of inputs has become another form of trade barrier.

In the debate over specific pests or specific chemical controls, science often gets swamped by the politics of protectionism. Producers and exporters continue to be disadvantaged by illogical, and inconsistent, control systems.

Role of Food Activists

Nothing causes greater alarm among consumers than claims that a food may cause immediate or long-term harm to themselves, their families or, above all, their children. Among the hundreds of thousands of activist groups in advanced societies jostling for the attention of the media or governments, many have found food alarms to be a fertile source of funds and influence. They often work in concert with government regulatory agencies, and receive grant funds from such agencies, because both support expanded regulation. Many employ "junk science" to buttress their claims of harm, and use emotional messages to arouse fear among consumers. They use an array of tactics to press their case, including lobbying politicians and government bureaucrats, planting stories in friendly media (who love a good alarm), seeking changes in current laws, bringing lawsuits against agricultural producers or their suppliers, or hounding retailers to impose new requirements on suppliers. Even the largest retailers can be intimidated into complying lest their reputation with consumers be besmirched.

In general, commodity organizations have done a poor job of countering the claims of food activists. They rarely have advance warning about which products, which inputs, or which farm practices will next come under attack. They rarely have the resources to defend themselves on the many fronts that can be opened up simultaneously by different activist organizations. In turn, although the general agricultural organizations are in a position to take a more strategic approach to food activist claims, they often lack the scientific resources or the public relations firepower to defuse the activist alarms. Because the food activists have been very effective in major advanced economies, their influence is now felt by exporters from around the world. In some cases, for example in their opposition to genetically modified foods, the activist groups have had serious negative effects on food and nutrition in developing countries. Unfortunately, the hit and run tactics of food activists continue to be very successful with the media and societal leaders. For that reason, agriculture, and the apple industry, can expect to come under attack from ever changing directions for the foreseeable future.

Dictatorial Retailers

Retailers have become increasingly dictatorial in their demands from produce suppliers. Partly this derives from consolidation within the retail sector, which gave individual retailers enormous buying clout. Partly it derives from the shift from spot market purchases, to purchasing though contracts with suppliers large enough to service at least one regional, retail division. Once a supplier had geared up to meet the needs of a specific retailer, it had a vested interest in ensuring that the contract was renewed. This gave retailers additional leverage to demand various standards of service and certifications from the supplier. The list of requirements imposed on suppliers continues to lengthen, partly driven by pressure from the food activists discussed in the previous section.

In general, retailers are willing to accept independent third party certifications that the supplier has met the retailer's requirements. However, because of fear of lawsuits, or loss of reputation, many retailers are now demanding the right to have their own employees inspect the suppliers' orchards, storage sheds or packing plants, or to check chemical use, worker housing, worker treatment and worker behavior (for example, sanitary practices) at any time. Many suppliers have resisted such intrusive practices, and retailers are less likely to press the issue when there is little public concern. However, media stories or activist pressure can rapidly change that situation.

Three other developments have altered the relationship between retailers and suppliers. One is the waning dominance of a few large retailers like Walmart, Carrefour and Tesco, and the increasing fractionation of the retail industry. Recessionary conditions favored the expansion of limited assortment discount chains like Aldi and Lidl. At the same time, upscale stores, like Waitrose, Whole Foods and Trader Joe's, have tapped the growing demand for organic, natural, specialty and exotic foods that have become popular with higher-income shoppers. A second is that other retail formats, such as drug stores, convenience stores and dollar stores, have expanded their food selections in order to attract clientele for their non-food items. These different formats vary in the demands they place on suppliers, but, in general, chains with more sophisticated and socially savvy shoppers are more exacting in their demands. A third is the increasing consumer interest in buying local foods. What was initially triggered by concerns about the carbon footprint of long-distance supplies has become more focused on the purported benefits of supporting local businesses during economic downturns, and on the claimed advantages of local foods in terms of freshness.

While shoppers, and the retailers that serve them, seek to exploit these changing consumer interests, suppliers must decide which of these different retail opportunities they, and their network of growers and packers are able to serve best. They also must try to anticipate which of these different retail opportunities are most likely to grow, stagnate or decline, and adapt their organizations accordingly.

Government Reach

In the 1980s and 1990s, under leaders like President Ronald Reagan and Prime Minister Margaret Thatcher, there were deliberate efforts to scale back the role of government ownership or operations in state and national economies. That role had expanded steadily since the 1930s. However, these efforts met stiff resistance from government officials, union leaders and supporters of state intervention, who had benefited from the government expansionism.

The terrorist attacks of September 11, 2001, and subsequent terrorist activity, led to reinvigoration of government regulation of military installations, airports and seaports, power plants, dams, irrigation systems, shipping containers, and the products those containers might hold. In the United States, a new department of Homeland Security was established to coordinate the fight against terrorism. There was widespread fear that terrorists might attempt to poison large groups of civilians by contaminating foods or beverages or public water supplies. While none of these fears have been realized, the control apparatus remains in place.

Then, in 2008, after the Great Recession hit, governments assumed broad new powers to hasten economic recovery. Central banks dramatically increased the money supply in an effort to drive down interest rates and encourage new investment. Governments around the world introduced hundreds of "stimulus packages", hoping to offset declines in private demand with increases in government demand. While there is much debate about how successful these efforts may have been, most of the new government structures still remain in place, while the role of central banks has continued to grow in Europe and Asia.

In addition, the Obama administration, that came to power in the United States in 2009, favored expansive government programs in many different areas. It set up new financial institutions to combat the financial excesses that were blamed for the Great Recession. Under the Affordable Care Act, it established a health program that affected every individual and business in the United States. Of more direct import to the produce industry, it installed the Food Safety Modernization Act, which potentially allows government inspectors to scrutinize every detail of the perishable foods system. The consequences of that Act's implementation will not be known for some time, but much industry resources have already been absorbed in preparing for implementation.

In Europe, even though it has been struggling to alleviate the effects of the Great Recession, the euro crisis in Greece, the influx of refugees from the Middle East and Africa, and other problems, the European Commission has not slowed down its regulatory expansion. In the two other major economies, Japan and China, government has become even more deeply involved in all facets of society. The perishable industry is not likely to get any relief from increased government reach any time soon.

Multinational Influences

As the world has become increasingly interconnected, businesses and consumers are as likely to be affected by foreign or multinational initiatives as by interventions by their own governments. One response to the Great Recession was an effort to carve out international agreements that would reduce the risks of future financial crises. There were also efforts to prevent countries adopting protectionist policies that could set back progress on trade liberalizations. There was particular concern that countries would trigger a currency war if they attempted to increase exports by lowering the value of their currency. If other countries retaliated, it could lead to a downward spiral of currency debasement. While many countries have weakened their currencies, they have so far shown restraint in preventing a currency war breaking out.

A second area of great common concern has been the risk of "global warming" or of "climate change". The United Nations Intergovernmental Panel on Climate Change (IPCC) has taken the lead in documenting the risks and in organizing international climate "summits" to co-ordinate policies to combat climate change. After the most recent summit in Paris in December 2015, participating governments agreed to common targets for reducing greenhouse gases. However, actual commitments have to be approved by the governments or parliaments of individual member countries. The strength of individual government commitments depends heavily on which party achieves power in any country. It is not yet clear how sectors like the tree fruit industry in any country might be impacted.

A third area of common concern has been the fate of long-standing efforts under the World Trade Organization (WTO) to liberalize free movement of people, goods, services, capital and intellectual property around the world. Since the Great Recession, the WTO has focused mostly on preventing countries reneging on existing agreements, and there has been little forward progress in global agreements. Many countries have chosen to participate in more limited bilateral or even multilateral agreements to increase trade. Work has also continued on two blockbuster agreements. The Transatlantic Trade and Investment Partnership (TTIP) would break down barriers between the world's largest economic blocks, the United States and the European Union. The Trans-Pacific Partnership (TPP) would link the United States and Japan with 10 other trade-oriented Pacific Rim countries. The TTIP has yet to be finalized, but a final agreement on TPP has been reached. In either case, ratification of these agreements will face many obstacles.

The final, and perhaps most fundamental concern in the international arena is the emerging conflict surrounding the so called "western consensus" that has been pursued by the United States, Europe and their allies since World War II. In general, that consensus favored free movement of people, goods and services, capital, ideas and communication, based on the principles of human rights and the rule of law. That consensus has been challenged by countries like China, Russia and Iran that believe that individual rights should be subservient to the needs of the state. The needs of the state are determined in China by the Communist Party, in Russia, by the ruling elite, and in Iran, by the Islamic religion, as interpreted by the reigning Ayatollah. To win friends to their point of view, Russia, China and Iran have been using various means, from direct military aggression, to military support of surrogates, to favorable trade and investment deals. The United States, Europe and Japan have been too distracted by their own problems to develop effective counter-strategies. However, collapse of the western consensus could cause serious problems for the apple industry because of its need for open borders.

Developments in Specific Apple Producing Countries

While the common factors described above can affect the apple industry in many different countries, the impact of each factor in any country will depend on the unique situation in each country. For example, the apple industry in an import-oriented country could benefit from obstacles to trade, whereas that in an export-oriented country could suffer severe economic hardships. The impact could be reduced, or exacerbated, depending on how willing the government, the scientific community, or industry organizations were to make needed adaptations. In the following section, the most influential factors are discussed for each major producing country.

China at Tipping Point

The Chinese apple industry has gone through a number of phases since private enterprise was encouraged in the early 1980s. Between 1980 and 1995, plantings and production expanded rapidly because the returns from fruit production were so much greater than from grain production. By the mid-1990s, over-production had led to falling prices. In response, the Chinese authorities encouraged increased fresh apple exports, helped develop a modern apple juice concentrate industry, and encouraged removal of unproductive orchards and development of future orchards in areas with the greatest comparative advantage in apple production. Low-priced exports of fresh apples and apple juice concentrate were stimulated by an undervalued yuan and subsidized transportation.

By 2005, Chinese domestic demand was growing so rapidly that most apple production could be absorbed profitably in the domestic market. Production continued to rise, while export growth gradually slowed. Imports were allowed to increase, and the value of the yuan was allowed to rise.

If Chinese apple production continues to grow as projected, and domestic demand begins to slow, China will face a similar over-production problem to what it faced in 1995. Some of the remedies are likely to be similar. There will be pressure to remove the least productive orchards. There will also be pressure to limit imports and to again expand exports of fresh apples and of apple juice concentrate. However, export prices are unlikely to be subsidized as in the past, so the competitive impact on other suppliers will be less severe than it was then. This reversal in exports is already apparent in the 2015-16 season. Of course, the future direction of imports and exports could be disrupted if increased tensions between China and its neighbors make shipments in the China Sea more difficult.

United States Perils of Prosperity

Difficult market conditions in the late 1990s and early 2000s led to the removal of many marginal orchards and to declines in total production in the United States. However, the surviving orchards have tended to be larger, better capitalized and more progressive. They have invested in new, high density plantings with the potential for much higher average yields than in the past. The first payoff from this strategy became apparent in the 2014 crop year when the United States produced its largest apple crop in almost two decades. Domestic sales have been boosted by the introduction of new, premium varieties, and by the widespread use of SmartFresh, that has lengthened the sales season for traditional varieties, but overall domestic per capita consumption of fresh apples has stagnated.

Export sales remain particularly problematic. Low shipping point prices in the 2014-15 season permitted record export sales, but substantial volumes of apples went unused. In order to market the volume of exportable crops likely to be available in the near future, the United States needs unfettered access to major markets like Mexico, Canada, China, Taiwan, India and Indonesia. However, that access has been curtailed by anti-dumping disputes, temporary bans, phytosanitary alarms and logistical restrictions that have often been imposed without warning, and that are costly and difficult to remove. The strengthening of the value of the U.S. dollar in the last two years has made U.S. products more expensive relative to those of many major competitors. Because of the relative strength of the U.S. economy, little relief is likely in the near future in the value of the dollar.

The recent period of prosperity has encouraged expansion in the U.S. apple industry at a faster pace than current markets can absorb. However, the industry has no coherent strategy for expanding overall demand. Its export programs are seriously underfunded, and industry-wide programs in the domestic market have been gradually disbanded. Its best hope for near-term relief is weather-induced reductions in total apple production. However, relying on Mother Nature to bail out the industry is not a reliable strategy for ensuring a profitable apple industry.

European Union Dilemma

Because official EU policies favored keeping marginal operations in production, the shakeout of smaller apple producers and the consolidation in production, packing and marketing has been slower in the EU than in the United States. Greater use of cooperative organizations has partially offset the limitations due to having numerous small producers. However, most of the countries in Western Europe have been also moving towards higher density orchards and introduction of newer, premium varieties, just like in the United States.

The situation in Eastern Europe has been quite different. Countries like Poland, Hungary and Romania only joined the European Union in 2004. Many of the legacy orchards inherited from their central planning era under Soviet influence had older varieties, and low productivity. These countries were hoping that by joining the EU, they would get free access to the rich markets of Western Europe, and be able to modernize their orchards through generous subsidies from the EU and through private investments. In both cases, they have been disappointed. The European Union was in the process of reforming its common agricultural policy to reduce subsidies, while private investors were discouraged by concerns about political instability, security of property rights, and lack of adequate infrastructure. Reform of the apple industries of Eastern Europe has been painfully slow. In addition, only a small portion of their production has been able to meet the quality standards demanded in Western Europe, so much of their exports continued to be directed to the low-priced Russian market.

The decision by Russia to place a ban on imports of perishables, including fresh apples, from the EU in August 2014 had a traumatic effect. Poland, by then the world's largest exporter of fresh apples, primarily due to its sales to Russia, was especially hard hit. However, other EU countries that had sold limited quantities of high-priced apples also suffered losses. Prices for fresh apples declined across Europe. Various measures were used to mitigate the losses. The European Commission, and some member governments, provided compensation for potential losses, but it only covered a fraction of the damage. Some countries increased promotion of domestic consumption of apples. EU apples continued to move into Russia by "unofficial" channels, through non-EU countries, but the Russian authorities did their best to reduce such flows. In addition, there was a concerted effort to expand exports of EU apples to third countries and to expedite permits for exports to markets that had previously been closed. There were also limited efforts to find a common ground with Russia, but Russia's continued occupation of the Ukraine, its continued meddling in the Eastern Ukraine, and its confrontational posture relative to other EU member countries, has meant little or no progress in ending the Russian ban.

The European apple industry faces a problem similar to that of the United States. Potential apple production exceeds what can be consumed domestically. The surplus can go only to export markets that (without Russia) remain limited and unreliable. Promotion of domestic consumption has showed limited payoff. However, no one appears willing yet to admit that the most effective way to balance supply and demand may be to cut production.

Poland Center Stage

The Polish apple industry has been most disadvantaged by the Russian embargo. It has been by far the most successful of the new member states in expanding apple production, improving its varietal mix and developing modern packing, storage and marketing structures. It now has the world's largest apple processing industry. However, it still has a long way to go to reach par with some of the world's most competitive apple industries. Its ability to supply large volumes of low-priced apples and of apple juice concentrate to the Russian market gave it an immediate source of revenue, but did not generate the economic surpluses needed to bring its entire industry up to competitive standards.

The sudden closure of the Russian market has left the Polish apple industry with severe over-capacity, but it does not have the mix of varieties and qualities that are in demand in alternative markets. It would take many years and huge investments to seriously alter its variety mix and capture large alternative markets. As the Russian embargo nears the end of its second year without any resolution in sight, Poland faces some difficult choices, but lacks many of the resources needed to pursue more profitable paths. Clearly, the firms with the most desirable mixes of apple varieties will be in the best position to weather the current stresses. However, small producers also have advantages in surviving periods of depressed prices. They can lower their drawings from their operation, effectively reducing their standard of living, or they can subsidize their orchard operations from off-farm earnings. How rapidly the Polish apple industry can reach a sustainable level of profits will depend on both when and how supply can be trimmed to match reduced demand.

Turkey Stumbles

After EU apples were banned by Russia, it was assumed that Turkey would be one of the main beneficiaries. It has a large apple industry, its apple exports have been growing, it is closer to Russia than most alternative suppliers, and its prices are relatively low. However, after Turkey, in December 2015, shot down a Russian fighter jet that had breached its territory, Russia extended its ban to imports of Turkish products. Turkey has a large domestic fresh apple market, that is protected by very high tariffs. This has been a disincentive for the Turkish apple industry to modernize its varieties and production and marketing systems. In addition, Turkish producers have many options in terms of fruits and vegetables that they can supply to domestic and export markets. Turkey has the potential to expand both domestic and export sales of apples, but that is not likely to occur unless the apple business becomes more profitable.

Italy Remains Strong

The apple industry in Italy has become increasingly concentrated in the South Tyrol region of Northern Italy. Unlike many other parts of Italy that can produce many other fruits and vegetables, the South Tyrol has exploited its strong comparative advantage in the production of apples. It has been among world leaders in adopting new technologies in growing, storing, packing and marketing fresh apples. It is also in a favorable geographic position to serve some of the largest concentrations of populations in Western Europe. Although most production units are small, they have benefited from being in close proximity. They have also used local cooperatives and unions of cooperatives very effectively to enhance the strength of the industry. In addition, they have been supported by a sophisticated research and extensions system.

Despite strenuous efforts, the industry in South Tyrol has had difficulty in finding new varieties that prosper in its growing conditions. As a result, it still remains heavily dependent on older varieties like Red Delicious and Golden Delicious that tend to be less profitable. It has also been affected by the persistence of weak economic conditions in its main markets in Western Europe. The Russian ban on EU apples will have little direct effect, but will put downward pressure on apple prices within the region. To compensate, Italy has been expanding its exports to Asia, Africa and North and South America. It continues to make slow, but steady progress, on many different fronts.

France on Downward Slide

In 1995, France was the third largest producer of apples in the world, after China and the United States. By 2015, it had fallen to eighth place. Both area harvested and production had fallen by over 16 percent in the intervening years, indicating that average productivity had not improved. Since similar shrinkage has occurred across the French fruit sector, it suggests that common factors have contributed to the decline. In general, costs of production have been higher in France than in neighboring countries. Land and labor have been relatively expensive because of competing pressures from non-farm uses, and the burden of taxes, fringe benefits and widespread regulations has been high. The French apple industry has made extensive use of cooperative structures in packing and marketing operations, but major production areas are more widely separated, and less cohesive, than in Italy. However, France has been more successful in introducing newer varieties, both those developed by French breeders, and others, like Pink Lady, developed in other producing countries.

France was also once among the leading exporters of fresh apples in the world, but exports, too, have fallen, by over 20 percent in the last two decades. A number of factors have contributed to this decline, including high internal costs, sluggish economic growth in the main markets, and the strength of the euro. Exports to countries like the United Kingdom and Germany have also been affected by the growing strength of the "Buy Local" food movement, so France has been pursuing other markets outside Europe. However, it takes a long time to open and expand many foreign markets.

Chile Eases Back on Apples

Given its small population and relatively low incomes, the Chilean apple industry has always been aimed primarily at export markets. Until recently, its most lucrative export markets were in the richer countries of North America and Western Europe. Because of its elongated land mass, Chile has many different microclimates suitable for different apple varieties, and numerous firms engaged in exporting different varieties. In addition, the Chilean government has been particularly aggressive in gaining access to as many markets as possible. As a result, Chile has now one of the most diverse apple exporting sectors in the world. However, a combination of economic weakness and the strength of the Chilean peso has made those traditional markets less attractive, so Chile is placing much of its future hope on increased exports to Asia.

While the apple industry remains one of Chile's largest fruit sectors, the planted area peaked around 2010, and has declined modestly since. Production increases are now mainly due to higher yields. Chile remains a favorite partner for testing of new apple varieties, and as a complementary supplier to Northern Hemisphere marketers in their off-season. However, Chilean fruit producers have a wide range of planting options, including table grapes, wine grapes, berries and soft fruit, so growth in the apple industry will only resume if and when returns in apples are comparable to those of other crops.

Iran In or Out

Iran remains one of the world's largest producers of apples. However, its role in the world apple scene has been disrupted by its prickly economic and political relations with many of its Arab neighbors and with other world powers. UN,FAO data suggest that apple production peaked at about 2.7 million metric tons in 2008, and has fallen since. The reasons for this decline are not clear, although sanctions on trade with Iran have certainly contributed by reducing the Iranian government's revenue from oil exports, and limiting the access of Iranian businesses to many key inputs to boost low productivity.

As we went to press, Iran was once again on the verge of escaping western sanctions. It had negotiated an end to its nuclear weapons program with the Obama administration and other world powers in return for a lifting of the sanctions. However, the Republican Party in the United States opposed the administration actions until Iran also ended its support of terrorism and ceased other aggressive actions in the Middle East. If the sanctions are lifted, Iran would be better able to import the inputs needed by its fruit producers and to increase exports of its apples to countries in the Middle East and South Asia. However, even if sanctions are fully removed, it will take years for the Iranian apple industry to resume its growth.

Russian Federation Difficult Choices

After the Russian economy abandoned central planning in the 1990s, its artificially stimulated apple industry downsized rapidly. The private sector often lacked the clear ownership titles and capital needed for modernization. As Russia's economy boomed during the first decade of the twenty-first century, it was easier to import a wide diversity of apple varieties and quality levels from numerous foreign suppliers than to rebuild the Russian apple industry. However, after the Russian government imposed its ban on imports of produce from many major suppliers in 2014, and produce prices rose sharply, the government began to provide inducements to producers to make more vigorous efforts to increase the nation's self-sufficiency in produce. This might encourage entrepreneurs in Russia to take a fresh look at rebuilding the apple industry.

However, plantings of annual crops, like carrots or lettuce, require limited investments, and promise a rapid return of capital. In contrast, increasing plantings of a perennial crop, like apples, requires much more careful selection of sites, a much greater investment per hectare, and a much longer wait for that investment to break even. Unless the supporting packing and storage infrastructure is already in place, that too needs to be provided. The investor also faces the risk, should the ban be suddenly lifted, of imports again flowing freely and driving down prices. The level of inducements being offered by a cash-strapped Russian government are unlikely to be sufficient to offset those risks for producers of perennial crops. Thus, increases in self-sufficiency are most likely to occur in annual crops. Only if bad relations between Russia and its produce suppliers are expected to continue indefinitely would investments in new apple plantings pay off. On the other hand, were substantial investments in perennial crops to be made, it would create a pressure group within Russia with a vested interest in maintaining continued obstacles to imports. That would be an additional impediment to the restoration of normal trade relations.

Argentina Woes Continue

For many years, the natural advantages that Argentina enjoys in production of temperate fruits have been undermined by populist economic policies that have favored transfers of resources from the producing sector, such as agriculture, to the consuming sector, the mass of voters in the major cities. These policies have debased Argentina's currency, damaged its global creditworthiness, and led to crumbling infrastructure, runaway inflation, worker unrest, spiraling wage demands and foreign exchange controls. Owners and managers of fruit operations have been forced to devote their energies to staying afloat rather than investing in new initiatives to keep Argentina competitive with leading world producers. The result has been limited growth in production and exports of apples and apple products.

However, Argentina elected a new president, Mauricio Macri, in late 2015 on a platform of ending many of the populist policies, reducing state influence on the economy, and favoring free markets. Reform will not come easily, since his political opponents still control Congress. The future competitiveness of the Argentine fruit industry will be strongly influenced by how much of President Macri's agenda he is able to put into effect, and how rapidly real change occurs.

Troubled Brazil

In contrast to Argentina, Brazil enjoyed two decades of strong growth. Independent analysts were predicting that it could soon compete with Europe and North America for world economic leadership. It was one of the world's largest exporters of agricultural commodities like soybeans, sugar and meat. The apple industry was able to attract substantial foreign investment that enabled it to grow rapidly and to build a strong portfolio of widely accepted newer varieties, like Gala and Fuji. Production has continued to expand as older orchards have been replaced with newer, higher density orchards. Because of its large population and rising per capita incomes, the Brazilian apple industry was much less dependent on export markets than its South American rivals, Chile and Argentina.

The ultimate recognition of Brazil's emergence as a world power was its selection to host the world's two greatest sporting spectacles, the World Cup of soccer in 2014, and the Olympic Games in 2016. However, in the last two years, the Brazilian economy has been plunged into recession by the collapse of commodity prices. Its politics have descended into chaos as a result of a corruption scandal surrounding the national oil company, Petrobras, and calls for the impeachment of President Dilma Rousseff. Despite its rich resources, it may take several years for Brazil to set its economic and political houses in order.

The Ukraine in the Crosshairs

Recent history in the Ukraine has been equally turbulent. It has struggled more than most former Soviet territories in rebuilding its economy and ending political corruption. It was hoped that negotiating the Ukraine's associate membership of the European Union would help resolve both problems. Instead, it created a new set of (even more vexing) problems. Russian President Putin saw the Ukraine's closer ties with the EU as a threat to Russia's influence in the region. That led to the Russian seizure of the Crimea, the Ukraine's southern province, and funding of an insurrection in Ukraine's eastern provinces. After the European Union and its allies clamped sanctions on prominent Russian citizens, President Putin responded in August 2014 by banning imports of perishable products from those countries. Thus, resolving the Ukraine crisis will be central to ending the Russian ban.

The Ukraine remains caught in the middle. Continuing violence in its eastern provinces is disrupting normal commercial relations with its major trade partner, Russia. It will take time to build new relationships with the European Union. Its apple industry had begun to revive with the help of a major World Bank project, but faces numerous disruptions from the current economic, political and military situation. The Ukraine economy needs massive external aid to avoid insolvency. The prospects are for these troubles to continue.

South Africa Internal Tensions

The apple industry in South Africa has expanded successfully in the last two decades since foreign boycotts of South African products were lifted after the Apartheid regime ended. For much of the recent period, demand was boosted by a growing domestic market, and greater diversification of export sales. The industry was able to improve its infrastructure and the quality of its products. It should now be enjoying the fruits of that expansion.

However, the industry remains troubled by simmering disputes over land ownership, and by government pressure for increased black participation in the ownership, management and operations of orchards and packing houses. The black empowerment movement in agriculture has had limited success, despite the industry's best efforts. It has been hindered by lack of interest among blacks in agricultural work, and lack of the skills and education needed in a business that must compete globally to survive. More recently, rising inflation and stagnant real incomes have led to demonstrations, strikes and property destruction in the industry in support of higher wages, which threaten the viability of many apple operations. A weak South African rand has relieved some of the pressure on returns, but adds one more element to uncertainty about the industry's future.

Germany Sweet Spot

The apple industry in Germany faces both advantages and disadvantages. Its major advantage is that its producers and marketers are nearest to the largest, and richest, market in Europe, and one that has been least affected by Europe's widespread economic problems. It has also been boosted by a strong "Buy Local" movement that receives the support of most major retailers and many consumers.

However, it also faces numerous disadvantages. Its population is aging and stagnant. This has led many retailers to use heavy discounting in order to retain market share, and to put pressure on suppliers for lower delivered prices. Germany is also open to competition from the world's most efficient and most competitive suppliers of fresh apples. The area of land suitable for orchards is limited, and often highly fractionated, making it difficult to gain economies of scale. To offset some of these disadvantages, German producers have made substantial investments in new varieties, but have been limited in their ability to grow varieties like Pink Lady because of Germany's cool, damp climate. Increasingly, the survivors in the German apple industry will be firms that can tap a profitable market niche amid the sea of competing apples.

New Zealand Bets on Innovation

Since it lost preferential access to the United Kingdom market after that country joined the European Union in 1973, the New Zealand apple industry recognized that it needed to find other premium markets that would offset New Zealand's greater distance from world markets. Its earliest efforts involved the commercialization and introduction to the world markets of newer varieties like Gala, Fuji and Braeburn, that often generated 100 percent premiums over traditional varieties. However, since those varieties did not have intellectual property protection, they were heavily planted by numerous competitors, and their premiums gradually eroded.

Under its then New Zealand Apple and Pear monopoly marketing board, the industry sought to develop further new varieties that would have intellectual property protection so the volume produced and marketed could be managed to sustain price premiums for a longer period. Among the early results of that effort were the Pacific Series of apples and the Jazz variety. The board also introduced the concept of a unique New Zealand brand, ENZA (an acronym for "New Zealand"), to give the new apples additional distinctiveness on retail shelves in importing countries. The new apples would be marketed like major branded products such as Tide soap powder or Coca Cola soft drinks.

However, before the plan could be fully implemented, the monopoly marketing board was disbanded. New Zealand's marketing efforts were dispersed among many new, often inexperienced, exporters. A large private company, Enza Limited, gained control of the Pacific Series and Jazz apples, but ended up controlling less than half of New Zealand's apple exports. For several years, the New Zealand industry struggled to adjust to the new structure. A wave of consolidation in the growing, packing, marketing and exporting activities led to fewer, larger, often fully-integrated, enterprises. In order to restore the stream of unique new varieties, the industry set up a new organization, Prevar Limited, which was responsible for working with breeders at HortResearch (later merged into Plant and Food Research Limited) in developing and commercializing new varieties. New Zealand producers, and cooperators in Australia and elsewhere, are just now testing the commercial potential of the early Prevar discoveries. Consolidation has also continued. For example, Enza Limited was absorbed by Turners & Growers, which was, in turn, taken over by a German company, Baywa Limited. Baywa also acquired the Apollo Company to add to its New Zealand apple portfolio.

The New Zealand apple industry appears to have resolved many of the problems that emerged after the demise of the monopoly board, and is again set on the path of pursuing premium prices through product innovation.

Australia Renewal

Over a decade ago, the Australian apple and pear industries recognized that their domestic market was vulnerable to increased imports, and that their share of export markets had been slipping due to lapses in productivity and the continued production of varieties that were losing popularity. Since then, the industry organization, Apple and Pear Australia (APAL), has mounted continuous campaigns to help producers increase their orchard efficiency. The "Future Orchards" program aims to make the majority of Australian producers globally competitive. The industry appears well on the way to achieving that objective.

In addition, one of the main goals of the Australian Pome Fruit Improvement Program Limited, established in 1997, was to independently evaluate new varieties with potential under Australian conditions. APAL has also become a major shareholder in the New Zealand-based Prevar program for developing new varieties. Other promising, new varieties have also emerged from separate Australian public and private breeding programs. Australia also suffers from limited orchard land, and scattered production areas. However, it remains heavily committed to its renewal program and to increasing Australia's international competitiveness.

Spain in Slow Decline

The Spanish economy was hard hit by the Great Recession and its aftermath, and this has slowed both consumer demand and business investment. Spain is slowly working to resolve a complex of political, financial and economic crises. This has complicated any recovery in the Spanish apple industry, which has been in slow decline in recent years as the industry has adjusted to competition from other major European suppliers of apples, and from internal competition with other fruits more suitable to the Spanish climate. Apple production has gradually moved to more limited areas with a comparative advantage in apple production, and the apple processing sector has shrunk. However, Spain has been relatively slow to convert to newer, premium apple varieties. Spain is likely to continue to be a large net importer of fresh apples.

Portugal Recovering

Like Spain, the apple industry in Portugal expanded too rapidly in the 1980s, and had to gradually adjust to competitive forces. The area harvested reached a low point in 2007, and has risen modestly since. Production has also rebounded, but average yields remain very low compared to its major European competitors. Limitations of land and climate have prevented Portugal from introducing new varieties as rapidly as might be desired. Thus, Portugal, like Spain, is likely to remain a large net importer of fresh apples.

Austria Specializes

Situated as it is close to major apple producers like Italy, France and Germany, Austria has chosen to aim for niche markets through use of its Eva brand, and emphasis on its green, organic and natural credentials. These niche markets have come under pressure because of the economic stress in European markets and the heavy emphasis on discounting at the retail level. However, given Austria's small volume of apples, there should continue to be enough upscale retailers and consumers in Austria's market areas to support these specialized niches.

Belgium and the Netherlands Seeking New

Because of their close proximity, Belgium and the Netherlands face similar advantages and disadvantages in land area, climate, and openness to global competition. For many years, both countries specialized in one major apple variety, Jonagold in Belgium and Elstar in the Netherlands. As those apples lost popularity, both countries converted much apple plantings to pears. However, since the premium for pears gradually eroded, both are now aggressively pursuing the discovery and commercialization of new apple varieties. Two, Kanzi and Red Prince, have already shown considerable potential.

Greece Static

The apple industry in Greece has experienced slowly declining area and relatively flat production in recent years. Part of the reason is that Greek fruit producers have found more profitable opportunities for their limited land area in higher value items like grapes, kiwifruit and sweet cherries where export opportunities are greater. Higher returns have been particularly important to the fruit industry because of the deep recession into which the Greek economy has been plunged since 2010. This situation appears unlikely to change any time soon.

United Kingdom Revival Slows

The apple industry in the United Kingdom had suffered falling area and production for many years as its producers were burdened with older apple varieties that could not compete with a wide array of more attractive, imported, newer varieties. However, the warming effects of climate change led a number of pioneering firms to seek adapted strains of newer varieties, like Gala, Braeburn and Jazz, that would prosper under UK conditions. At the same time, increasing concerns about the greater carbon footprint of imported products fueled increased interest in buying local products. The apple industry was better prepared than most of UK agriculture to capitalize on this trend because it already had an established promotional program for English apples that featured a highly recognizable logo, the national flag, the Union Jack.

The early success of those pioneers encouraged other producers to follow. The effort received broad support from UK retailers. By 2015, production had recovered to levels last seen in the late 1990s. However, the UK must still depend on imports for about two-thirds of its apple supplies. Many foreign suppliers will continue to produce innovative varieties that will be available in the UK. Further expansion of the UK apple industry will be hindered by the limited availability of suitable orchard land, and by its high cost. Continual improvements will be needed to ensure that the industry maintains its recent gains.

Canada Combats Further Shrinkage

The apple industry in Canada has been in long-term decline due to increasing pressure from imports, especially from neighboring United States. Many apple blocks were removed in favor of higher value items such as blueberries, wine grapes or sweet cherries. However, two new apple varieties, Honeycrisp, bred in Minnesota, and Ambrosia, a chance seedling found in British Columbia, have proved highly successful under Canadian growing conditions. A number of government-funded replant programs have helped many surviving apple producers to revitalize their orchards.

Pressure from imports is likely to continue. The industry continues to have many small growers and to be spread among many separate provinces, so it is difficult for apple organizations to achieve the economies of scale needed to be internationally competitive in packing, storage and marketing. However, recent developments should help the industry to avoid further shrinkage and to establish a base for further recovery.

Mexico Still Growing

The apple industry in Mexico also faces stiff challenges from imports from powerful foreign suppliers like the United States and Chile. Seasonal restrictions on U.S. imports have been used to protect the Mexican market for several months of each year after the Mexican apple harvest. However, in seasons when Mexico has a large apple crop, its product comes into more direct competition with imports. The Mexican industry blames this for depressed prices, and has instituted a series of anti-dumping actions, primarily against U.S. imports.

Continued growth in Mexico's population and per capita incomes has led to continued expansion of per capita consumption of fresh apples. Both domestic suppliers and imports have shared in this expansion. Production has continued to grow based on higher yields from a relatively stable planted area. The industry has belatedly moved to more modern planting systems and to introduction of newer varieties like Gala. But, the Mexican apple industry needs improvement on many fronts to remain improve its global competitiveness.

Apple Revival in Transition Countries

Many of the countries in Eastern Europe that began to transition from central planning to the free market in the 1990s, are still trying to overcome their legacies of outdated varieties and inefficient production, packing, storage and marketing systems. Three individual countries have already been discussed, Poland, the Russian Federation, and the Ukraine. Many other countries have had similar experiences. In varying degrees, they have had to deal with abandoned orchards, run-down infrastructure, uncertainty about ownership of land and facilities, and lack of either public or private capital needed to modernize their industries.

A number of these countries are now members of the European Union, including Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia. For various reasons, they have not benefited as much as they expected from access to EU markets, and have not received the hoped-for assistance from the EU in modernization. Progress towards modernization has varied by country.

Another group of small transition countries includes Albania, Belarus, Bosnia-Herzogovina, Macedonia, Moldova, Montenegro and Serbia in Europe, and Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan in Asia. Once again, these countries have varied in their ability to modernize their apple industries. They could receive a boost from increased demand from the Russian Federation as long as the Russian ban on EU and other suppliers continues. However, they have no more certainty about the longevity of that ban than any other suppliers.

While none of these countries are large enough or sophisticated enough to have much individual impact on world markets, in some years their total production could have an impact on many markets in Russia, Europe, the Middle East and Asia.

Significant Apple Production in Other Countries

The apple industry is important, either absolutely, or relatively, in many other countries. Richer countries, like Norway and Switzerland, that are not within the EU, have been able to protect their apple industries through import controls and domestic subsidies. Their goals have been to preserve rural societies or cultural traditions. So far, those measures have not led to punitive actions by the World Trade Organization, even though they are trade-distorting.

In many other countries, such as Peru, apple production is limited by geography or climate. They are characterized by limited investment and poorer quality products. However, 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. Their effect on major exporting and importing countries is generally minor, but can increase in years depends when the combined volume produced is large.

II. Future World Apple Production

Perils of Prediction

For perennial crops like apples, producers, investors, and their financiers, need to be able to peer into the future and predict both the potential crop sizes, and the possible future prices, if they are to evaluate the wisdom of any specific planting decision. This is true whether the decision is to replace one or more existing blocks, to develop a completely new block of orchard land, or whether or not to remove an existing block. It is the future flow of revenue that will determine whether or not any given block will continue to be profitable. The most important consideration is the future volume that can be expected for each individual apple variety and for all apple varieties. In general, the demand curves for any or all varieties tend to be relatively static over time. Thus, fluctuations in future prices will be most sensitive to fluctuations in the volume supplied.

This creates a problem for most individual apple producers or investors. They usually assume that the future volumes they produce will not materially affect market prices. As a result, they assess the feasibility of any particular development based on assumptions about the productivity of that development. In fact, since many other producers and investors will simultaneously be making similar plans, it is the combined effects of multiple decisions on future supplies that is most likely to materially affect future prices. Each individual decision is more likely to be influenced by the effect on total supplies of the collective decisions of many individuals, rather than by the supplies generated by any individual.

In order to fill the gap left by normal industry practices, Belrose, Inc., publishers of the World Apple Report has, for many years, been attempting to develop more systematic, less subjective, forecasts of future apple production, both in total, by country and by variety. Such forecasts are likely to be of value to producers, investors, financiers, breeders, nurseries, marketers, input suppliers, apple 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 note the distinction between forecasts of the future and predictions of the future. Makers of predictions either claim unique abilities for prophesy (mostly fraudulent), are trading on insider information (often illegal), or are attempting to conceal the fact that they are guessing by how vehemently they declare their predictions. In contrast, forecasts are based on objectively established baseline data and proven 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 in any given growing environment can be determined from historical statistics. It will be possible to forecast fairly accurately how many of the initial 100 trees will survive into each subsequent year. In addition, yield per tree tends to follow a predictable pattern as the tree ages.

Of course, predicting future apple production is not quite that easy. We know that average yields of fruit trees tend to follow an S-curve as trees age. Yields 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 yields. In the past, these phases, especially the last phase of slow decline, could stretch beyond 30 years or more. However, competition from a rising flood of newer varieties has meant that the economic payoff from a tree declines much more rapidly than the physical productivity. The profitable life cycle of plantings has become much more condensed. Orchard developers have been forced to use trees, rootstocks and planting systems that are more productive earlier, that reach a higher peak of production than previously, and that combat declining yields later in the cycle.

Forecasts are also based on known, past economic 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 a number of reasons why responses are lagged. For example, a producer or investor 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 high price years to persuade them to expand production. 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 a number of years, either to reduce costs or risks, because capital is not immediately available, or because it takes time to acquire suitable land or to accumulate all the rootstocks and trees needed. Similar considerations prolong decisions by producers or investors to take over the family operations, to enter the apple industry for the first time, or to exit the industry.

The forecasts presented in this edition of the World Apple Review update those that were first developed by Belrose, Inc. in the 2014 edition. They look back at the actual world and national production in 2010, include the estimated production for 2015, and forecast production five and ten years ahead, in 2020 and 2025. They should provide producers and investors with a useful guide to national and world supply conditions during the period when individual planting decisions will be reaching maturity. The forecasts were developed by analyzing trends in area, yields and production for individual countries. These results were then combined to make forecasts for major regions and for the total world. The forecasts for future years assume average yields. Actual production in 2020 or 2025 could deviate from these forecasts if yields are higher or lower than the average.

World: Apple Production Trends and Forecasts, Actual 2010, Estimated 2015 and Forecast 2020 and 2025

(1,000 metric tons)

Region or Country	2010, Actual	2015, Estimated	2020, Forecast	2025, Forecast
France	1,788	1,740	1,850	1,900
Italy	2,205	2,210	2,366	2,396
Poland	2,600	3,280	3,655	3,700
Other Europe	7,223	8,315	9,398	9,661
Total Europe	13,816	15,545	17,269	17,657
United States	4,215	4,561	5,535	5,900
Other North America	957	993	1,170	1,229
Total, North America	5,172	5,553	6,705	7,129
China	33,265	43,112	45,700	49,454
Turkey	2,600	2,740	3,185	3,400
Other Asia	8,186	9,586	11,553	12,293
Total, Asia	44,051	55,438	60,438	65,147
Total South America	4,201	3,797	4,434	4,607
South Africa	724	865	924	979
Total Oceania	748	840	1,004	1,067
Total Southern Hemisphere	5,673	5,502	6,362	6,653
Russian Federation	992	1,390	1,480	1,550
Other Producing Countries	882	1,599	1,640	1,672
WORLD TOTAL	70,586	85,027	93,894	99,808

The chief driver of expanded world production in the next decade is the turnaround that has taken place in the area of apples planted and harvested. In the decade leading up to 2008, apple area harvested had fallen steadily both in China and in the Rest of the World. However, between 2008 and 2013, world apple area harvested rose by 13 percent. The biggest increase was in China which expanded by 21 percent. However, orchardists in the Rest of the World also became more optimistic, increasing area harvested by 7 percent, that is a rate of more than one percent per year. Average yields have also been increasing in most major producing countries, due to higher density plantings, improved plant materials and better technology. Average yields in China are expected to reach 23 metric tons per hectare by 2025, 12 percent above present levels, and those in the rest of the World to exceed 18 metric tons, 24 percent above recent levels.

Using average yield assumptions, total world apple production is now expected to reach almost 100 million metric tons in 2025. Of course, in favorable years, yields will be above average, so world production could top 100 million metric tons even before 2025. Recent events have made long-term forecasting more hazardous than usual. The biggest risk relates to the Russian ban on fresh apple imports, especially form the European Union, and especially from Poland, formerly the major supplier of Russia. The Polish apple industry is likely to trim back its expansion plans if it suffers prolonged economic pain as a result of the Russian ban.

There are also major uncertainties surrounding China. For much of the last three decades, the trajectory of the Chinese apple industry has been strongly upwards. As recently as 2015, China was adding apple plantings and steadily increasing average yields. Most of the recent growth was driven by rising domestic demand. In addition, major exporting countries were expecting that further economic growth in China would translate into increased demand for imported apples. However, the rate of economic growth in China has begun to slow from its torrid double-digit pace. So far, measures taken by the Chinese government to restore the old rate of economic growth have not been successful. If Chinese domestic demand slows while apple production continues to increase, it will tend to drive down internal apple prices, and encourage the Chinese apple industry to again expand its exports of fresh apples and of apple juice concentrate.

If both Poland and China are forced to expand exports, it could drive down prices in many markets and affect demand for third country apples in those markets in the same way as happened between 1995 and 2005. Producers and marketers in many export-oriented countries could be forced to re-appraise their plans for continued expansion of apple production.

Shake-up Ahead for Apple Varieties

Just as important as the total volume of apples entering world markets will be the mix of apple varieties that make up that total. Changes in that mix reflect the outcome of the battle between the forces of inertia within the industry and the forces favoring disruptive change. Among the stabilizing forces are the relatively high cost and long life span of existing orchards. Producers will tend to stick with existing varieties as long as their variable costs in any year are covered in the hope that those fixed costs will be covered in more favorable price years. Some may be deterred by the risks involved in switching to a different variety. Even when they might prefer to switch, many lack the capital needed to cover the costs until a new planting reaches breakeven. Thus, there are very strong forces protecting the status quo. At the same time, progressive growers that have access to the needed capital have been able to earn premium prices from the introduction of newer varieties that disrupt existing markets. While the forces of inertia remain strong, the appeal of disruptive tactics has been growing.

In order to track the outcome of this battle, in previous issues of the World Apple Review we have identified four broad categories of apple varieties that stand to gain or lose as the battle rages. The categories are:

1. Traditional majors, defined to include Red Delicious, Golden Delicious and Granny Smith varieties that have been grown around the world for decades.

2. New majors, defined to include varieties that are now grown in many countries, and that have begun to supplant the traditional majors in the last two decades. These 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 districts or regions. For many reasons, from production ease to consumer acceptance, these have not been widely adopted outside their primary producing areas. Some have been "rediscovered" by producers elsewhere, or have been rehabilitated as "heirloom" varieties.

4. New varieties that are seeking to serve a particular retail or consumer niche, or that are seeking to disrupt the market segments dominated by traditional majors or new majors. For many years, efforts to establish new varieties were confined to a few progressive growers that were willing to invest the necessary time and money into establishing an unknown variety and mastering the intricacies of its production, storage, packing and marketing. However, many individual growers, packers, marketers or breeders are now aggressively seeking out and commercializing new varieties in order to capture the potential price premiums. The process has become a significant segment in most major producing countries.

A common characteristic of many new varieties is that their planting, production and marketing are tightly controlled by the sponsoring organization. This so called "principle of induced scarcity" implies that price premiums can only be maintained if supply is kept below current demand. The sponsoring organization aims to stimulate demand more rapidly than supplies can be made available. While the logic of the principle of induced scarcity is sound, applying it is tricky. Production from new blocks can be quite variable in both volume and quality from year to years depending on weather, unforeseen management problems in production, storage and packing.

In return for the promise of premium prices, the club managers levy fees on potential club members based on acreage planted, volume produced or marketing efforts planned. The earliest clubs were highly selective in the regions or producers that they would accept as members. They sought the "best" producers in the growing districts that had soil and climate conditions most suitable for the club variety. A number of worldwide commercialization networks have been set up that are highly selective in their choice of member producers, packers or marketers.

In general, when sponsoring organizations have found what they consider to be a winning new variety, they have sought to franchise the rights to a few major licensees. These, in turn, are allowed to accept a limited number of sub-licensees. Often, these too are in a few preferred locations around the world. In response to this selective system, many producing districts, and many individual producers, became concerned that they would be at a permanent disadvantage without one or more club varieties in their portfolio. In response, a number of major states and provinces set up programs either to breed new club varieties, or to find varieties developed elsewhere that could generate price premiums. Some of these programs, such as those in New York state or in Washington State in the United States have initially limited access to their new varieties to growers within their state.

Controlled production of club varieties has created a number of problems. One has been that the sponsors have considered information about the performance of their variety as proprietary, in terms of productivity, quality or price. This has made it difficult to compare the performance of different club varieties under different conditions. Because of the relatively small volume, few public agencies collect detailed price of shipment information on competing new varieties. In turn, the lack of data on competing new varieties makes it difficult for club sponsors to effectively manage "induced scarcity."

The continued proliferation of club varieties has also altered the marketing and promotion system for fresh apples. Many of the primary licensees for apple club varieties are major integrated grower-packer-marketers. Even though they usually supply their major retailer customers with a wide range of apple varieties, they are most likely to earn price premiums for their club varieties. They have also begun to offer select new varieties exclusively to one or more retailers for whole or partial seasons. Thus, they have a strong incentive to promote those premium varieties at the expense of traditional majors, new majors, or regional varieties. Those established varieties are more likely to become "orphan" varieties, that is varieties that are not the primary concern of any promotional organization. In addition, in many countries, there is no longer a marketing organization responsible for promoting consumption of fresh apples in general.

In turn, major retailers have begun to respond to the proliferation of new varieties by altering their apple stocking, merchandising and promotion strategies. In order to make way for newer, higher-priced varieties, shelf space is being reduced for weaker major varieties, including Red Delicious, Braeburn, Cameo and Jonagold. The once common practice of uniform retail prices for all major apple varieties is gradually fading away. Many retailers now group varieties in different price categories. For example, in the United States, Gala, Fuji and Granny Smith apples are often sold at standard prices, and Red Delicious and Braeburn at a discount to that standard price. In contrast, newer varieties like Ambrosia, Jazz and Pinova (Pinata) are sold at a 30 to 50 percent premium, and varieties like Honeycrisp and SweeTango at a 100 percent premium. Retailers have found that shoppers self select what price range fits their tastes and their budgets.

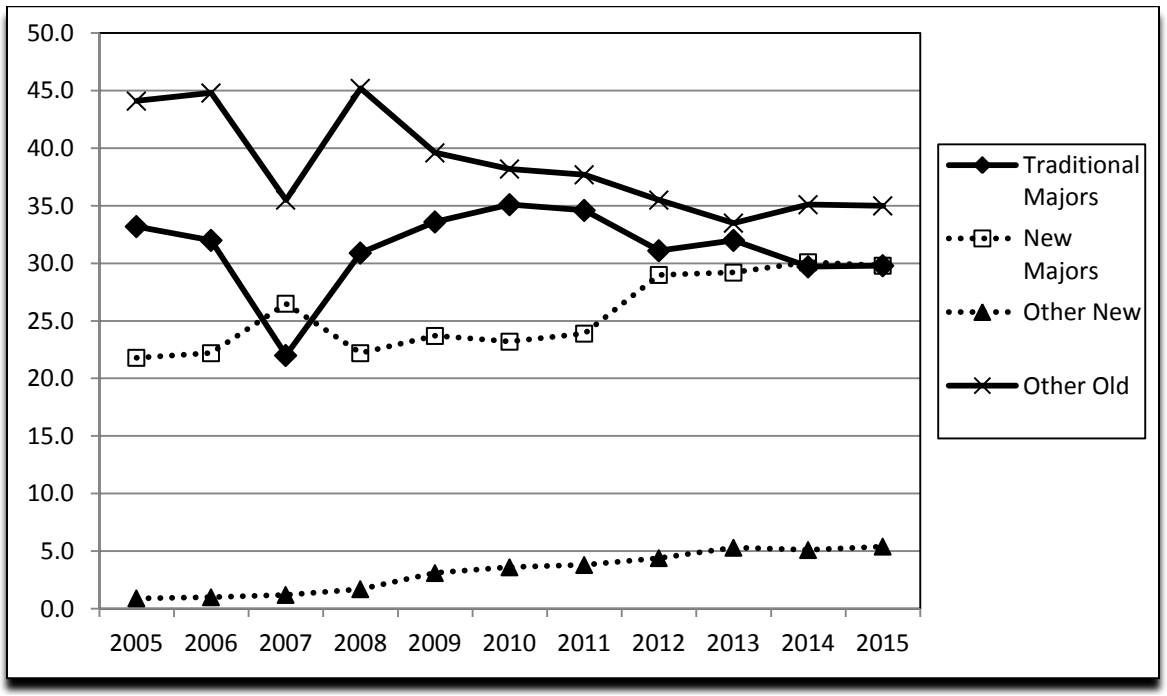
While many new varieties have emerged from managed breeding programs, others are the result of innovative marketing initiatives. For example, protected names are important marketing tools under European Union law. European places of origin, such as Pomme Limousin and Sudtiroler Apfel (apples from Limousin in France, or the South Tyrol in Italy), can be used to differentiate apples. The EU has been lobbying for such names to be protected by the EU's trading partners. The Braun organization in Italy has applied the Kiku brand name to a Fuji mutant that claims to be 20 percent sweeter than the traditional Fuji. It has licensed rights to the Kiku Fuji around the world. Some large marketers have attempted to create umbrella brands for their apples in the manner of Chiquita bananas or Dole pineapples. Other marketers have attempted to rebrand old varieties under a new name, for example, replacing the Cripps Red name with the Name "Joya" and targeting younger consumers. Such efforts are likely to increase as the consolidation among apple marketing firms increases.

Trends in Major Varieties

Data on past trends in apple varieties are available for a number of countries and regions, but are not always comparable in coverage, or easy to summarize on a global scale. Some countries report only the volume of major varieties produced, others report only fresh sales, still others, the volume exported fresh. There is little information available on new or minor varieties. Accordingly, the data are best used to indicate trends rather than precise measurements of different varieties.

The longest detailed series on apple varieties relates to 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, which had very large volumes of older, regional varieties, caused distortions. The chart below shows trends between 2005, after the last major enlargement of the EU took place, and 2015, the year of the latest data. It groups apple varieties into the four categories, traditional majors, new majors, other new, and other old (a category that includes older, regional varieties).

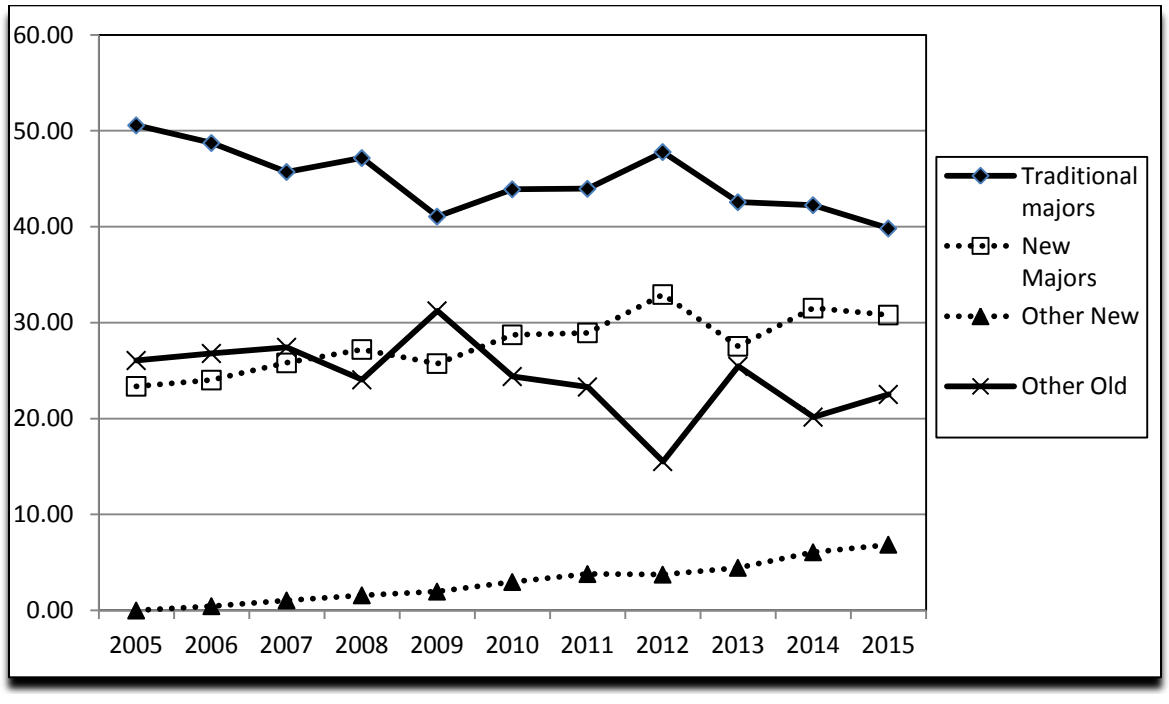
European Union: Apple Production, by Major Categories of Varieties, 2005-2015
(percent)



For the enlarged EU-28, a number of trends are apparent since 2005. The share held by the new majors (like Gala) rose from about 22 percent in 2005 to almost 30 percent in 2015. The share of other new varieties, such as Pinova, Kanzi and Red Jonaprince, rose from less than one percent to more than 5 percent in the decade. The share of the traditional majors like Golden Delicious was quite resilient, falling by only 3 percentage points in the decade to about 30 percent. The biggest loser was the other old varieties category. It lost 9 percentage points in the decade, but was still the largest category in 2015. The ascent of the two newer apple categories appears to have slowed since 2012. It is not clear how much of this has been due to the difficult economic conditions in Europe, which might have inhibited new plantings, or to other factors.

A similar breakdown is presented in the chart below for the United States for the same recent period. In 2005, the traditional majors had a slightly larger share in the United States than in the EU, while the other older varieties had a smaller share. However, the trends in the United States have been similar to those in the EU.

United States: Apple Production, by Major Categories of Varieties, 2005-2015
(percent)



The share for the new majors in the U.S. has risen more gradually than in the EU, but has hovered around 30 percent for the last six years, almost identical to the experience in the EU. The share of Other New varieties has grown slightly faster than in the EU. Not surprisingly, then, the share of other older varieties has been very substantially lower than in the EU. It has fallen by almost 10 percentage points between 2009 and 2015.

Trends in apple varieties in these two major markets, the EU and the United States, have had many similarities. Clearly, similar forces were at work. The forces of inertia have been stronger in Europe, partly because of the lack of capital for change in Eastern Europe. The disruptive forces have also been similar. Many of these have come from Southern Hemisphere suppliers, especially New Zealand, that introduced varieties like Gala, Fuji and Braeburn, that rapidly won favor among European and American consumers, and earned substantial premiums over traditional favorites like Golden Delicious and Red Delicious. Progressive European and American suppliers adopted many of these newer varieties in self-defense.

Current trends in apple varieties in the Southern Hemisphere could provide early warnings of future disruptions ahead. The following three tables show trends in apple varieties in Chile, South Africa and New Zealand.

Chile: Apple Exports, by Major Varieties, Selected Three-Year Averages, 1991-94 to 2012-14

(percent)

Variety	1991-94	1996-99	2001-04	2006-09	2012-15
	(%)	(%)	(%)	(%)	(%)
All Red Delicious	58.8	45.2	32.5	22.0	13.7
All Golden Delicious	0.2	0.3	0.5	0.4	0.0
All Granny Smith	38.4	27.9	18.8	17.0	12.8
Gala	0.8	16.7	30.1	39.5	46.1
Fuji	0.2	4.9	7.2	7.2	7.6
Braeburn	0.1	3.7	5.0	4.4	2.2
Cripps Pink/Pink Lady	0.0	0.0	3.9	7.4	13.5
Newer Varieties	0.0	0.0	0.0	0.0	2.7
All Other	1.5	1.3	2.9	2.1	1.5
TOTAL	100.0	100.0	100.0	100.0	100.0

Because its apple producing areas are spread over many different micro-climates, Chile has the ability to successfully produce many different varieties. Although it has limited capacity to breed its own apple varieties, it has responded rapidly to signals from major markets of changing preferences for different varieties. The table above shows the percent of Chilean exports of major varieties or variety groupings for three-year periods from 1991-94 to 2012-15. Over the two decades, there has been a dramatic decline in production and exports of Red Delicious type apples, and of Granny Smith apples, and an equally dramatic growth in the Gala share. The share for Cripps Pink/ Pink Lady, Fuji, and miscellaneous new varieties (like Ambrosia, Honeycrisp, Jazz and Pinova), has also continued to grow. The share for Braeburn reached 5 percent in the 2001-04 period, but has fallen since.

Plantings data by variety have been available for both South Africa and New Zealand. South African data are presented in the table below for the calendar years from 2005 to 2014. In contrast to Chile, plantings of traditional majors like Golden Delicious and Red Delicious types (including Topred, Starking and Oregon Spur) have retained share, while that of Granny Smith has fallen less dramatically. In addition, the growth of new majors like Royal Gala/Gala, Fuji and Cripps Pink/ Pink Lady has been more modest. The Braeburn share of plantings peaked at less than 4 percent. The share of innovative new varieties remains small. Part of the inertia in South Africa relates to the needs of a large domestic market. Innovation is mostly focused on increasing competitiveness in international markets.

South Africa: Apple Plantings, by Calendar Year, 2005-2014
(percent)

Variety	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	(%)		(%)		(%)	(%)	(%)	(%)	(%)	(%)
Golden Delicious	22.4	21.8	25.5	25.4	25.2	24.9	24.5	24.5	24.8	24.6
Granny Smith	26.2	25.5	24.9	24.4	23.4	22.2	21.4	20.2	18.7	18.4
Royal Gala/Gala	11.5	11.7	13.7	13.7	14.1	14.7	15.0	15.5	15.9	16.1
Braeburn	3.1	3.3	3.4	3.4	3.4	3.5	3.4	3.3	3.3	3.1
Fuji	3.7	4.0	4.4	4.9	5.6	6.3	7.1	7.6	8.2	8.3
Cripps Pink/Lady [1]	6.4	6.7	7.1	7.1	7.7	8.9	9.3	9.4	9.8	9.8
Cripps Red/Joya	0.0	0.0	2.1	2.1	2.1	2.0	1.9	1.9	2.3	2.7
Topred/Starking	12.6	14.9	15.6	15.5	15.0	14.3	13.9	13.8	13.0	12.9
Oregon Spur	0.0	0.0	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0
Kanzi	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.7	0.9
Other	14.1	12.1	2.1	2.3	2.3	1.9	2.1	2.2	2.2	2.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Includes Rosy Glow.

As previously noted, New Zealand has for decades sought to produce apple varieties that can obtain a premium in international markets sufficient to overcome the transportation cost disadvantages it faces. Current plantings, shown in the table below, reflect both past efforts to develop such premium varieties, and ongoing innovations. With the exception of a small and declining share of Granny Smith apples, New Zealand has no remaining plantings of the traditional majors. It also has a small and declining share of Cox's Orange apples that were once popular in the British market. Gala, Braeburn and Fuji represent past waves of innovation. Their combined share has shrunk from over 70.4 percent in 2005 to 53.2 percent in 2015, but the industry would like to see that share continue to fall.

In the last decade, much of the effort at innovation was focused on the Pacific Series of apples and on the Jazz and Cripps Pink/Pink Lady varieties. While many of these varieties initially showed promise, only the Pacific Queen still had increasing plantings in 2015. The Jazz share of plantings peaked in 2011, and has fallen modestly since, while that of Cripps Pink/ Pink Lady peaked in 2013. The most impressive gains have been in production of other miscellaneous varieties that have not been separately identified. They include both selections developed by the Prevar program, like Smitten, and selections from private breeders, like Koru. The New Zealand apple industry continues to make strenuous efforts to find winning, new varieties, but its recent experience reflects just how difficult a strategy that is to implement successfully.

New Zealand: Apple Plantings, by Calendar Year, 2005-2015
(percent)

Variety	2005	2007	2009	2010	2011	2012	2013	2014	2015
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Granny Smith	3.5	3.4	3.3	3.1	3.0	3.1	2.9	2.8	2.5
Cox	3.7	3.6	3.3	2.9	2.8	2.4	2.1	1.8	1.6
Gala	31.5	33.0	29.9	28.0	28.6	28.5	28.5	27.7	27.9
Braeburn	29.4	28.3	24.0	21.7	20.5	19.1	18.0	16.4	15.6
Fuji	9.5	9.5	10.6	10.8	11.5	11.2	10.8	9.9	9.7
Cripps Pk/Lady	3.2	2.8	4.2	4.6	5.1	5.4	5.5	5.3	5.3
Jazz	2.7	6.6	10.8	11.3	11.6	11.3	10.8	10.3	9.9
Pacific Beauty	3.3	2.0	1.8	1.6	1.5	1.4	1.3	1.1	1.0
Pacific Queen	3.3	2.5	2.6	3.0	3.4	4.2	5.4	7.4	8.5
Pacific Rose	7.6	6.0	5.0	4.8	4.7	4.8	4.7	4.5	4.2
Other	2.3	2.3	4.5	8.2	7.3	8.6	10.0	12.8	13.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Future World Apple Variety Trends

The previous section has shown that decisions about plantings or removals of apple orchard blocks are the result of the offsetting forces of inertia and progressiveness. The forces of inertia are strongest when overall revenues are low, costs high and profit margins slim. When the opposite occurs, producers and investors become more progressive. In choosing what varieties to plant or remove, producers and investors are also strongly influenced by the relative profit margins from specific varieties. Individuals that see a wide gap between profit margins for existing varieties and those for newer varieties are more likely to invest in newer varieties.

The actual investment decisions can be affected by the availability of suitable land and adequate capital, and by growers' ability to access the desired trees. Often discrepancies arise in specific varieties between the volume of trees demanded by growers and the volume available from nurseries. There may be waiting periods of one or more seasons before the desired trees are available. In some cases, market conditions, or growers' circumstances, can have changed by the time the trees are available. Thus, in normal conditions, matching supply and demand for new trees can be an imperfect process.

The growing importance of club systems for new varieties can also affect grower decisions. Many club sponsors are quite selective in the licensees they choose to manage commercialization of their new variety in different regions. In turn, these licensees are quite selective about which growers will be chosen to plant a new variety, and about the number of trees they will be willing to allocate to any single grower. In general, those growers will be favored that already have a relationship with the licensee. So, the club system both restricts the supply response of individual growers and affects the future growth in production of the selected variety. This has made it even more difficult to forecast future trends in production of different apple 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 was excluded because up to 70 percent of its massive production continues to be in a single variety, Fuji. Inclusion of China would have distorted the market shares for all other varieties in the rest of the world. Data on past production and on new plantings of different apple varieties were acquired from many different sources and placed on a standardized basis so future projections could be compared with past experience.

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

Rank	Variety	2010 Actual	2015 Estimated	2020 Forecast	2025 Forecast
1	Golden Delicious	16.37	15.92	15.48	14.61
2	Delicious	16.63	15.22	14.99	14.55
3	Gala/Royal Gala	11.53	12.78	13.03	**13.30**
4	Fuji	6.88	7.17	6.98	6.88
5	Idared	3.20	4.80	4.10	3.80
6	Granny Smith	2.69	2.99	2.67	2.46
7	Jonagold	2.50	2.63	2.88	2.70
8	Cripps Pink/Pink Lady	1.81	2.23	2.13	2.15
9	Braeburn	2.03	1.72	1.74	1.63
10	Jonathan	1.44	1.21	1.39	1.27
11	Jonagored	0.83	1.53	1.74	**1.75**
12	McIntosh	1.11	0.98	0.88	0.80
13	Elstar	1.19	1.14	1.11	1.03
14	Rome Beauty	0.85	0.70	0.65	0.57
15	Gloster	0.42	0.57	0.62	0.59
16	Honeycrisp	0.27	0.88	1.20	**1.37**
17	Empire	0.46	0.35	0.37	0.34
18	Tsugaru	0.46	0.46	0.42	0.41
19	Ohrin	0.57	0.41	0.42	0.40
20	Reinette	0.34	0.39	0.28	0.27
21	Melrose	0.25	0.36	0.32	0.31
22	Spartan	0.31	0.34	0.30	0.28
23	Cortland	0.37	0.24	0.29	0.26
24	Boskop	0.26	0.29	0.25	0.22
25	Jazz	0.27	0.33	0.36	**0.41**
26	York	0.25	0.25	0.21	0.20
27	Bramley	0.31	0.16	0.21	0.19
28	Northern Spy	0.15	0.09	0.13	0.13
29	Pinova	0.02	0.27	0.31	**0.36**
30	Cox's Orange	0.36	0.17	0.19	0.16
31	Red Jonaprince	0.00	0.26	0.36	**0.44**
32	Pacific Rose	0.12	0.25	0.26	**0.26**
33	Sundowner	0.12	0.13	0.12	0.11
34	Stayman	0.13	0.10	0.07	0.06
35	Cameo	0.16	0.11	0.11	0.09
36	Lobo	0.21	0.10	0.12	0.11
37	Hokuto	0.08	0.08	0.07	0.08
38	Ambrosia	0.06	0.09	0.13	**0.14**
39	Senshu	0.07	0.10	0.09	0.08
40	Mutsu	0.10	0.10	0.09	0.08
41	R.I. Greening	0.07	0.03	0.03	0.03
42	Winesap	0.03	0.01	0.01	0.01
43	Ingrid Marie	0.04	0.04	0.03	0.03
44	Newton	0.05	0.01	0.03	0.02
45	Kanzi	0.00	0.03	0.05	0.07
-	All Other	18.37	17.85	19.22	**21.76**
-	TOTAL	100.00	100.00	100.00	100.00

The table on the previous page shows the share of production accounted for by 45 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 market accounted for by any single apple variety changes slowly over time. One result is that a small number of varieties will continue to dominate apple supplies outside China. For example, the top ten varieties in 2012 accounted for 65.1 percent of apple production in 2010, and an estimated 66.7 percent in 2015, and are projected to account for 65.4 percent in 2020 and 63.4 percent in 2025. In 2025, Golden Delicious and Red Delicious are forecast to remain the two leading varieties, with only Gala/Royal Gala coming anywhere close in market share.

However, considerable change is likely to continue to occur. In addition to Gala/Royal Gala, seven other varieties are forecast to achieve record market shares in 2025, Jonagored, Honeycrisp, Jazz, Pinova, Red Jonaprince, Pacific Rose and Ambrosia. Their combined share in 2025 is forecast at 4.73 percent, three times that in 2010 of 1.57 percent. The category of "All other varieties", which includes miscellaneous new varieties, was also forecast to set a new record in 2025. Thus, many sponsors of new varieties will experience substantial changes in the next decade. Most of their increases will come at the expense of established varieties. However, this shift to new varieties will be slowed by the quantity controls now applied by most club managers. It is only after proprietary varieties go off patent that growers anywhere are free to plant them. By that time, newer club varieties will be broadcasting their ability to sustain price premiums.

Apple Varieties in China

The mix of apple varieties in China continues to be dominated by Fuji which have been particularly suited to Chinese growing conditions. USDA, FAS estimates suggest that in 2015 Fuji still accounted for 66 percent of all apples produced in China. Fuji also dominates Chinese exports of fresh apples. China also produces varieties similar to western varieties of Red Delicious, Golden Delicious, Gala and Jonagold, although different Chinese names can cause confusion. Some processors made efforts to expand production of Granny Smith because they needed an apple that was more tart than Fuji for apple juice blends, but that effort remains tiny relative to total production, There have also been recent licensed plantings of Cripps Pink/ Pink Lady, but that effort is in its infancy. Concerns about protection of intellectual property have discouraged many club sponsors from licensing their proprietary varieties in China. Many will be watching the Cripps Pink experiment with interest. However, it will be several years before any of those initiatives alter China's apple variety mix significantly.

The Hunt for New Winning Varieties

The hunt for winning, new apple varieties has heated up around the world in recent years, and shows no sign of cooling off. The belief is still widespread among industry leaders that their operations cannot be sustained profitably with the typical returns from mainstream varieties. There is also much past experience with previous new varieties whose early premiums faded as the volume of supplies increased. However, public and private breeding programs, and individual growers continue to search for that apple variety that will have greater appeal to consumers than the hundreds of varieties already readily available. There are no good data on the amount of money being invested in the hunt for new varieties, or independent assessments of the payoff from those investments.

However, there are numerous forces driving further investment in new varieties. One is the stunning success of varieties like Honeycrisp. Growers of Honeycrisp can see from their own accounts the exceptional contribution that a high-priced apple like Honeycrisp can make to their profitability. So, growers are eager to find the "next Honeycrisp" even though they have no good measure of the likelihood of that occurring. Second, marketers have recognized that having exclusive rights to a new variety can give them leverage in winning the business of large retail chains. A number have also made new varieties even more exclusive by making them available to only one retail chain, or for limited time periods. Larger marketers can gain an edge in the market because they can afford to outbid rivals for the rights to produce or market a promising new variety. Finally, many retailers want exclusive access to new varieties as a way to add excitement to their produce shelves and to distinguish themselves from rival retailers. Unfortunately, few retail buyers appreciate the lengthy gestation period, and formidable costs and risks, involved in discovering and commercializing a new apple variety. Their expectations can easily get out of step with the realities.

As previously noted, another negative aspect of the emphasis on new varieties is that the marketing effort behind the mass of mainstream varieties is often reduced. In developed countries, where apple consumption is already slipping, this could contribute to further erosion of the total apple category. In addition, retailers either have finite display areas for fresh apples, or are moving towards smaller stores. In either case, for each new variety placed on their shelves, an established variety may have to be displaced. Increasingly, that decision is being based on objective measures of each variety's contribution to store sales or gross margins. That process may lead to further erosion of the market share of traditional varieties.

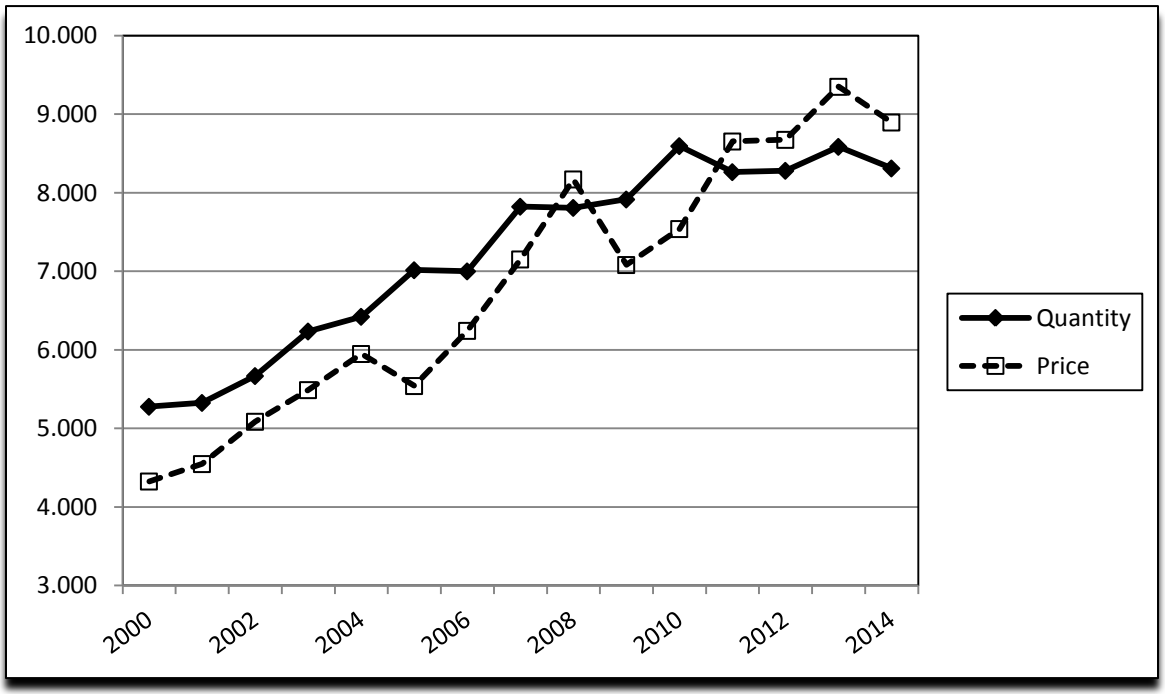
III. World Trade in Fresh Apples.

World Apple Trade Growth Slows

World trade in fresh apples was on a strong upward path between 2000 and 2010. However, since 2010, the volume of exports has moved sideways, and has averaged close to 8.4 million metric tons. That slowdown has coincided with the general slowdown in the world economy after the Great Recession hit in 2008. The share of world apple production exported also rose steadily between 2000 and 2010, but has slipped since.

World: Exports of Fresh Apples, Calendar Years, 2000-2014

(volume, million metric tons, and average price, US$100 per metric ton)



The chart above shows the trend in the volume of world exports and in the average price of those exports for the calendar years between 2000 and 2014. Surprisingly, the change in export volume and in export price was in the same direction in nine of the 14 years examined. Intuitively, one would expect that when the volume of exports rose, the price would fall. This chart suggests that average price was not a significant factor in influencing the level of world exports of fresh apples.

One major factor that changed during this period was the level of Chinese fresh apple exports. Prior to 2005, China expanded its fresh apple exports in many markets using a low price strategy. In 2005, the Chinese government began to allow the value of the Chinese yuan to rise against other currencies. At the same time, because of rapidly rising incomes, there was a surge in domestic Chinese demand for fresh apples. Together, these factors raised the price and lowered the volume of Chinese fresh apples being exported. Even though much of the expansion in world apple production has been in other countries that must export large surpluses of fresh apples, since the Great Recession, many importing countries have introduced temporary protectionist measures to reduce imports of non-essential items like fresh apples, either to protect domestic fruit producers or to save scarce foreign exchange.

Exporters Jostle at the Top

The table below shows the top ten exporters of fresh apples for the calendar years from 2009 to 2015. Countries like Belgium and the Netherlands, that re-export most of their imports, were not included. There have been considerable swings in ranking and in volume between 2009 and 2015, and in the two most recent years. Seven of the top ten fresh apple exporters enjoyed growth in exports between 2009 and 2015. In contrast, only six of the top ten enjoyed growth since 2013.

Top Ten Fresh Apple Exporters, 2009-2015
(metric tons)

Country	2009	2010	2011	2012	2013	2014	2015p
	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)
Poland	777,071	728,500	532,058	941,678	1,216,294	1,026,593	*888,801*
China	1,171,805	1,122,953	1,034,635	975,878	994,664	865,048	*833,356*
Italy	732,794	856,596	976,131	933,361	787,795	974,847	*1,143,885*
United States	816,167	790,376	826,438	870,185	890,463	888,632	*983,842*
Chile	678,629	842,668	801,167	761,984	833,251	820,184	*628,248*
France	611,279	695,760	726,609	625,943	542,921	695,865	*633,761*
South Africa	338,829	307,783	333,435	580,992	482,435	381,865	*455,000*
New Zealand	302,854	284,187	296,931	309,464	350,011	336,785	*328,887*
Argentina	207,196	180,309	234,148	132,117	163,598	144,418	*130,000*
Turkey	59,791	80,569	87,303	68,916	125,682	111,543	*140,000*
Top Ten	5,510,015	5,890,501	5,848,855	6,100,518	6,387,114	6,245,780	6,165,780
World Total	7,915,471	8,594,174	8,262,926	8,280,054	8,584,796	*8,310,087*	*8,400,000*
Top Ten %	69.6	68.5	70.8	74.9	74.4	*75.2*	*73.4*

Poland replaced China as the world's leading fresh apple exporter in 2013, but was itself surpassed by Italy in 2015. The United States moved into second place behind Italy in 2015, ahead of both Poland and China. This represents a very significant change in the export rankings. Chile and France retained their position among the top six exporters in 2015, but at considerably lower volume than in some previous years. While Chile has the potential to bounce back as a force in exporting, France has been in long-term decline. Exports from South Africa have the potential to exceed 600,000 metric tons within the next few years. Among the remaining three countries in the top ten, New Zealand and Turkey appear headed for future growth. However, the apple industry in Argentina has suffered from many recent setbacks. Even if the Macri government is successful in pushing through its planned reforms, it will take some time for Argentine exports of fresh apples to regain their upward momentum.

By early 2016, China was showing evidence that it was reaching a new turning point in its exports of fresh apples. Economic slowdown in China threatens the future growth of domestic demand for many products. It could once again become judicious for the Chinese apple industry to increase its exports of both fresh apples and of apple juice concentrate. For the first six months of the 2015-2016 season, from September 2015 to February 2016, fresh apple exports were up by 37 percent, and exports of apple juice concentrate by 48 percent. Annual exports were running at a rate of 1.14 million metric tons of fresh apples, and 694,000 metric tons of apple juice concentrate, both the highest level since 2010. This could have a disruptive effect on many export markets depending on what pricing strategy Chinese exporters follow and what key markets they target.

The major fresh apple exporting countries were widely disperse geographically. After omission of Belgium and the Netherlands, three of the top ten were in Europe, two were in Asia, one in North America, and four in the Southern Hemisphere. While all three European countries are members of the European Union and trade heavily within the EU, the other leading exporters are unlikely to be affected by common factors such as weather or economic or political regulations. Thus, there exports are almost all net additions to total world supplies.

The concentration of world exports of fresh apples has been rising over time. The top ten accounted for less than 70 percent of world exports in 2009 and 2010. By 2014, their share is estimated to have exceeded 75 percent.

Instability Among Major Importers

The table below shows the volume of fresh apple imports from the top ten importers, ranked by the volume in 2014, for the calendar years from 2009 to 2015. As with exporter data, the data for importers are preliminary estimates for 2015. However, the table should provide a relatively accurate picture of trends for individual importing countries. While the Russian Federation is likely to remain the world's top importer of fresh apples in 2015, its level of imports could be 40 percent below the peak level in 2013, and its advantage over the next largest importers has been shrinking. Russia's imports have been affected by the embargo Russia placed on its major EU suppliers in 2014, falling demand within Russia as the economy has slumped, and the shrinking purchasing power of Russian importers because the value of the Russian ruble has plummeted by half. Germany has remained clearly in second place, and the United Kingdom in third place, far ahead of all other major fresh apple importers.

As in the case of the top ten exporters, Belgium and the Netherlands have been excluded because most of their imports are not for internal consumption, but for re-export to other European countries.

Top Ten Fresh Apple Importers, 2009-2015
(metric tons)

Country	2009	2010	2011	2012	2013	2014	2015p
	(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	800,000
Germany	622,564	621,502	672,823	593,485	658,423	687,832	641,882
United Kingdom	455,671	400,722	459,187	476,525	479,540	446,026	426,454
Spain	238,712	253,496	244,081	223,046	239,415	247,167	232,268
Mexico	222,209	221,301	198,481	235,893	274,978	235,502	306,402
Canada	182,119	191,717	198,618	202,608	233,589	222,140	212,337
United States	155,775	191,579	147,789	183,453	198,746	207,994	153,277
UAE	158,680	155,753	149,763	156,720	172,726	205,192	180,000
India	98,895	93,264	179,015	186,368	194,335	204,570	193,692
Saudi Arabia	50,747	176,572	181,280	187,139	189,295	195,000	175,000
Top Ten	3,293,577	3,310,081	3,588,761	3,723,788	3,993,394	3,701,295	3,321,312
World Total	7,504,227	8,302,899	8,095,873	8,386,623	8,613,231	*8,400,000*	*8,500,000*
Top Ten %	43.9	39.9	44.3	44.4	46.4	44.1	39.1

Further down the list, a number of countries have shown wide fluctuations in volume and rankings of imports from year to year. Of the top ten importers, six had bigger imports in 2015 than in 2009, while only one had bigger imports in 2015 than in 2013. The fastest rate of growth between 2009 and 2015 was for Mexico (up 38 percent), India (up 96 percent), and Saudi Arabia (up 245 percent). Vietnam has also seen surges of imports in some years. Two countries in Eastern Europe, Belarus and Lithuania have reported imports far from their historical norms. Belarus' imports were reported at 414,655 metric tons in 2014 and 731,118 metric tons in 2015. Lithuanian imports were reported as 110,318 metric tons in 2014 and 427,583 metric tons in 2015. These levels of imports are inconsistent with the populations and per capita income levels in Belarus and Lithuania. Presumably, these volumes represent fresh apples destined through unofficial channels for the Russian market. As long as the present Russian embargo on fresh apple trade is in place, trade statistics for Eastern European countries will continue to be distorted, and to be unreliable indicators of trade flows.

Strategies of Major Exporters

Since detailed world trade flows for fresh apples 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, 2014 and 2015, for the European Union, and for the eight largest individual apple exporting countries.

The table on the next page compares exports by China, the United States, and the total for all EU-28 member countries. Together, these three suppliers accounted for over 70 percent of all world exports of fresh apples. In any year, the EU-28 supplies twice as large a volume of fresh apple exports as do China and the United States combined. However, between 55 and 60 percent of EU-28 exports in any season include transactions between member countries within the EU-28 single market. Exports to the rest of the world are much closer in volume to those of China and the United States.

In general, each of the three major exporters focused on different primary destinations. For example, China shipped over 86 percent of its fresh apple exports to other Asian countries in 2014 and 2015. While the United States served more varied destinations, over 40 percent of its shipments went to its NAFTA partners, Mexico and Canada. the EU-28 sent over 50 percent of its third country exports to other countries in Europe.

China, United States and EU-28: Destination of Fresh Apple Exports, 2014 and 2015
(metric tons)

Destination	China 2014	China 2015	U.S. 2014	U.S. 2015	EU-28 2014	EU-28 2015
Germany	0	7	0	0	633,837	645,727
United Kingdom	683	609	8,614	6,181	216,685	211,941
Other EU-15	350	207	1,120	397	906,648	1,042,703
NMS	23	0	21	63	349,675	648,548
Total EU-28	1,056	823	9,774	6,641	2,106,865	2,548,919
Other Western Europe	396	397	1,002	533	51,995	56,072
Russian Federation	89,066	85,660	4,394	0	506,761	51,424
Other Europe	1	0	107	0	436,078	803,746
Europe, exc EU-28	89,463	86,057	5,503	533	994,834	911,242
Canada	2,447	1,661	140,219	141,820	971	2,307
Mexico	0	0	235,966	305,092	0	0
United States	0	112	0	0	802	205
North America	2,447	1,773	376,185	446,912	1,773	2,512
Central America	404	28	61,591	77,408	911	1,477
Southern Hemisphere	510	921	29,052	23,980	35,077	20,034
Middle East	23,919	18,411	92,630	94,670	196,290	226,180
Africa	1,327	995	4,723	1,369	381,899	442,251
Middle East & Africa	25,246	19,406	97,353	96,039	578,189	668,431
North Asia	52,671	64,372	110,978	126,626	10,682	8,003
Southeast Asia	391,152	393,909	128,068	95,708	23,487	22,125
South Asia	213,254	202,953	63,151	109,041	13,781	22,203
Other Asia	88,881	63,093	95	60	74,643	88,441
Total Asia	745,958	724,327	303,357	331,435	122,593	120,862
All Other	11	844	1,775	894	1,579	11,716
TOTAL	865,095	833,356	882,937	983,842	3,841,821	4,285,193

The main destinations where all three giant exporters locked horns were in Asia, the Middle East and Africa. China was the market leader in Southeast Asia and South Asia, the United States in North Asia, and the EU-28 in Other Asia, the Middle East and Africa.

The Russian embargo caused all three to re-direct some of their export efforts in 2015. The EU-28 was most affected. Exports to Russia fell by almost 90 percent, while exports to other European countries rose by 84 percent. Exports to the Middle East and Africa rose by over 15 percent. Even though China was not barred from the Russian market, its exports there fell by about 4 percent as Russian purchasing power fell. However, China faced lower total exports, so it tended to reduce supplies to many different markets.

The United States made its biggest percentage gains in 2015 in South Asia, Mexico and Central America. None of the big three made much headway in selling to the Southern Hemisphere in 2015. Even with the EU-28's need to find alternative markets to Russia, its exports to the Southern Hemisphere actually fell by 43 percent. Many import markets in the Southern Hemisphere were suffering from depressed economic conditions, while Southern Hemisphere exporters continued to provide formidable competition.

The table on the next page compares fresh apple exports in 2014 and 2015 for the three leading exporters within the EU-28, France, Italy and Poland. France and Italy have been leading exporters for decades and have long-established trade links with many countries. In contrast, exports from Poland have grown rapidly, but quite erratically, over the last decade. Both France and Italy have focused heavily on richer Western European markets, both those within the EU and independent countries like Switzerland and Norway. Italy has long been the dominant supplier to Germany, and France to the United Kingdom. With a larger crop in 2015, Italy expanded exports aggressively in the new member states (NMS) of the EU in Eastern Europe, and in South Asia, the Middle East and Africa. With a smaller crop in 2015, France reduced exports to most of its traditional markets. In both cases, exports to Russia fell dramatically.

Poland was hardest hit by the Russian embargo. It exported 676,316 metric tons, 55 percent of its total fresh apple exports, to Russia in 2013. Just about 100 metric tons of exports to Russia were reported in 2015. In response, Poland increased exports dramatically to the NMS countries in Eastern Europe, and modestly to other Eastern European countries.

All three countries, France, Italy and Poland, have made strenuous efforts to get more rapid access to other markets where they were previously hindered by tariffs, quotas or licensing requirements. Until the impasse with Russia is resolved, they will become increasingly aggressive players in many distant markets.

France, Italy and Poland: Destination of Fresh Apple Exports, 2014 and 2015
(metric tons)

Destination	France 2014	France 2015	Italy 2014	Italy 2015	Poland 2014	Poland 2015
Germany	60,755	57,092	282,539	304,561	91,621	69,479
United Kingdom	123,127	117,328	28,827	33,190	10,838	5,446
Other EU-15	278,747	271,205	201,890	249,237	67,340	66,697
NMS	3,278	5,734	82,138	125,827	135,637	318,557
Total EU-28	465,907	451,359	595,394	712,816	305,436	460,179
Other Western Europe	2,208	1,701	35,479	37,693	4,128	5,416
Russian Federation	19,046	0	26,328	133	400,780	116
Other Europe	417	7	13,202	23,703	311,369	341,993
Europe, exc EU-28	21,271	1,708	75,009	61,529	716,277	347,525
Canada	379	976	228	921	1	207
Mexico	0	0	0	0	0	0
United States	169	71	625	121	0	0
North America	548	1,047	853	1,042	0	207
Central America	293	232	411	425	17	0
Southern Hemisphere	6,363	3,520	10,024	4,173	0	57
Middle East	71,094	69,082	91,798	114,318	2,775	3,123
Africa	99,260	77,862	194,519	232,381	6,825	16,913
Middle East & Africa	170,354	146,944	286,317	346,699	9,600	20,036
North Asia	9,056	6,308	547	305	536	110
Southeast Asia	21,316	18,850	906	1,107	216	323
South Asia	4,728	2,391	4,031	11,804	39	1,348
Other Asia	579	338	484	509	63,917	58,959
Total Asia	35,679	27,887	5,968	13,725	64,708	60,740
All Other	929	1,064	872	3,476	17	57
TOTAL	701,344	633,761	974,848	1,143,885	1,096,055	888,801

The fresh apples displaced from the Russian market because of the embargo are likely to lead to more direct confrontation between the major Northern Hemisphere suppliers and their Southern Hemisphere counterparts. Recent exports for the top three Southern Hemisphere fresh apple exporters are shown on the next page.

Chile, New Zealand and South Africa: Destination of Fresh Apple Exports, 2014 and 2015
(metric tons)

Destination	Chile 2014	Chile 2015	N Zealand 2014	N Zealand 2015	S Africa 2014	S Africa 2015 p
Germany	7,031	6,592	11,938	8,867	3,130	7,303
United Kingdom	41,152	25,373	45,323	47,236	65,218	79,917
Other EU-15	113,633	78,362	84,219	63,004	21,475	10,215
NMS	609	559	338	62	18	81
Total EU-28	162,425	110,886	141,818	119,169	89,841	97,516
Other Western Europe	5,594	4,171	1,145	1,392	1,190	1,421
Russian Federation	15,202	26,076	9,093	7,821	4,512	n.a.
Other Europe	0	0	0	0	1,115	78,413
Europe, exc EU-28	20,796	30,247	10,238	9,213	6,817	n.a.
Canada	18,855	10,528	8,302	5,481	316	1,683
Mexico	4,861	1,827	179	686	0	0
United States	119,574	78,290	44,306	31,356	0	22
North America	143,290	90,645	52,787	37,523	316	1,705
Central America	32,509	26,271	134	177	0	0
Southern Hemisphere	267,748	220,815	6,493	5,732	2,447	n.a.
Middle East	58,603	58,875	14,256	22,202	24,756	n.a.
Africa	8,877	6,434	293	528	181,746	25,020
Middle East & Africa	67,480	65,309	14,549	22,730	206,502	n.a.
North Asia	73,029	62,829	36,456	54,270	6,156	3,072
Southeast Asia	3,249	841	53,194	55,793	57,335	56,052
South Asia	48,775	20,083	13,442	23,651	11,366	1,726
Other Asia	18	42	1,841	0	1,027	n.a.
Total Asia	125,071	83,795	104,933	133,714	75,884	n.a.
All Other	632	280	5,833	629	123	n.a.
TOTAL	819,951	628,248	336,785	328,887	381,930	455,000

Since neither Chile, New Zealand or South Africa were included in the Russian ban, they continued to be free to sell in the Russian Market. Thus, they were impacted as much by the indirect effects as other suppliers encroached on their traditional markets.

While all three countries have sought to diversify their markets, Chile has generally been the most successful. It has a strong presence in Western Europe, North America, the Middle East and Asia, and a dominant position in Southern Hemisphere markets, especially in Latin America. Although total exports were lower in 2015, its exports to Russia rebounded strongly in 2015.

Because of its focus on premium-priced markets, New Zealand has tended to be more selective in which markets it serves. Its biggest percentage gains in 2015 were in the Middle East, North Asia and South Asia. In contrast, South Africa remains heavily dependent on the United Kingdom, but has built a dominant position in many African markets where its main competition comes from European countries in their former colonies. In Asia, South Africa has been most successful in the Southeast Asian market.

Changes in World Import Markets

Detailed data on trends in world imports of fresh apples are not available in a timely manner. However, since the EU-28 remains the dominant world importer of fresh apples, EU-28 data is a good bellwether of overall world changes. The table below shows the volume of fresh apples imported by the EU-28 for the calendar years from 2008 to 2015, by major suppliers. Total EU-28 imports exceeded 3.2 million metric tons in 2008, but have not exceeded that level since. This reflects a number of factors, including increased domestic supplies of fresh apples, weak economic conditions in much of the EU-28, and a number of non-tariff barriers that have made the EU market less attractive to many external suppliers.

The volume of imports coming from internal EU-28 sources increased both in metric tons, and as a percent of total fresh apple imports. The absolute volume set a new record in 2015, almost 13 percent above the 2008 level. The share of imports coming from other EU-28 countries rose from 74.7 percent in 2008 to 85.6 percent in 2015. The EU-28's dependence on third countries for its fresh apple supplies has shrunk significantly in recent years. The combined share of other Northern Hemisphere suppliers, primarily the United States and China, fell from 2.1 percent to 0.2 percent in the same period. The Southern Hemisphere share fell from 21.9 percent in 2008 to 12.4 percent in 2015. For many recent decades, demand in the EU-28 was a major driving force behind expansion of the apple industry in many Southern Hemisphere countries. The continued fall in that demand, has forced these suppliers to change the orientation of their production and export businesses.

EU-28: Imports of Fresh Apples, by Major Sources, 2008-2015
(1,000 metric tons)

Source	2008	2009	2010	2011	2012	2013	2014	2015
France	518.8	450.8	525.5	532.1	464.4	413.4	499.8	436.9
Italy	506.0	536.5	672.1	615.2	579.2	517.9	520.8	599.4
Poland	224.9	165.9	100.5	57.6	183.7	345.9	281.4	354.7
Other EU-28	1,142.5	1,031.7	1,064.2	1,151.1	1,196.7	1,145.9	949.0	1,307.4
Total EU-28	2,392.2	2,184.9	2,262.2	2,356.0	2,424.0	2,423.0	2,251.0	2,698.4
Canada	2.5	1.2	1.6	1.2	0.8	0.1	0.2	0.2
United States	27.3	26.4	20.1	10.2	10.5	12.1	9.0	6.2
N America	29.8	27.6	21.6	11.4	11.3	12.2	9.2	6.4
China	38.2	18.4	11.0	5.6	3.2	7.8	1.6	0.9
Argentina	79.8	57.7	47.1	49.8	29.2	45.5	34.9	14.1
Australia	0.6	0.3	0.4	0.3	0.5	0.5	0.1	7.0
Brazil	97.5	80.2	70.7	39.8	57.8	66.4	30.5	35.5
Chile	211.5	186.5	177.8	170.2	133.0	169.4	164.3	111.6
New Zealand	140.9	165.2	126.6	147.0	115.5	131.6	129.0	117.3
South Africa	171.2	144.9	112.8	110.5	120.0	152.7	84.4	105.6
S Hemisphere	701.4	634.8	535.4	517.6	456.0	566.1	443.2	391.1
All Other	41.4	19.4	47.3	61.3	33.7	82.6	40.8	56.2
TOTAL	3,203.0	2,885.1	2,877.5	2,951.9	2,928.2	3,091.7	2,745.8	3,153.0

The reduction has been felt most severely by Argentina and Brazil, but has also affected the three leading suppliers, Chile, New Zealand and South Africa. New Zealand, with its premium varieties, has suffered the least losses, while Australia, with its premium Pink Lady variety, has increased its (admittedly small) exports to the EU-28. Thus, the suppliers of mainstream varieties have been hardest hit.

Response to Russian Import Ban

The Russian ban on imports of produce items from the European Union, United States, Australia, Canada and Norway in August 2014 was one of the biggest shocks to world trade in fresh apples in many years. While observers expected trade flows to be disrupted, most assumed the result would simply be a re-allocation of trade links. Traditional Russian suppliers would be replaced in the Russian market, but would then substitute for the new Russian suppliers in their traditional markets.

For many reasons, this substitution did not run as smoothly as planned. After 2014, falling oil prices led to a recession in Russia. Because of western sanctions, the value of the Russian ruble was cut in half and Russia's purchasing power was dramatically reduced. Many alternative suppliers were unwilling to take the risks involved in selling to Russia. In turn, many traditional suppliers of the Russian market did not have the necessary clearances to export to other markets. Removing the numerous bureaucratic obstacles to trade can be a slow process. Many major trade flows involve specific varieties, qualities and price points. Poland sold large quantities of low-priced apples to Russia. Many of the best alternative markets would only accept high-quality, high-priced apples of other varieties. Often the volume, quality and price points of available supplies did not match the demands in alternative markets.

Given these rigidities in trade, one of the immediate responses to the Russian embargo was to attempt to bypass it by shipping product to Russia through unofficial channels (that is, smuggling). It appears that initially the Russian border controls were quite lax. However, these became more restrictive as time passed.

EU-28: Adjusting to the Russian Import Ban. One Year On. August 2013-July 2014 compared to August 2014-July 2015

(Exports in metric tons)

Exporter	EU-15	EU-15	Poland	Poland	Other NMS	Other NMS	EU-28	EU-28
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
Destination								
Russia	81,579	5,800	529,031	173	43,138	54,670	653,747	60,643
Azerbaijan	215	565	390	158	29	0	633	723
Belarus	8,213	3,635	234,561	289,921	20,005	360,331	262,779	653,887
Georgia	462	1,734	488	1,044	55	0	1,005	2,778
Kazakhstan	1,010	4,554	54,019	61,473	2,327	21,392	57,356	87,419
Kyrgyzstan	0	0	59	880	14	138	73	1,018
Moldova	178	20	32	717	16	41	226	778
Romania	17,144	27,951	36,406	45,942	5,177	9,228	12,784	83,120
Tajikistan	0	20	625	117	58	319	683	456
Ukraine	601	317	35,212	61,725	46	50	35,859	62,072
Subtotal	27,823	38,795	361,790	461,975	25,727	391,499	417,340	892,251
TOTAL	2,398,272	2,431,540	1,126,713	899,936	279,239	749,225	3,804,225	4,080,731
EU-15	1,587,151	1,505,758	167,375	169,522	132,622	81,609	1,887,148	1,756,889
NMS	136,818	90,588	95,024	251,888	79,086	196,563	310,929	539,039
EU-28 Extra	674,303	835,194	864,314	478,526	67,531	471,083	1,606,148	1,784,803
Ave Price €	787.55	769.74	336.15	299.47	283.86	273.98	622.96	559.91

The table above shows how EU-28 exports to Russia, to Russia's neighbors, and to other markets changed between the 2013-14 season, before the Russian embargo was imposed and the 2014-15 season, the first full year that the embargo operated. Three different supplied regions within the EU-28 were analyzed, the EU-15 (mostly rich Western European countries), Poland (Russia's largest single supplier in 2013-14) and Other NMS (all other new member countries of the EU-28). As expected, direct trade with Russia fell precipitously for the EU-28 and for the three separate regions, with Poland relatively hardest hit. However, EU-28 exports to Russia's immediate neighbors, like Azerbaijan and Belarus, more than doubled between 2013-14 and 2014-15. Exports from Poland alone to Russia's neighbors rose by 100,000 metric tons. However, exports from other NMS countries to Russia's neighbors soared, increasing by over 365,000 metric tons.

Poland almost tripled exports to NMS countries, and displaced much of the volume that would have been shipped from the EU-15. Poland was not very successful in increasing exports to the more demanding EU-15 markets. In contrast, the EU-15 was much more successful than Poland in expanding exports to countries outside the EU-28 (EU-28 Extra). The price data in the bottom row shows why. Average prices of EU-15 exports were more than twice those of Polish exports, indicating that EU-15 apples better reflected the higher quality demanded in many third-country markets. In all cases, average export prices in 2014-15 were lower than in 2013-14, but the decline was greatest for Polish apples.

EU-28: Adjusting to the Russian Import Ban. Two Years On. August-December, 2013, 2014 and 2015

(Exports, metric tons, Average Prices, € per metric ton)

Destination	Aug-Dec 2013	Aug-Dec 2014	Aug-Dec 2015	Aug-Dec 2013	Aug-Dec 2014	Aug-Dec 2015
	(mt)	(mt)	(mt)	(€/mt)	(€/mt)	(€/mt)
Russia	127,329	59	2	336.74	573.58	352.22
Russia's neighbors	49,709	94,882	52,677	302.66	211.83	292.25
Other Outside EU-28	2,926	19,479	15,915	580.95	312.23	464.21
Total outside EU-28	173,627	101,516	52,917	331.67	228.54	323.32
EU-15	79,350	81,773	53,873	281.41	264.84	310.53
Other EU-28 (NMS)	22,769	27,809	66,801	351.26	178.31	366.35
Total EU-28	102,118	109,582	120,674	296.98	242.88	341.43
TOTAL	275,744	211,099	173,591	318.82	235.99	335.91

The table above shows how EU-28 apple exporters have adjusted to the Russian embargo two years on from August 2014. It compares the volume and average prices of EU-28 exports in August-December 2015 with those for the same period in 2013 and 2014. Total EU-28 exports of fresh apples in August-December 2015 were 37 percent below those in 2013 and 18 percent below those in 2014. Average prices fell sharply in 2014, but rebounded strongly in 2015. Exports to Russia approached zero in both 2014 and 2015. Exports to Russia's neighbors soared in 2014, but fell back to 2013 levels in 2015, presumably as Russia stiffened enforcement of its embargo. Exports to all other countries outside the EU rose more than six-fold in 2014, but fell back somewhat in 2015. The only trade flows that showed increases in both 2014 and 2015 were those to the NMS countries of Eastern Europe. In August-December 2015, they were almost triple those in the same period of 2013. Clearly, the Russian embargo has continued to affect trade flows both within and outside the EU-28. It is likely to cause particular problems when the total supplies available for exports are larger than normal.

Prospects for World Fresh Apple Trade

The growth of world trade in fresh apples appears to have slowed in recent years, primarily because of economic and political problems in many markets. A number of very large markets, including the European Union, the Russian Federation, China and Brazil, have struggled with prolonged recessions that have dampened demand for many products, including fresh apples. A wide array of smaller countries have suffered economic setbacks due to the steep decline in the prices of oil and other major commodities. This includes both developed countries like Australia and Canada, and developing countries like Indonesia and Angola. Many of the main oil-exporting countries, such as Saudi Arabia and the United Arab Emirates, are facing the need to cut government expenditures to balance their budgets. In such economies, government expenditures continue to be the main drivers of demand.

A number of countries in Latin America, including Brazil and Venezuela, have suffered a combination of economic problems as a result of unwise policies and political problems due to widespread corruption. The combination has been very detrimental to trade. Perhaps the most troubled region of the world is in an area that stretches across much of North Africa and most of the Middle East as far as Afghanistan and Pakistan. In countries like Libya, Syria, Yemen and Iraq, an actual civil war has been raging, causing severe trade disruptions. Both government troops and renegade armies have been involved in clashes in an ever-changing pattern of alliances.

One result of these problems has been the increase in protectionist measures in many importing countries. The World Trade Organization (WTO), which succeeded the General Agreement on Tariffs and Trade (GATT) as the guardian of free and open trade, has not been able to reverse this tide or find quick solutions for the injured trade partners. Most countries have given up hope that the WTO can be strengthened, and are placing their faith in numerous bilateral or regional trade agreements that liberalize trade sector by sector and country by country.

Currently, two massive trade agreements are in the final stages of negotiation or implementation. The Transatlantic Trade and Investment Partnership (TTIP) would further liberalize trade between the world's two largest economies, the United States and the European Union. Terms of that agreement are still being negotiated, but disputes over agricultural issues, such as food safety or genetically modified organisms, could prove intractable. The second agreement, the Trans Pacific Partnership (TPP) between the United States, Japan and ten other Asia-Pacific countries has been finalized, but is awaiting ratification. Crucial to its completion will be a favorable vote from the U.S. Congress. The odds of a favorable vote have been reduced by the vehement opposition to such trade agreements of some of the most prominent candidates in the 2016 U.S. presidential race.

Perhaps an even greater threat to further liberalization of world trade is the challenge to the "western consensus" from countries like China, Russia and Iran, and splinter groups like ISIS and Boko Haram. The "western consensus" honed over centuries, and promoted by western countries since World War II, saw liberalized trade and investment as the natural outcomes of other critical rights and freedoms, such as human rights and the rule of law, private property, freedom of speech, religion and movement, and competitive markets free of undue government interference. Under the western consensus, governments derived their authority from the people. The people would decide, in democratic elections, how much power they would cede to governments.

While many western countries did not fully honor those principles, China, Russia, Iran, and some similar regimes, believe that all power derives from the state. In each case the state gets its legitimacy from a superior power. In the case of China, it is the Communist Party, for Russia, the ruling junta, for Iran, the tenets of Islam. Rejection of, or opposition to, these superior powers is seen as treason against the state. Abrogation of individual rights and freedoms is viewed as acceptable if necessary to carry out the regime's goals.

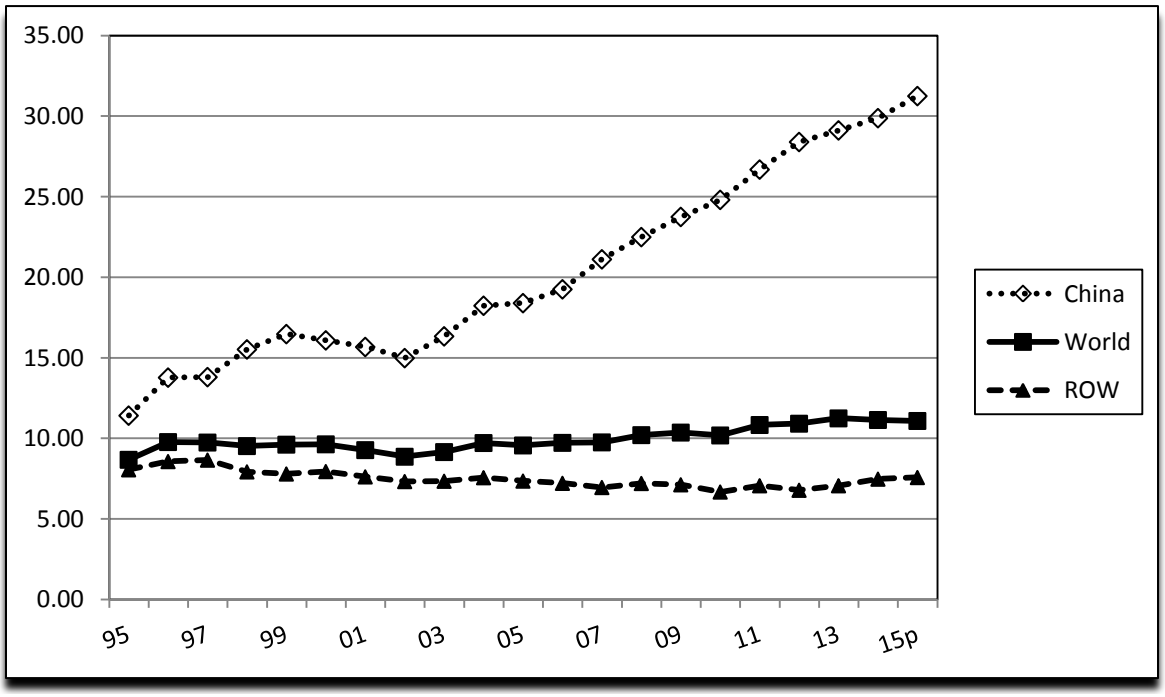
Clearly, this view of the world is at odds with the western consensus. Countries like China, Russia and Iran feel free to pick and choose from western principles in support of their regimes. For example, both China and Russia are members of the WTO, and have made commitments to honor its principles. However, they believe that they can ignore those commitments if it serves state control. Both have placed increasing restrictions on human rights, due process, and freedom of speech. Both are seeking to create a new world order where the western consensus is not dominant. They have now become powerful enough that they carry considerable influence in world forums. If they were to succeed in overturning the western consensus in their areas of influence, it could rapidly undo much of the progress in trade liberalization that has been made since World War II.

IV. Consumption of Fresh Apples

World Apple Availability Still Rising

The volume of apples available per capita for all uses has been on a modest upward trend over the last two decades. However, the major driver of the upward trend has been the production in China. The chart below was derived primarily from the apple production and population series reported by the UN,FAO in its online FAOSTAT database. Production data for 2014 and 2015 are preliminary estimates.

World: Per Capita Supplies of Apples, 1995-2015
(kilograms)



Per capita supplies of apples available in China briefly broke their upward trend between 1999 and 2002, but have increased steadily since 2003. It is estimated that they topped 30 kilograms per capita in 2015, twice the level achieved in 2002. It is not possible to verify how accurate the apple production statistics for China may be. Clearly, the sort of growth in apple supplies depicted here is unprecedented. Since processing and fresh exports take a relatively small share of Chinese apple production, it suggests rapid growth in supplies for fresh consumption.

In contrast, per capita availability of apples in the rest of the world had its most recent peak in the mid-1990s, when it averaged 8.43 kilograms per capita. It remained between 7 and 8 kilograms between 1998 and 2009, before falling below 7 kilograms in 2010 and 2012. It has since increased by 3 to 4 percent per year as production in the rest of the world has increased.

The diverging trends in per capita apple availability between China and the rest of the world have major implications for consumption and trade in fresh apples and apple products. In the first decade of the twenty-first century, Chinese exports of fresh apples and of apple juice concentrate increased in step with total Chinese apple production. This had traumatic effects on many competitors and many markets around the world. However, between 2010 and 2015, most of the increased Chinese apple production was retained in the Chinese domestic market. With the Chinese economy now slowing, that process could again go into reverse and have major impacts on markets in the rest of the world.

In contrast, in the rest of the world, many of the major apple producing countries have large surpluses of fresh apples that they must either send to export markets or dispose of in the less lucrative apple processing sector. Large supplies of apple juice concentrate from China continue to squeeze established processing sectors in many countries. China has also gained a substantial share of fresh apple imports in many countries, especially in Southeast Asia and South Asia. The good news is that the population in the rest of the world is currently growing by 77 million people per year, whereas the population in mainland China is growing by only 6.6 million. So, the opportunities in the rest of the world appear more numerous, but will also be more difficult to exploit.

Trends in Per Capita Consumption

Knowledge of trends in per capita consumption of fresh apples is particularly important in assessing the effects of changing supplies, pricing, promotion, and other marketing activities employed by the apple industry in different producing countries. However, for a variety of reasons, numerous major statistical agencies have stopped publishing estimates of per capita consumption of minor products like fresh apples. UN,FAO occasionally publishes such data, 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, developed its own unofficial estimates in countries where reasonable data series could be assembled. 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.

This relationship overstates actual fresh consumption because it does not account for shrinkage of apple weight in storage, fruit deteriorating in the distribution system, or fruit left unused by consumers. However, the measure should be a reasonable proxy, and has the added advantage of being consistent across time and across many countries. The first table below covers 18 major apple producing countries in Europe, which has traditionally been associated with relatively high levels of per capita consumption of fresh apples.

Europe: Estimated Per Capita Consumption of Fresh Apples, Selected Countries, 1992-2015
(kilograms)

Country/Region	1992-94	2001-03	2007-09	2013-15	2001-03 to 2013-15
	(kg)	(kg)	(kg)	(kg)	(% change)
Austria	32.80	23.97	24.90	26.00	+ 8.5
Belgium	26.80	17.55	18.26	15.30	- 12.8
Denmark	16.03	19.66	19.22	19.05	- 3.1
France	14.94	16.06	15.04	15.27	- 4.9
Germany	24.31	18.26	19.48	18.60	+ 1.9
Greece	21.33	20.21	20.42	17.88	- 11.5
Italy	20.93	19.87	20.26	17.18	- 13.5
Netherlands	28.51	19.99	18.27	19.43	- 2.8
Spain	18.88	17.14	13.72	12.26	- 28.5
Sweden	16.42	14.99	15.45	14.54	- 3.0
United Kingdom	11.39	9.25	9.80	9.75	+ 5.4
EU-11	19.51	16.72	16.47	15.52	- 7.2
Bulgaria	6.17	4.22	4.35	8.30	+ 96.7
Hungary	23.25	13.82	13.87	15.77	+ 14.1
Norway	16.27	14.75	16.11	15.40	+ 4.4
Poland	12.23	14.54	12.56	16.95	+ 16.6
Romania	24.71	17.02	15.48	20.06	+ 17.9
Serbia	16.84	8.91	7.65	6.75	- 24.2
Slovakia	11.15	13.11	10.48	9.63	- 26.5
Other Europe	16.29	13.74	12.29	15.34	+ 11.6

In the table on the previous page, the first eleven countries (EU-11) are all members of the original European Community of 15 member countries (EU-15), and are generally among the richest countries in Europe. The last seven countries are primarily in Eastern Europe, and have a lower per capita income than the EU-15 members. Norway is the exception on both those criteria. Five of the seven, Bulgaria, Hungary, Poland, Romania and Slovakia, are new member states (NMS) of the enlarged EU-28. Data are presented on a per capita basis to eliminate the effects of population size, and for three-year average periods to reduce the impact of unusual weather or marketing conditions in any one year. The years chosen for comparison are intended to provide both a long-term and a recent perspective on changes in per capita consumption.

The table shows that average per capita consumption of fresh apples fell sharply (by over 14 percent) in the EU-11 between 1992-94 and 2001-03. The rate of decline slowed between 2001-03 and 2007-09, but speeded up again between 2007-09 and 2013-15. Even among the EU-11 countries, per capita fresh apple consumption varied widely in both absolute levels, and in changes over time. Austria had consistently the highest per capita consumption, and the United Kingdom the lowest, at less than half the Austrian level. Only Austria, Germany and the United Kingdom experienced an increase in per capita consumption between 2001-03 and 2013-15. Belgium, Greece, Italy and Spain experienced double-digit percentage decreases. Despite some increases in some periods, the general experience of the EU-11 countries has been for a reduction in per capita fresh apple consumption over time.

On average, the seven other, generally less affluent, European countries in the lower half of the table ended up in 2013-15 with about the same per capita fresh apple consumption as the EU-11 countries. However, in their case, the bias was upwards. While average per capita consumption was successively lower in 2001-03 and 2007-09 than in 1992-94, it actually rose between 2007-09 and 2013-15. This was also true for five of the seven countries. Increases were in double-digit percentages for all but the richest country, Norway. The swings in absolute per capita consumption were also quite wide, especially for Bulgaria, Poland and Romania, where domestic production has been quite volatile. The levels of per capita consumption also varied more widely. By 2013-15, per capita consumption in Bulgaria, Serbia and Slovakia was lower than that of the lowest EU-11 member, the United Kingdom. In only one country, Romania, was per capita consumption greater than 17 kilograms per year. This compared to six countries in the EU-11, Austria, Denmark, Germany, Greece, Italy and the Netherlands.

There were no obvious geographical patterns to explain the wide differences in levels and rates of change in per capita fresh apple consumption in these European countries. For example, Scandinavian neighbors, Norway and Sweden, had very similar levels and trends in per capita consumption, while Baltic neighbors, Bulgaria and Romania, had quite different experiences. Major net exporters like France and Italy suffered similar declines, but major net importers like Germany and the United Kingdom had similar trends, but widely different levels of per capita consumption. These discrepancies also make it more difficult to develop effective programs to boost fresh apple consumption in Europe.

Other Major Producing Countries: Estimated Per Capita Consumption of Fresh Apples, Selected Countries, 1992-2015
(kilograms)

Country/Region	1992-94	2001-03	2007-09	2013-15	2001-03 to 2013-15
	(kg)	(kg)	(kg)	(kg)	(% change)
Argentina	8.32	8.50	7.76	6.02	- 29.2
Australia	9.53	6.43	10.60	11.28	+ 75.4
Brazil	3.47	4.58	4.83	6.02	+ 31.4
Chile	6.39	7.14	10.25	13.16	+ 64.3
New Zealand	14.78	15.87	13.27	15.00	- 5.5
South Africa	5.31	3.66	3.85	4.09	+ 11.7
S Hemisphere	5.07	5.33	5.80	6.56	+ 23.1
China, mainland	4.78	12.66	15.92	26.40	+ 108.5
Japan	6.64	6.02	5.83	5.43	- 9.8
Taiwan	6.10	5.48	5.85	6.82	+ 24.5
Turkey	34.05	34.36	32.67	31.21	- 9.2
Asia selected	6.16	12.94	15.70	24.68	+ 90.7
Canada	12.25	11.28	12.44	11.62	+ 3.0
Mexico	5.61	5.31	5.62	7.89	+ 48.6
United States	8.72	7.34	7.37	7.44	+ 1.4
N America	8.26	7.14	7.30	7.87	+ 10.2
Russian Federation	4.92	6.03	9.67	13.10	+ 115.6
All 32 Countries	8.42	11.41	12.99	17.97	+ 57.5
Excluding China	11.48	10.38	10.58	11.08	+ 6.7

The table above provides similar data on per capita fresh apple consumption for 14 other 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 in Asia, an additional three in North America, and finally, the Russian Federation.

The Southern Hemisphere countries have a heavier focus than most on exports, so this is likely to affect the volume of fresh apples that would be retained for domestic consumption. While average per capita consumption has been increasing over time, the level has generally remained below that in the European countries which take much Southern Hemisphere fresh apple exports. Countries like Brazil and South Africa are also major producers of competing citrus fruits, soft fruits and grapes. Growth in per capita fresh apple consumption has been particularly strong in Australia, Brazil and Chile, all of which have different levels of focus on exports. Argentina has faced the most severe decreases. Recent economic problems have dampened domestic demand.

The four Asian countries included are extremely diverse in many ways, so average data are relatively meaningless. China has had spectacular growth in per capita fresh apple consumption, rising 5.5 fold in the last two decades. In contrast, Turkey has consistently had very high per capita consumption, but the level has slipped gradually in the last decade. Turkey and China now have the highest per capita fresh apple consumption of any of the 32 major apple producing countries. In stark contrast, per capita fresh apple consumption has been very low in both Japan and Taiwan. It has been falling for Japan, but rising for Taiwan. Most of Japan's apple supplies are produced domestically, whereas almost all of Taiwan's supplies are imported.

The three countries in North America, Canada, Mexico and the United States, also had sharp differences in levels and trends of per capita fresh apple consumption. By 2013-15, per capita consumption in Canada was about 50 percent above that in Mexico and the United States. However, the long-term trend was downward in the United States, upward in Mexico, and ambivalent in Canada. Overall, per capita consumption in North America averaged only about half that in Europe.

The results for the Russian Federation have been presented separately. Apple production has been falling in Russia, but per capita fresh apple consumption has risen by 2.7 times in two decades due to rapidly increasing imports. Until recently, Russia's increased imports were a major positive factor in world markets. However, the continuation of the Russian embargo could weaken that influence.

The last two entries in the table show the average per capita fresh apple consumption for all 32 countries, weighted by the relative populations. At first glance, the achievement is impressive. The average more than doubled between 1992-94 and 2013-15, and increased by about 4 percent per year between 2001-03 and 2013-15. However, when China is excluded, the average fell by 3.5 percent over the two decades, and increased by only 6.7 percent in the most recent decade. This is one more indication of the general stagnation in the level of per capita consumption of fresh apples in most major apple producing countries.

Consumption Trends in Non-Producing Regions and Countries

In addition to the major apple producing countries discussed above, many countries are minor producers of apples that are available for domestic consumption. However, comparable data are not available on the disposition of that production. Historical data are available for just two regions that have no domestic production of fresh apples, Central America and the Caribbean, and Southeast Asia. For these regions, per capita consumption of fresh apples can be estimated by dividing net imports (imports minus exports) of fresh apples by the appropriate populations. United Nations data indicate that per capita fresh apple consumption in the Caribbean/Central America region rose from 0.97 kilograms per capita in 2002-04 to 1.19 kilograms in 2011-13, an increase of about 2 percent per year. That of Southeast Asia rose from 0.82 kilograms to 1.12 kilograms in the same period, an increase of over 3 percent per year. The Caribbean/Central America region is very important as a tourist destination for rich North American and European patrons. Southeast Asia is important because of its combined population approaching 600 million people.

The World Apple Review has also been keeping track of per capita fresh apple consumption in seven individual non-producing countries in East Asia, seven in the Middle East and nine in Latin America for one quarter of a century. All of these have at one time or another been prominent importers of fresh apples. The results are presented in the table below. Net imports, divided by population, were used to derive the per capita consumption estimates. In general, per capita consumption was highest in small, high-income countries like Hong Kong, Singapore, Kuwait and the United Arab Emirates, and lowest in large, lower-income countries like Indonesia. While the overall trend was modestly upwards, the fastest growth in East Asia and Latin America was between 1990 and 2000. The rate of growth slowed between 2000 and 2010. In East Asia, per capita consumption actually declined between 2010 and 2014.

Non-Producing Countries: Estimated Per Capita Consumption of Fresh Apples, Selected Years, 1990-2014
(kilograms)

Country/Region	1990	1995	2000	2005	2010	2012	2013	2014p
East Asia								
Indonesia	0.01	0.23	0.32	0.56	0.82	0.74	0.52	0.55
Hong Kong	9.74	11.53	7.64	8.49	9.99	8.67	8.74	12.36
Malaysia	1.28	2.71	3.12	3.23	3.55	3.40	3.59	2.97
Philippines	0.54	0.78	0.89	0.79	0.75	0.80	0.87	0.67
Singapore	9.65	12.36	9.05	8.61	8.88	7.55	7.81	7.33
Taiwan	3.82	5.17	6.16	6.18	5.86	5.78	6.41	6.77
Thailand	0.42	1.09	0.68	1.46	1.92	1.95	2.14	1.92
Subtotal	0.68	1.17	1.18	1.40	1.60	1.53	1.52	1.47
Middle East								
Bahrain	8.11	13.86	6.74	12.95	5.84	7.92	6.98	7.50
Egypt	0.00	0.33	0.58	0.79	1.37	2.75	1.19	0.17
Kuwait	5.20	12.48	10.42	6.51	7.03	n.a.	8.37	7.37
Libya	4.02	1.48	0.96	1.69	8.44	n.a.	11.38	0.00
Oman	4.41	4.50	3.07	15.36	9.06	29.17	8.23	8.21
Saudi Arabia	8.27	6.85	5.29	5.72	6.22	6.49	6.40	n.a.
UAE	13.32	22.99	34.38	9.68	10.87	n.a.	16.44	18.89
Subtotal	2.52	2.81	2.72	2.77	3.42	n.a.	4.26	n.a.
Latin America								
Colombia	0.75	1.48	1.17	1.19	1.82	1.99	2.07	2.31
Costa Rica	1.60	2.04	3.10	1.70	3.21	3.27	3.19	n.a.
Dominican Rep.	0.14	0.49	1.00	1.43	1.47	1.47	1.08	1.11
El Salvador	0.95	0.99	1.48	1.95	1.94	1.90	1.82	2.24
Honduras	0.42	0.32	0.46	1.18	1.60	1.40	0.99	1.17
Nicaragua	0.06	0.16	0.31	0.37	0.35	0.34	0.42	0.48
Panama	1.93	2.09	2.54	2.17	2.01	2.09	2.09	2.39
Peru	0.11	0.63	0.59	0.92	1.63	1.45	1.40	1.66
Venezuela	0.59	1.11	1.92	1.17	0.52	1.15	0.41	n.a.
Subtotal	0.56	1.05	1.22	1.19	1.48	1.61	1.42	n.a.
Total 23 countries	0.94	1.40	1.44	1.59	1.94	n.a.	1.99	n.a.

In most of these countries, per capita consumption was relatively stable from year to year. However, this was less true in the Middle East where there were wide year to year swings. In some cases, this may reflect incomplete statistics, in particular, where exports to third countries are not reported.

Trends in per capita consumption reflect both global economic fluctuations and fluctuations within individual regions and countries. For example, the Asian financial crisis disrupted trade in East Asia after 1997. Trade through Hong Kong is heavily affected by demand in mainland China. Fluctuations in oil prices affected demand in many oil-producing countries in the Middle East. Consumption in countries like Egypt and Venezuela were disrupted by political conflict. Within East Asia, the economy of the Philippines lagged the rate of growth of many of its Southeast Asian neighbors. Once again, any plans to boost consumption in any of these countries requires paying attention to the specific circumstances of each.

Apple Consumption Relative to Produce Consumption

Fresh apples are just one among many fruits that compete for space on retail shelves and the attention of consumers in different countries. In any country, the potential demand for fresh apples is likely to be constrained by the total demand for produce. That, in turn, is affected by the cooking and eating habits of households, and by the availability of competing manufactured snacks and beverages, discussed in chapter 1. The table below shows estimated per capita consumption of all fresh fruits and vegetables in six countries that are all at advanced stages of economic development, for selected years from 1990 to 2014.

Selected Developed Countries: Per Capita Consumption of Fresh Produce, Selected Years, 1990-2014

(kilograms)

Country	Item	1990	2000	2005	2010	2011	2012	2013	2014p
United States	Veg	65.1	78.9	78.8	77.6	75.9	77.2	75.1	74.6
	Fruit	41.3	44.5	45.4	46.6	47.8	49.3	50.7	51.5
Canada	Veg	130.5	146.0	141.2	130.2	132.4	131.4	n.a.	n.a.
	Fruit	61.4	63.6	71.0	72.8	77.6	74.9	n.a.	n.a.
United Kingdom	Veg	38.3	39.2	41.7	39.4	38.4	38.2	38.9	38.7
	Fruit	31.6	39.8	44.5	39.3	39.7	38.7	38.7	39.8
France	Veg	88.3	91.6	87.8	85.2	86.2	n.a.	n.a.	n.a.
	Fruit	62.5	56.6	60.1	52.7	51.9	n.a.	n.a.	n.a.
Germany	Veg	n.a.	94.0	97.1	92.5	94.4	96.4	96.5	93.0
	Fruit	n.a.	111.9	78.6	65.6	68.6	68.8	68.0	69.0
Japan	Veg	56.9	59.1	58.8	56.4	54.8	54.5	59.0	59.6
	Fruit	24.3	32.1	29.8	27.3	26.7	26.5	26.7	n.a.

Data were not available for all years examined. They were derived independently from each country's statistical agencies, so there is no guarantee that the coverage of fruits and vegetables is identical in all cases. However, the differences between countries are so great that they are unlikely to be due to definitional or measurement differences. The data should be a good indicator of fresh produce trends in the different countries.

It is notable that in the decade of the 1990s, per capita consumption of both fresh vegetables and fresh fruit rose in every country with the sole exception of fresh fruit in France. However, thereafter, the trends have been much more diverse. Canada reported by far the greatest total per capita consumption of fresh produce of over 200 kilograms in most years. The United Kingdom and Japan reported by far the lowest, less than 90 kilograms in both cases. Beginning in 1990, all countries reported more per capita consumption of fresh vegetables than of fresh fruit. That relationship continued through 2014 for all countries except the United Kingdom, where fresh fruit consumption sometimes exceeded fresh vegetable consumption.

In general, the long-term trend in per capita fresh vegetable consumption after the year 2000 was flat or slightly down. In contrast, the long-term trend in per capita consumption of fresh fruit was upward in both the United States and Canada.

An analysis of trends in the United States for major fruits gives some clues as to what may be occurring. Per capita consumption of fresh apples fell between 1990 and 2000, and languished close to the 2000 level until there was a sharp uptick in 2014. That coincided with a very large fresh apple crop and heavily discounted prices. Per capita consumption of fresh oranges fell by over 40 percent between 1990 and 2000. Despite some recovery, by 2014, it was still one third below the 1990 level. Per capita consumption of fresh bananas rose by 16 percent between 1990 and 2000. It has come close to, but not topped that level since, even though bananas remain by far the lowest-priced major fruit.

The biggest change in fresh fruit consumption in the United States has come in the "Other Fresh" category. That category grew by 27.4 percent in the 1990s, and by a further 19.2 percent in the following decade. It has grown a further 10.4 percent since 2010. Almost all the net gain in U.S. per capita consumption of fresh fruit has occurred in the "Other Fresh" category. As noted in chapter 1, much of this demand has been satisfied by increased imports of tropical or exotic fruits. Thus, one of the chief obstacles to increased consumption of fresh apples in the United States is the increased competition from non-traditional fruits.

United States: Per Capita Consumption of Fresh Fruit, Selected Years, 1990-2014

Fruit	1990	2000	2005	2009	2010	2011	2012	2013	2014p
Apples	8.89	7.94	7.58	7.39	6.94	6.99	7.26	7.85	8.53
Oranges	6.52	3.81	5.17	4.13	4.40	4.54	4.76	4.76	4.26
Bananas	11.07	12.88	11.43	9.98	11.61	11.57	12.25	12.75	12.66
Other Fresh	15.56	19.82	21.18	23.13	23.63	24.66	25.04	25.35	26.09
Total Fresh	41.44	44.45	45.36	44.63	46.68	47.76	49.31	50.71	51.53

This phenomenon has occurred to a much lesser extent in other countries for which data have been available. For example, in both the United Kingdom and in Japan, per capita consumption of "Other Fresh" fruit surged in the 1990s. However, in the United Kingdom, that surge peaked by 2005, and has since eroded. The Great Recession of 2008 and inflation in fruit prices have depressed demand in the United Kingdom. In Japan, per capita consumption of "Other Fresh" fruit remains well below the peak reached in 2000. Japan has suffered a series of minor recessions since 2000, and this has affected demand for all food products.

Explaining Fruit Per Capita Consumption

There is a long tradition in many countries of using socio-demographic profiles of produce purchasing or consumption to identify the best potential segments of shoppers or consumers, and to target marketing and promotion to those groups. There is not sufficient space in a Review like this to do an exhaustive analysis of all the relevant socio-demographic factors. However, the table below, drawn from Fresh Trends 2015, produced by Vance Publishing for the United States, focuses on two key characteristics, household incomes and age of household respondent, and their relationship to purchase of seven different fruits, majors like apples, bananas and oranges, berries, like strawberries and blueberries, and three tropical fruits, pineapples, mangos and papayas.

The total column shows the percent of all households purchasing each item in the past 12 months. Over 80 percent had purchased both apples and bananas, and over 60 percent oranges and strawberries. The percent purchasing blueberries, pineapples, mangos and papayas was lower in sequence, with papayas being purchased only by 13.6 percent of all households.

United States: Socio-Demographic Factors Affecting Purchase of Selected Fresh Fruits, 2015
(Percent of Sample Purchasing)

Fruit	Total	Income < $25K	Income $25-50K	Income 50-100 K	Income $100K+	Age 21-39	Age 40-49	Age 50-58	Age 58+
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Apples	83.5	74.6	84.4	85.5	84.3	85.4	84.7	80.2	81.1
Bananas	84.4	76.9	87.8	84.0	85.1	78.6	90.0	88.6	87.6
Oranges	61.4	46.2	62.6	61.8	67.5	59.4	66.3	59.9	62.2
Strawberries	64.6	47.7	64.1	66.7	71.1	61.3	68.9	62.3	69.1
Blueberries	52.3	31.5	46.7	56.1	63.9	54.0	51.1	47.3	53.9
Pineapple	45.1	30.0	43.3	46.4	53.0	47.7	47.4	40.7	41.5
Mangos	27.0	13.1	26.3	27.4	34.5	31.2	27.9	19.8	23.5
Papayas	13.6	3.8	11.5	15.4	18.5	18.1	11.6	8.4	10.6

For all seven fruits, the higher the income level, the greater the percentage that had purchased that fruit. However, the higher income groups were more prominent buyers of oranges and strawberries, and the dominant purchasers of blueberries, pineapple, mangos and papayas. The age of the respondent was not a significant influence on purchases of apples, bananas, oranges, strawberries or blueberries, but it was significant for pineapples, mangos and papayas. Younger, higher income consumers were more likely purchasers of exotic or tropical fruits. Younger consumers tend to be more adventurous, while higher-income consumers can afford the higher prices demanded for these specialty fruits.

The same survey revealed that 90.2 percent of all households used apples as a snack. The next two highest uses were as an ingredient in a recipe (42.2 percent) and as a dessert (38.4 percent). Over 20 percent used apples as a salad or as a side dish, almost 20 percent as an appetizer, but only 13.3 percent as a main dish. Snacking was by far the widest use for all income groups and all age groups.

Purchasers of different varieties can also be segregated by socio-demographic factors. However, it is notable that only four apple varieties (listed in the table below) were mentioned as purchased in the past 12 months by at least 10 percent of respondents. These were Red Delicious, Fuji, Gala and Granny Smith. Purchasers of Red Delicious and Gala were more likely to be older and lower-income. Fuji purchasers were more likely to be higher-income and older consumers, as were purchasers of Honeycrisp. Responses for other varieties were generally too low to provide reliable indicators. The take-home message is that different varieties appeal to different socio-demographic niches.

United States: Socio-Demographic Factors Affecting Purchase of Selected Fresh Apple Varieties, 2015
(Percent of Sample Purchasing)

Fruit	Total	Income < $25K	Income $25-50K	Income 50-100 K	Income $100K+	Age 21-39	Age 40-49	Age 50-58	Age 58+
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Red Delicious	15.2	20.6	15.8	13.7	14.3	12.4	17.4	14.9	19.3
Fuji	14.0	13.4	11.4	14.0	17.1	18.1	12.4	10.4	9.7
Gala	13.4	11.3	16.2	12.0	13.3	11.3	12.4	14.9	17.6
Granny Smith	12.9	17.5	13.6	12.0	11.4	13.5	14.9	14.2	9.1
Honeycrisp	9.1	6.2	5.7	11.0	11.4	8.2	9.9	9.0	12.2
Pink Lady	3.1	6.2	3.1	2.7	2.4	2.7	1.9	4.5	4.0
Jonagold	0.6	n.a.	0.4	0.7	1.0	n.a.	0.6	1.5	1.1
Idared	0.1	n.a.	n.a.	n.a.	0.5	0.3	n.a	n.a	n.a

Future Prospects for Fresh Apple Consumption

The data presented previously in this chapter on per capita fresh apple consumption indicates that it is stagnant or declining in most developed countries, whether or not they have a large domestic apple industry. A number of factors have been implicated in this weakness, including aging populations, competition from other fruits and snacks, changing preferences among consumers, and the negative effects of the Great Recession and subsequent lesser recessions on purchasing power and on shopping patterns. Per capita fresh apple consumption also remains low in many developing countries around the world, especially those that are non-producing. In many cases, there have not been persistent marketing programs to encourage fresh apple consumption. On the other hand, because the populations of many of these countries are young and growing, incomes are continuing to rise, and the influence of modern retail outlets is spreading, many developing countries offer substantial opportunities for expanding per capita consumption.

In both developed and developing countries, governments have mounted campaigns to promote increased consumption of fresh fruits and vegetables. The names are very familiar to operators in the apple industry, including Five-a-Day, Ten-a-Day, More Matters, Eatwell, etc. However, the results have generally been disappointing. It appears that the level of promotions are not sufficient to break through the din of alternative food messages, and that they also fail to persuade shoppers or consumers to change long-standing habits.

In many countries, the apple industry has unilaterally disarmed in the battle to win over consumers by allowing industry-wide promotional programs to be dissolved. At one time, large programs were mounted by state or national boards like the Washington Apple Commission in the United States, Unifruco in South Africa or ENZA in New Zealand. Increasingly, generic promotional programs have been replaced by proprietary programs that aim to advance the cause of one apple firm or brand, and that focus on promoting the premium varieties controlled by those firms. In some countries, public funds have been secured to help boost overall fruit and vegetable consumption. However, those funds must often be used for a wide variety of fruits. In some cases, they may be used to promote imported fruits not grown in the country. So, promotions that give an advantage to fresh apples are rarely available.

Thus, the challenge of finding a way to boost per capita consumption of fresh apples remains unresolved. It is important to remember that different consumers prefer different fruits, or different varieties of apples. Their motivations for buying their preferred choice can range widely based on the variety's color, taste, pricing, status or other triggers. Any effective promotional campaign for fresh apples will have to use different appeals aimed at multiple target audiences. In addition to decisions about what messages will be most convincing, decisions must also be made about what media to use. The alternatives range from mass market methods like advertising on network television (the preferred medium of the past) to sending individual, targeted messages to specific consumers through various social media (the most effective medium of the present).

Given the competition that fresh apples now face from a growing array of fruits and other snacks, per capita consumption of fresh apples is not likely to increase without planned, sophisticated and professional marketing and promotional campaigns. On the other hand, without an organized industry effort, per capita consumption of fresh apples could continue to erode in many countries.

V. Prices and Marketing Margins

Good Times Not Over

The key to firms entering or staying in the apple industry is the level of prices they receive for their products. With some exceptions, price trends in the apple industry in the last decade have been among the most favorable in many years. For example, the first chart in chapter III shows that average world export prices for fresh apples more than doubled in terms of U.S. dollars between 2000 and 2012. These good times have encouraged re-investment, both in higher density plantings, and in new varieties. The past period of relative prosperity will shape the world apple industry for many years into the future. Many of those planting decisions will not be lightly reversed, so the industry will have to adapt to changing circumstances as best it can.

The euphoria described above received a severe setback in the 2014-15 season. Record apple crops in Europe, North America and China coincided with weakening economies in many import markets and the beginning of the Russian embargo. That embargo distorted normal trade flows, forcing many suppliers to enter new markets, and (at least temporarily) driving down apple prices.

There was some relief in the 2015-16 season, when apple crops were smaller in many major exporting countries, and prices bounced back. The big unknown for apple firms is whether the 2014-15 season signaled the end of the good times, or was merely a temporary blip in an otherwise buoyant market. Ironically, the answer may be a little bit of both. Some parts of the apple world will continue to prosper, while some will continue to face adversity.

On the positive side, more affluent consumers tended to suffer less, and recover more rapidly, from the Great Recession, which began in 2008. They have quickly resumed their indulgent purchasing habits. Premium products, including premium apple varieties have benefited most from this resurgence. On the other hand, lower-income consumers have not recovered as rapidly. Many either lost key assets, or remain burdened by accumulated debt. Discount retail chains, like Aldi and Lidl, have responded to their needs by providing quality products at discounted prices. Since the discount chains have continued to gain market share and have announced plans for further expansion in 2016 and beyond, this suggests that many consumers are still facing financial struggles.

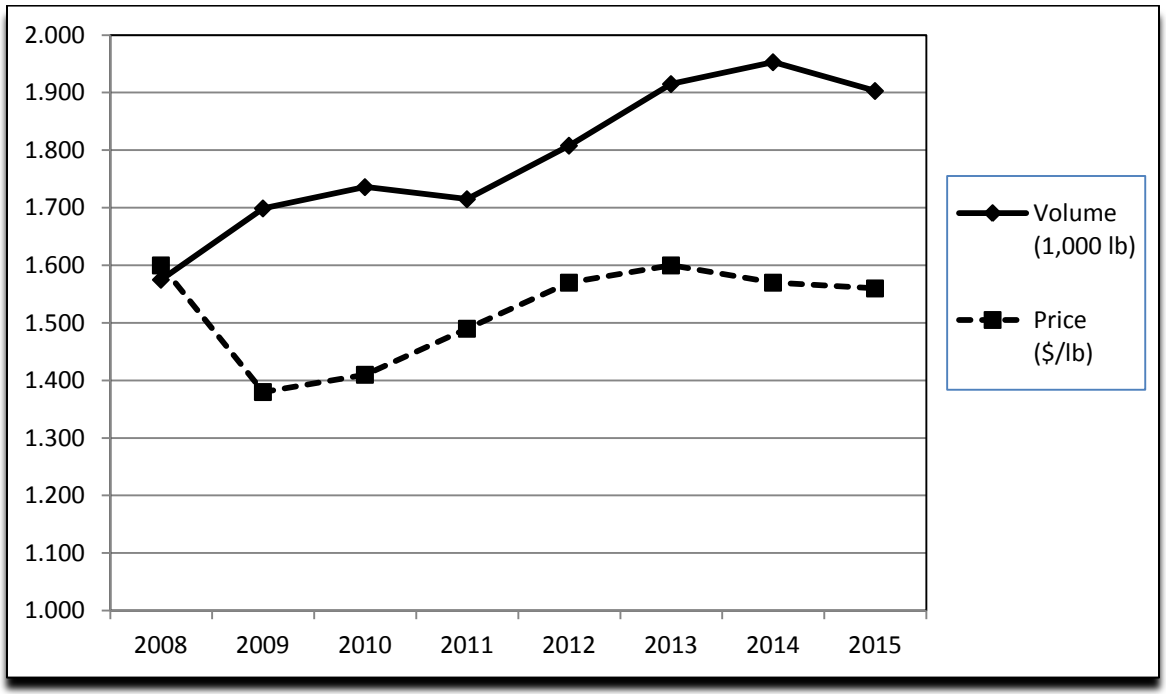
In the immediate aftermath of the Great Recession, the major concern was that overall consumer demand was not recovering as fast as would be expected in the developed countries, despite their use of numerous economic stimulus measures. However, that concern was mitigated somewhat by the rapid rebound in the major developing countries, and in the so called BRICs, Brazil, Russia, India and China. In particular, the industrial sector in China roared back rapidly to full strength. Its demand for raw materials fueled a new commodity boom around the world. Numerous countries whose economies relied heavily on commodity exports, from Argentina and Australia to Zambia and Zimbabwe, were pulled along in the wake of China's massive economic engine.

However, the Chinese economy began to stall in 2012. In particular, Chinese imports, that had grown 38.8 percent in 2010 and 24.9 percent in 2011, averaged only 4 percent growth in the next three years, before falling by 14.2 percent in 2015. Falling demand in China reduced both the quantity demanded of many commodities, but also sent world commodity prices into a downward spiral. Many economies around the world that had benefited from Chinese import demand saw their own economic growth either stall, or fall into recession, from these twin blows. A particular group of commodity-dependent countries, the oil producing countries, were especially hard hit by falling prices because their economies are so heavily dependent on oil revenues. In addition to China, two other BRIC economies, Brazil and Russia, were badly hurt by falling commodity prices. Brazil's problems were compounded by a widespread political corruption scandal, while Russia's economy was hit by comprehensive western sanctions.

Meantime, the traditional drivers of global demand, countries like the United States, Japan and much of Western Europe, were recovering so slowly that they could not compensate for the slowdown in China. All these forces combined to slow the growth of both the world economy and of world trade. Unless there is a reversal of fortune in many key countries, world demand, and world trade, could continue to slow in 2017 and 2018. This would create a drag on the demand for many consumer products, including fresh apples.

The chart below shows summary information from the United Fresh quarterly publication, Fresh Facts at Retail, that shows how average weekly retail volume per store and average retail prices of fresh apples have varied since the Great Recession. It shows that average weekly retail volume of fresh apples has risen by about 3 percent per year, but average weekly retail prices have not yet recovered to 2008 levels in current terms. If inflation is taken into account, retail prices of fresh apples in 2015 were almost 12 percent lower in real terms than in 2008.

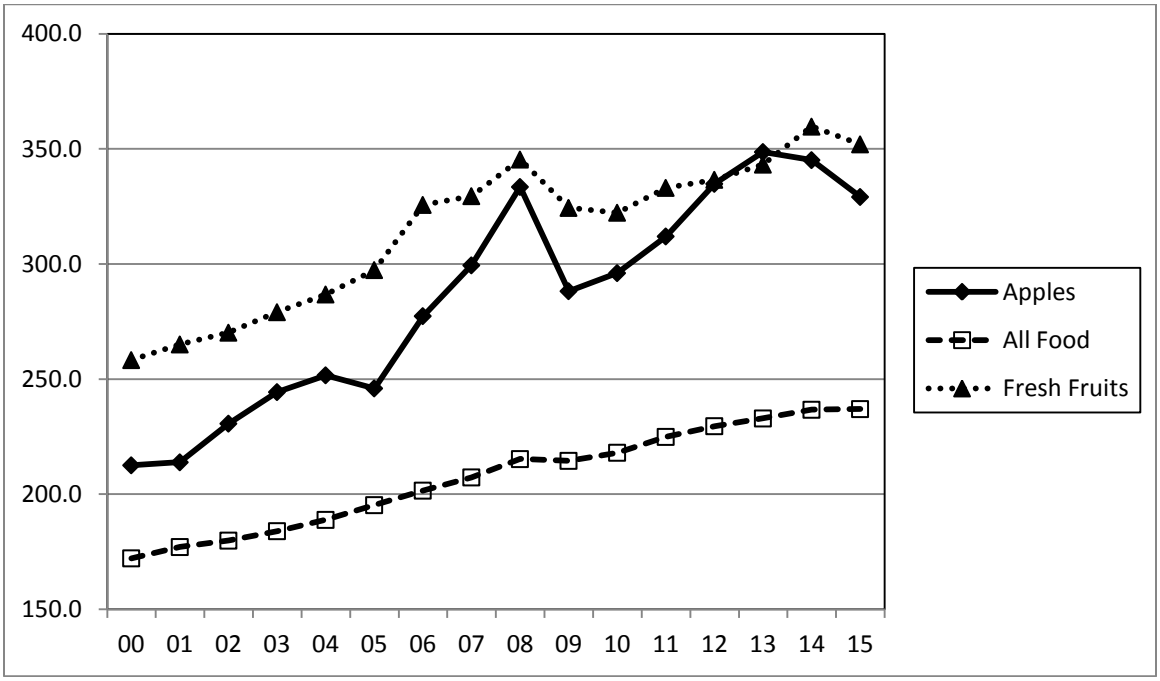
United States: Average Weekly Volume per Store and Average Retail Prices of Fresh Apples, 2008-2015



The biggest plunge in average retail prices occurred in 2009 when the full brunt of the Great Recession was still being felt. Prices then recovered steadily for the next four years before again turning downwards in 2014 and 2015.

Data published monthly in the Bureau of Labor Statistics Consumer Price Index reports enables us to see how retail prices of fresh apples have moved relative to those of all fresh fruits and those of all food. In general, the index of prices of all food has moved upward from year to year in very small increments. There was a minor pause in 2009 after the Great Recession hit, and again in 2014 and 2015. In contrast, the index of prices of all fresh fruits rose rapidly between 2000 and 2008. However, it then moved sideways for the next seven years. In 2015, in current dollar terms, it was still only 2 percent below the peak level achieved in 2008, a decline of 7.5 percent in real terms. The index of prices for fresh apples was even more erratic than that for all fresh fruits. It had strong surges between 2001 and 2004, between 2005 and 2008, and again between 2010 and 2013, followed by brief setbacks at the end of each period. By 2015, it was still 1.3 percent below the 2008 level in current terms, and 10 percent in real terms.

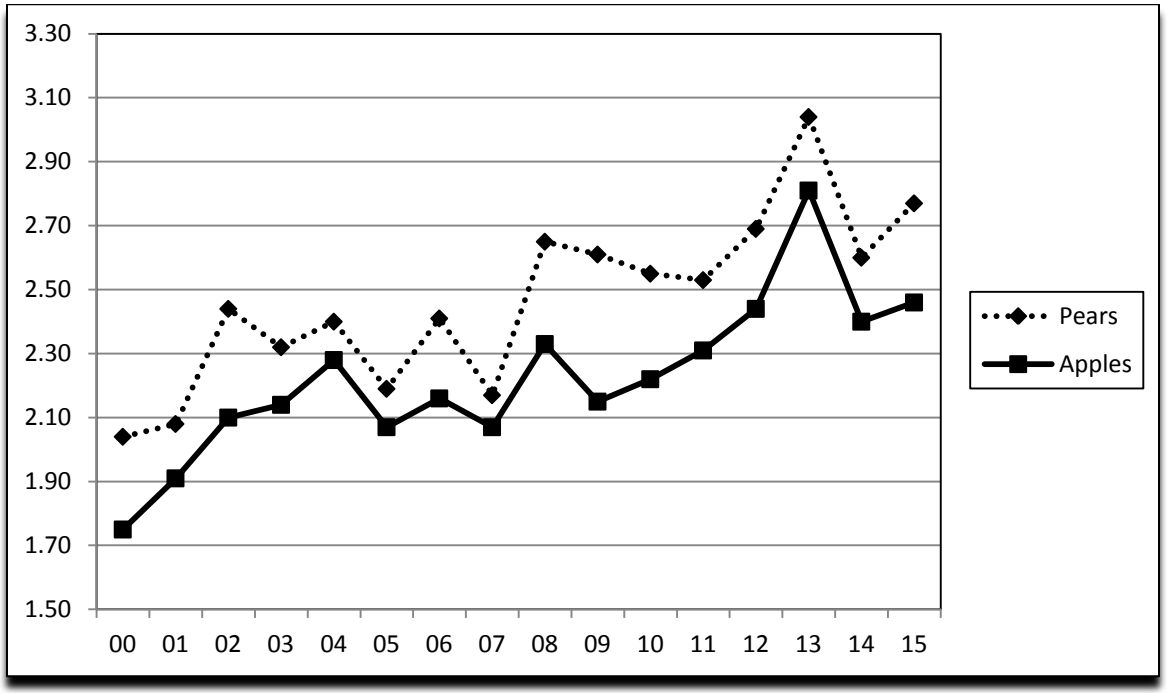
United States: Annual Average Retail Price Index of Fresh Apples and of All Food, 2000-2015
(1982-84 = 100)



From a longer term perspective, prices for all food rose by 37.6 percent between 2000 and 2015, those of all fresh fruits rose by 36.3 percent, and those for fresh apples rose by 54.8 percent. Thus, in price terms, the increases for fresh apples were far ahead of those for all fruits and for all food. This appears to indicate a small increase in the consumer preferences for fresh apples compared to other fruits, and may reflect the improved quality and diversity of fresh apples available.

The retail prices of fresh apples in many countries appear to be closely linked to the prices of fresh pears. The chart below shows annual average retail prices of fresh apples and fresh pears in France for the period from 2000 to 2015. Clearly, the prices of fresh apples and fresh pears have been closely correlated, with fresh pears being higher being higher in every year, by an average of over 10 percent. This suggests that retailers set the prices of fresh pears each year relative to the prices established for fresh apples. One other notable item in this chart is that retail apple prices showed a similar, if more muted pattern, than retail apple prices in the United States, with similar peaks in 2004, 2008 and 2013. This indicates how retail prices of apples are linked even between markets in different continents.

France: Annual Average Retail Prices of Fresh Apples and Fresh Pears, 2000-2015
(euros per kilogram)



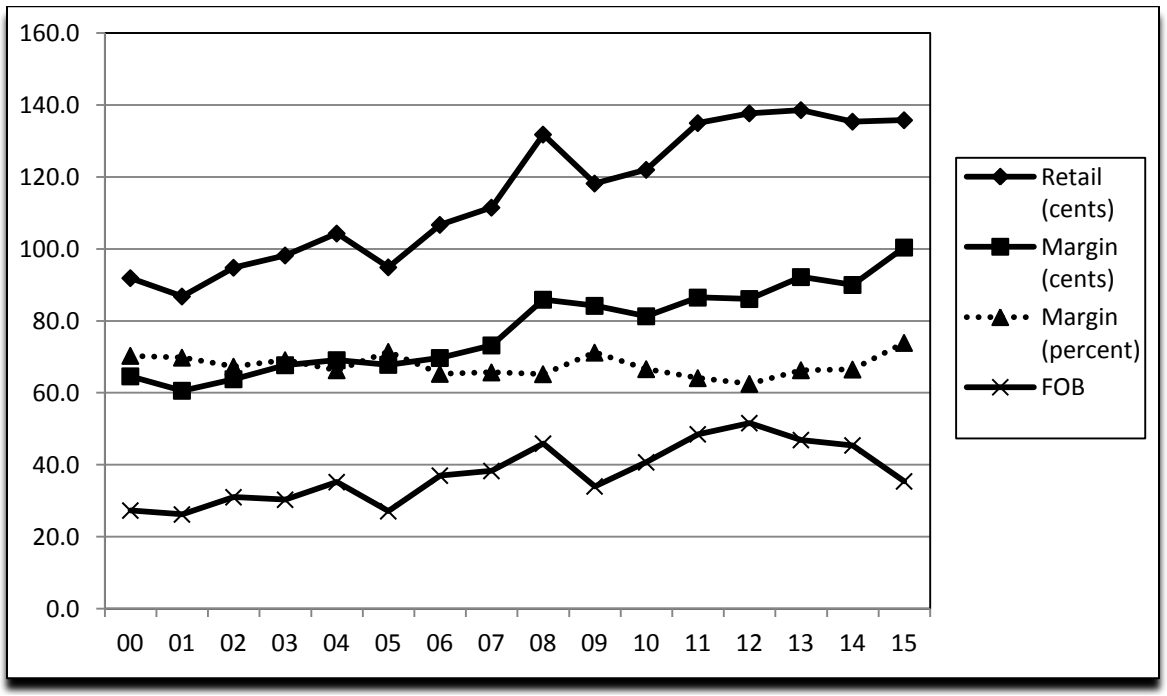
Transmitting Retail Prices Back to Growers

Retail prices represent what consumers are willing to pay to acquire fresh apples, or any other product. That sets the initial constraints on how much will be returned to the growers for their products. However, what is eventually returned to growers depends on costs and efficiencies within the marketing system. Since most fresh apples are purchased in chain grocery stores, the prices passed back to growers reflect the costs and charges imposed by the many actors involved between the consumer and the orchardist. Modern marketing systems tend to be increasingly complex despite frequent efforts by large retailers to "squeeze" perceived inefficiencies out of the system. Between the orchard and shipping point, fresh apples must be assembled, sorted, packed in inner and outer packs, and stored. Sales between marketers at shipping point and wholesale or retail buyers must be negotiated. Apples are usually hauled in truck loads for long distances, unloaded at wholesale warehouses or retail distribution centers, broken into smaller lots for hauling to individual stores, unloaded at the stores, placed on the shelves and monitored while on the shelves by store employees.

While all these physical activities are costly, produce items now incur a wide range of additional service costs on their way to market. This includes audits, quality inspections, government and private certifications, and an array of services, financial, insurance, communications, research, promotion, public relations, etc.

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. 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 Red Delicious apples, still the most widely grown variety. The chart below shows annual average Red Delicious retail prices, FOB shipping point prices, absolute marketing margin (retail minus FOB), and percentage marketing margin for the years from 2000 to 2015. While retail prices have moved up steadily until 2013, as was shown previously for all fresh apples, absolute marketing margins moved to a higher plateau between 2008 and 2015 compared to the 2000-2007 period. However, percentage marketing margins remained relatively stable throughout the 16-year period.

United States: Red Delicious. Retail Prices and Marketing Margins, Annual, 2000-2015



The FOB shipping point price of Red Delicious apples moved very closely in sync with the retail price, although the absolute marketing margin widened over time. The proportion of the retail price returned at FOB actually rose, from 32 percent in the 2000-2007 period to 33 percent in the 2008-2015 period. This once again indicates a slight increase in the favorable treatment of fresh apples in the U.S. marketing system.

Changing Effect of Inflation on Apple Prices

In the past, in many apple producing countries, inflation (a general increase in price levels) has played a disruptive role, both positive and negative, in the apple industry. On the positive side, since apple growers tend to be long-term borrowers, money borrowed in any year could be repaid in a later year with deflated dollars. That was particularly beneficial if apple prices rose in step with inflation, as they have done in the United States. On the negative side, inflation can show a false picture of how well sales or profits are progressing. If profits rise by 5 percent, but inflation rises by 10 percent, the real purchasing power of those profits has actually fallen. In addition, once major suppliers of goods and services (such as chemicals or labor) see inflation reducing their purchasing power, they will demand higher prices or wages. An economy can easily slip into a spiral where such demands cause further inflation, and further demands. Many countries, including major apple producing countries, like Argentina and Turkey, have been caught in such inflationary spirals in recent years.

However, since the onset of the Great Recession, governments and businesses in many major economies, including China, Japan, the European Union and United States, have begun to worry about the opposite, deflation, a general decrease in price levels. The chief concern about deflation is that if businesses and individuals think that prices will continue to fall, they will delay purchases of goods and services. That, in turn, will reduce the incentives for businesses to invest or to increase employment. Thus, a deflationary spiral brings its own set of problems for societies. Most economists see a modest level of inflation of about 2 percent as being the most desirable. The Economist magazine estimated that of the 42 countries whose inflation rate it tracks weekly, over half were expecting inflation below 2 percent in 2016, and over one quarter inflation below 1 percent.

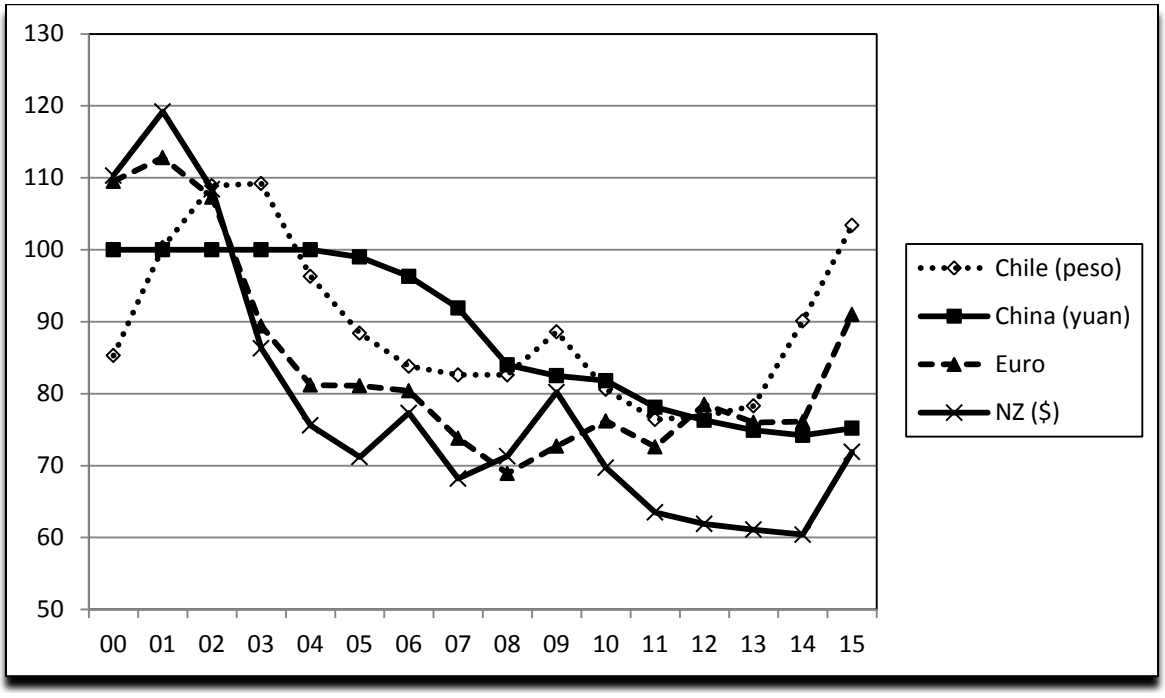
While deflation would certainly affect purchases of large ticket items like automobiles or refrigerators, it is not clear how much it would affect purchases of regularly bought items like fresh apples. For such items, the bigger threat from deflation would be a general slowdown in business investment and hiring.

Distorting Effects of Exchange Rate Changes

Changes in exchange rates can have similar effects to inflation or deflation in that exchange rate swings can artificially alter what exporters receive for their product, or what importers must pay for products purchased. For example, in 2003, one U.S. dollar was worth 691.4 Chilean pesos. Two years later, in 2005, it was worth only 559.8 pesos. Thus, a Chilean exporter who sold the same dollar value of apples in 2005 as in 2003, would have received back almost 20 percent less Chilean pesos in 2005, a serious blow to revenue and profits. The chart below shows changes in exchange rates against the U.S. dollar between 2000 and 2015 for the Chilean peso, Chinese yuan, euro and New Zealand dollar.

Value of Selected Currencies per U.S. Dollar, 2000-2015

(Index to Base 2000-04 = 100)



The first point to note is the wide swings that have taken place in each of these currencies over a 16-year period. The gap between the highest rate of exchange and the lowest was 43 percent for Chile, 35 percent for China, 64 percent for New Zealand and 97 percent for countries using the euro currency. It is also notable that the exchange rate of the Chinese yuan has showed less fluctuations. China has been able to control the value of its currency against the U.S. dollar, whereas the exchange rate for the other currencies have been more open to free market forces.

In general, those free market forces have led to reduced exchange rates against the U.S. dollar between 2003 and 2005, relatively stable rates between 2005 and 2013, and a sharp upward swing in rates in 2014 and 2015. There are many reasons why exchange rates fluctuate as they do. However, for our purposes here, it is sufficient to note that they do, and that those fluctuations can be difficult to predict.

The implications for exporting countries are clear. Marketers and their producers need to be able to keep unit costs low enough to make a profit even when they face the most unfavorable exchange rates. For example, in the case of Chile, they need to be able to make a profit when their returns in pesos are 30 percent below the highest historic levels. This means seeking every possible efficiencies that can be gained in the production, packing, storage, marketing or shipment of their apples to market. In the case of a more distant supplier, like New Zealand, another way to survive unfavorable exchange rates is to focus on producing premium varieties, a strategy that New Zealand follows. For importing countries, importers can get higher quality fruit at lower prices by buying from supplying countries whose currencies are weakest that season.

While these examples of exchange rate fluctuations have focused on the parties to the exchange other than the U.S. dollar, the same principles apply to the United States and to other countries that use the U.S. dollar as their currency. When the U.S. dollar weakens against other currencies, U.S. suppliers gain a competitive advantage. On the other hand, when the U.S. dollar strengthens against other currencies, U.S. suppliers need to redouble their efforts to improve efficiency or improve quality in order to sustain their businesses.

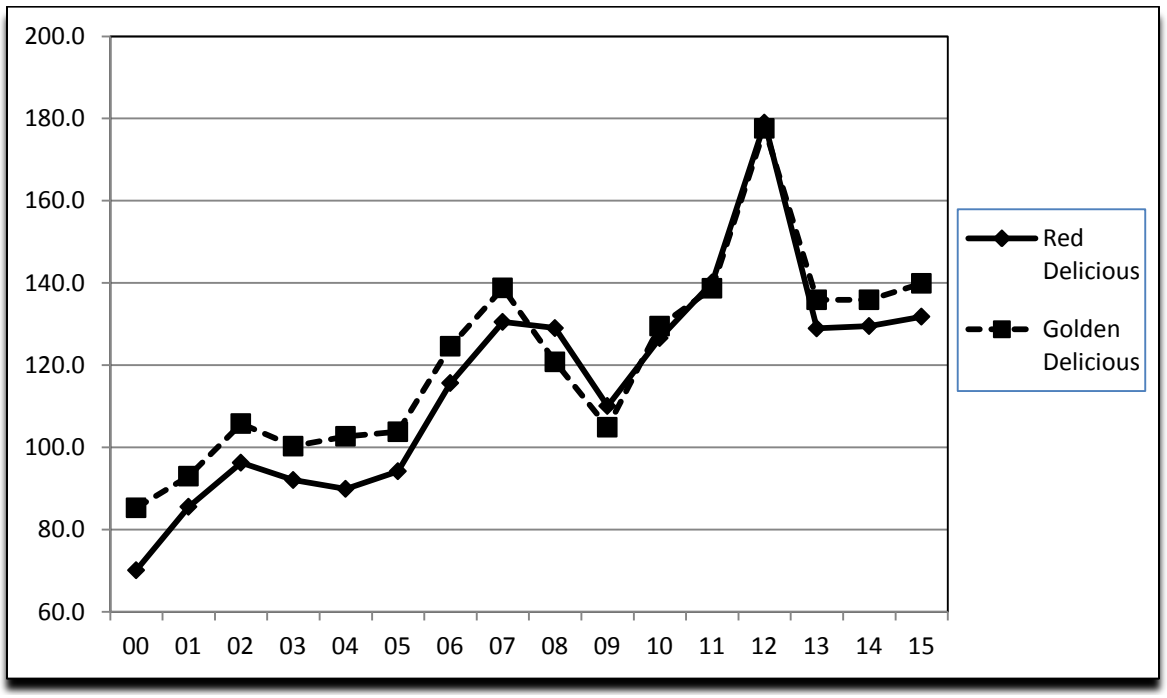
Variations in Wholesale Prices

Information on prices of fresh apples at the wholesale level are available in a few countries for individual varieties. Unfortunately, most of these price series were constructed in a past era when different varieties were more important than they are today. Data on emerging new varieties were rarely collected. One exception is the wholesale price series for the United States that is published in the monthly Producer Price Index series. Data have been reported for many years for five major varieties, Red Delicious, Golden Delicious, Granny Smith, Rome and McIntosh apples. More recently (in 2014) data have been included on the Gala, Fuji and Empire varieties, but historic data for these varieties are not available. It will be possible to track these varieties in future issues of the World Apple Review.

The indexes are all presented here to the base December 1991 = 100. For the charts, we have used the relevant price index for December of each year because missing data has made it difficult to compile an accurate season average series. It is believed that the December data tend to represent shipments at a time when the supply for the year, and the expected price level, has been established. It is a good, but not an exact, indicator of seasonal differences. For clarity, the first chart below shows only price indexes for Red Delicious and Golden Delicious, while the second chart includes data for Granny Smith, Rome and McIntosh.

United States: Producer Price Indexes, Red Delicious and Golden Delicious Apples, 2000-2015, December of Each Year

(percent of base, December 1991 = 100)

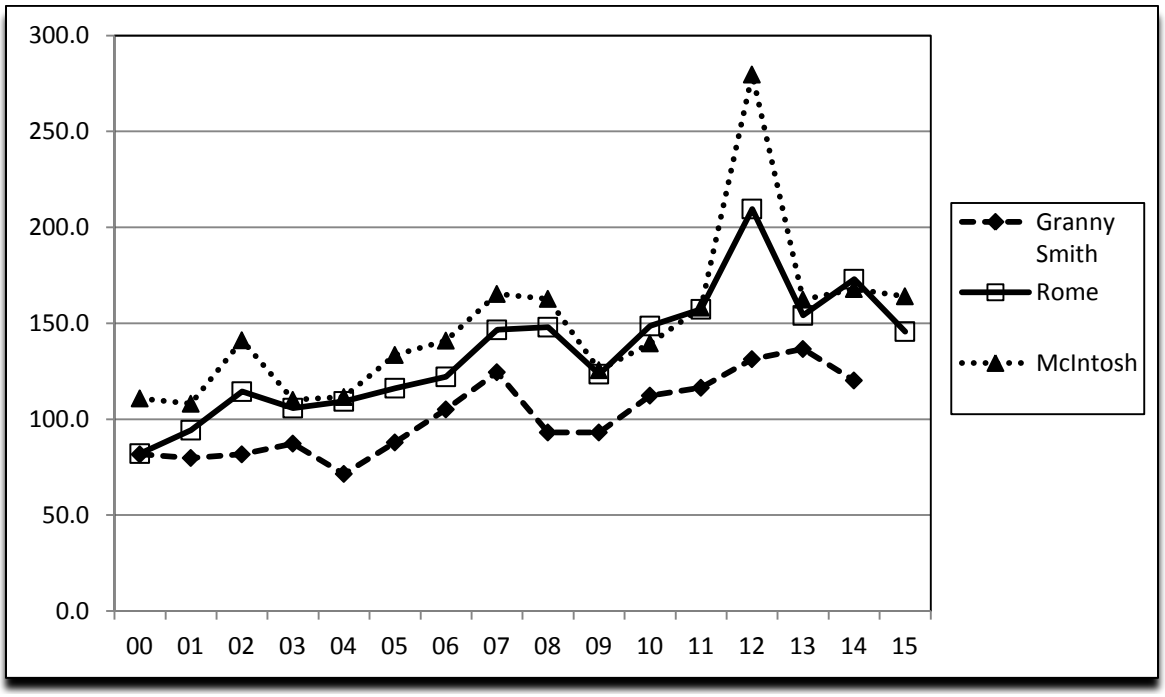


The chart for Red Delicious and Golden Delicious shows a strong upward trend between 2000 and 2015, but with wide swings above and below that trend. It shows temporary peaks in 2007 and 2012, similar to those shown for all U.S. retail prices. However, the upward trend between 2000 and 2004 reflected a recovery from depressed prices in the previous decade. Real growth only occurred after 2006. The chart also shows the close similarity in year to year movement of prices for Red Delicious and Golden Delicious. The prices have been highly correlated historically, and this tight linkage is likely to continue in the future.

The second wholesale price chart (below) shows the producer price indexes for Granny Smith, Rome and McIntosh apples, three other leading eating apples. Granny Smith is produced primarily in the Western United States, and Rome and McIntosh in the Eastern or Midwestern states, so their supply in any year is unlikely to be affected by similar weather events. Despite that fact, there is a strong correlation in the movement of all three price series over time. This indicates that the prices for individual apple varieties are highly influenced by the overall supply-demand situation in the apple market in any year.

United States: Producer Price Indexes, Granny Smith, Rome and McIntosh Apples, 2000-2015, December of Each Year

(percent of base, December 1991 = 100)



However, the level of the price of each individual variety is affected by supply trends in that variety. For example, Granny Smith prices were relatively high in the 1990s. As supply increased, prices were driven below the December 1991 base level. Between 2000 and 2009, they only exceeded that level in two years, 2006 and 2007, before moving clearly above that level after 2010. In contrast, the prices of both Rome and McIntosh exceeded the December 1991 base from 2002 on. In general, the supplies of Rome and McIntosh have not grown as fast as total apple supplies. The big spike in McIntosh prices in 2012 reflected the short crop in that season due to frost damage, but prices fell back as normal supplies resumed.

Influences of Varieties and Production Methods

Until recently, limited data were available on how different apple varieties, or different production methods, such as organic production, affected retail apple prices. During the 2010-11 apple marketing year, USDA,AMS began to report weekly on the number of stores with ads, and on advertised prices, for hundreds of produce items, including many different varieties of fresh apples. Over time, the number of varieties covered regularly has been extended. Most coverage relates to apples sold per pound, but data are also available on bagged (usually in 3-lb bags) apples. In addition, data are reported separately for apples grown conventionally and those grown organically. Other USDA,AMS data show that organic shipments currently account for 7 to 8 percent of total fresh apple shipments in the United States. The table below shows average weekly number of stores with ads for each major variety sold per pound for the 2013-14 and 2014-15 seasons, and for the first eight months of the 2015-16 season.

United States: Average Weekly Number of Ads for Major Varieties, sold per pound, 2013-14 to 2015-16 Seasons

Variety	2013-14	2013-14	2014-15	2014-15	2015-16p	2015-16p
	Conventional	Organic	Conventional	Organic	Conventional	Organic
Braeburn	782	51	935	132	1,043	153
Fuji	2,167	346	2,541	842	2,483	1,087
Gala	3,683	702	4,387	1,558	3,217	1,244
Golden	1,148	108	1,765	408	1,227	203
Granny	1,735	156	2,278	359	2,159	389
Honeycrisp	1,129	159	1,793	250	3,158	416
McIntosh	416	0	424	1	581	1
Cripps Pink	570	26	627	94	1,006	172
Red Del.	2,890	324	3,459	669	2,535	517
Total	14,519	1,872	18,208	4,313	17,408	4,181

The table above shows a large increase in the number of stores with conventional ads in the large crop year of 2014-15. Every variety shared in the increase. However, between 2013-14 and 2014-15, the number of stores with organic ads more than doubled. Once again, all varieties shared in the increase. For the first eight months of 2015-16, the total number of stores with conventional and organic ads has fallen modestly. The biggest change has been increases in ads for the higher-priced items, Honeycrisp and Cripps Pink/Pink Lady, and decreases for the mainstream varieties, Gala, Red Delicious and Golden Delicious.

United States: Average Weekly Advertised Prices for Major Varieties, sold per pound, 2013-14 to 2015-16 Seasons

Variety	2013-14	2013-14	2014-15	2014-15	2015-16p	2015-16p
	Conventional	Organic	Conventional	Organic	Conventional	Organic
Braeburn	1.409	1.729	1.193	1.850	1.301	1.932
Fuji	1.458	2.016	1.277	2.041	1.410	2.300
Gala	1.443	2.031	1.268	2.010	1.374	2.263
Golden	1.224	2.201	1.176	2.122	1.225	2.287
Granny	1.349	2.064	1.327	2.166	1.337	2.337
Honeycrisp	2.412	3.046	2.240	3.145	2.426	3.073
McIntosh	1.344	n.a.	1.174	n.a.	1.163	1.710
Cripps Pink	1.693	1.949	1.557	2.163	1.693	2.487
Red Del.	1.235	2.014	1.154	1.920	1.177	2.078
Total	1.456	2.114	1.346	2.090	1.533	2.336

The table above shows weekly advertised prices for the same seasons and varieties and for conventional and organic apples. Average advertised prices for all conventional apples fell by 7.6 percent between 2013-14 and 2014-15, in response to the much larger apple crop. In contrast, average advertised prices of organic apples fell by just 1.1 percent. Indeed, organic prices for Braeburn, Fuji, Granny Smith, Honeycrisp and Cripps Pink/Pink Lady actually rose slightly. In the first eight months of 2015-16, average advertised prices for all conventional apples rose almost 14 percent, and of organic apples almost 12 percent. The only advertised price that was lower in 2015-16 was the organic price of Honeycrisp. This suggests that retailers faced consumer resistance in raising Honeycrisp organic prices.

Casual observation of normal (unadvertised) prices suggests that advertised prices reflect the actual relationships between normal prices for the different varieties. In 2015-16, the prices of conventional Red Delicious and McIntosh were about 25 percent below the average for all conventional varieties, Golden Delicious about 20 percent below, Braeburn and Granny Smith about 15 percent below, and Fuji and Gala about 10 percent below. Conventional Honeycrisp received a 58 percent premium, and Cripps Pink/Pink Lady a 10 percent premium. These relationships were similar for previous seasons. In the case of organic apples, prices were much closer. While McIntosh prices were 27 percent below the organic average, Braeburn 17 percent below, and Red Delicious 10 percent below, five varieties, Fuji, Gala, Golden Delicious, Granny Smith and Cripps Pink/Pink Lady were within 10 percent of the average organic price. The percentage premium for organic Honeycrisp was about half that for conventional Honeycrisp.

Influence of Processing on Apple Prices

The volume of apples demanded for processing uses continues to have an influence on average grower prices and returns in many countries. In some cases, orchards are dedicated to producing only processing apples for a specific use in a neighboring processing plant. Often, such deliveries are covered by contracts with varied terms and durations. In other cases, orchards produce so called "dual purpose" apples, such as the Idared, Golden Delicious or Rome varieties that are in demand for both fresh and processing uses. Increasingly, as more and more producers have planted varieties aimed primarily at the fresh market, the volume of apples being processed is dependent on the proportion in any year that fail to meet fresh market standards. In the rare occasions when fresh apple prices are relatively low, and processing prices are relatively high, some apples that could have gone to the fresh market may be diverted to the processing market for purely economic reasons. Processing prices rarely cover the full cost of production. However, in some years they can be valuable to producers in covering some of the variable costs incurred in production.

Unfortunately, data on processing uses and prices are limited in most countries. The best historical information is for the United States. However, the U.S. experience in many ways mirrors what has happened to the processing apple sector in other major producing countries. The table below shows the long-term trend in apple production and use in the United States for selected past three-year periods, and for the three most recent seasons, 2012-13, 2013-14 and 2014-15.

Total production of apples in the United States was on a long, downward trend between 1997-99 and 2009-11. However, a strong rebound occurred in 2013-14 and in 2014-15. Total production in 2014-15 was almost 10 percent higher than in 1991-93. Fresh use had climbed steadily over time. By 2013-14, fresh use was almost one million metric tons (37.7 percent) higher than in 1991-93. In contrast, processing use fell much faster than total use between 1991-93 and 2009-11. Even after the rebound in total production, processing use in 2014-15 was 546,100 metric tons (27 percent) below the level in 1991-93.

The largest processing category for the entire period studied was the use for apple juice and cider. However, that category fell by 400,000 metric tons (almost 38 percent) between 1991-93 and 2014-15. The reason for that fall is well known. Many apple juice processing plants were closed because of intense competition from imported apple juice concentrate, especially from China. When prices for juice apples fall too low, the cost of diversion can exceed the return from juicing.

United States: Quantities of Apples In Major Alternative Uses, Selected Years, 1991-2015
(thousand metric tons)

Use	1991-93	1997-99	2003-05	2006-08	2009-11	2012-13	2013-14	2014-15
Fresh	2,621.5	2,755.1	2,754.4	2,821.3	2,853.6	2,991.4	3,112.1	3,609.2
Processed	2,016.4	1,998.4	1,580.0	1,459.9	1,407.6	1,057.6	1,561.3	1,470.3
Canned	626.6	608.0	553.0	531.0	509.6	339.7	580.6	509.4
Juice/cider	1,065.6	1,072.0	759.0	628.4	584.2	504.4	690.9	663.7
Frozen	123.3	125.5	120.7	112.0	95.6	30.2	108.5	100.9
Dried	149.6	132.2	86.8	101.2	78.6	101.2	73.0	82.1
Fresh slices	n.a.	n.a.	34.4	52.1	79.2	58.0	74.2	86.9
Other	51.3	60.6	26.1	35.3	30.3	24.0	33.7	27.3
Total	4,637.9	4,753.5	4,334.3	4,281.2	4,080.6	4,049.0	4,673.4	5,079.5

The second largest category has continued to be that for canned uses. The volume canned bounced back strongly in 2013-14, but slipped somewhat in 2014-15. That volume was 117,200 metric tons (18.7 percent) lower in 2014-15 than in 1991-93. No other categories came close to the volumes used in juice or canning. The volume either frozen or dried has moved down in step with total processing use. The one segment that has experienced growth has been in fresh slices. That category was not separately identified in 1991-93. However, it more than doubled between 2003-05 and 2013-14, and continued to grow even with the smaller apple crop in 2014-15. It has received a boost from increased stocking in major fast food restaurant and grocery chains. However, the relatively high retail price compared to that of whole apples, continues to be a deterrent to more rapid expansion.

Trends in average prices for different uses over the same period help explain why processing uses have generally continued to shrink. In 1991-93, fresh prices averaged about three times average prices for all processing uses. By 2013-14, fresh prices averaged more than four times average processing prices. Prices for apples used for fresh slices were generally higher than for all other processing uses except in 2012-13, when spring frosts ravaged production in states like Michigan that devote a high proportion of production to processing. Canned prices were generally the highest among purely processing uses. Prices for juice/cider uses and for dried uses tended to be the lowest in most periods.

United States: Prices of Apples In Major Alternative Uses, Selected Years, 1991-2015

($ per metric tons)

Use	1991-93	1997-99	2003-05	2006-08	2009-11	2012-13	2013-14	2014-15p
Fresh	460.12	444.17	520.36	733.65	758.64	998.68	890.66	531.08
Processed	149.04	136.61	125.78	188.59	195.22	309.75	217.15	184.55
Canned	167.96	178.00	166.11	177.22	219.20	435.41	245.81	243.40
Juice/cider	130.52	109.17	86.97	124.85	158.50	243.61	159.83	150.00
Frozen	193.13	182.70	176.72	195.38	216.07	361.55	256.84	n.a.
Dried	159.39	110.11	109.45	93.27	154.49	194.00	210.53	n.a.
Fresh slices	n.a.	n.a.	235.55	312.47	390.33	332.89	442.02	n.a.
Other	141.76	169.53	186.07	260.05	344.93	267.86	294.31	n.a.
Total	324.87	314.87	375.95	547.12	682.93	817.91	665.79	584.22

While the overall trend in prices between different uses has been clear, the data also indicate that prices for the different uses of processed apples tend to move in the same direction from year to year in response to total supplies. For example, in 2012-13, the prices for most processing uses moved up in step, and in 2013-14 moved down in step. There were exceptions in each year. Final data for the 2014-15 season are not yet available, but it appears that prices will again fall across the board. This means that producers can gain little from transferring product from one processing use to another in different years.

Influence of Trade on Apple Prices

Trade remains a powerful equilibrating force in shaping prices in different countries. In general, an increase in exports removes supply form the exporting country and drives up price there. Domestic users must compete against foreign users for access to supplies. In contrast, an increase in imports increases supplies in the importing countries, and tends to reduce prices there. Domestic users have more options in choosing between local and imported supplies. In theory, trade in any product will continue until the price in the importing country is equal to the price in the exporting plus the costs of transferring the product between the two. This rule may occasionally be broken, as exporters may continue to supply importers at a loss to maintain goodwill, or importers may continue to import items at a loss to ensure access to supplies in periods of future shortage.

The major argument for freer trade is that when two trading nations focus on products where each has a comparative advantage, the overall economies of both nations will benefit. However, in the immediate aftermath of trade liberalization, the weaker industries in both nations will suffer harm. For that reason, many governments provide temporary trade adjustment assistance so the damaged industries can shift their capital and employees to alternative enterprises. In many cases, the industries that fear they will be damaged take protective action, either to secure exclusion from free trade deals, or ensure that protective measures, such as tariffs or quotas, are reduced at a slower rate.

The advantage of negotiating multilateral trade deals is that the support of industries that may benefit is more likely to outweigh the opposition of industries that fear possible harm. When a negotiating party claims exceptions for too many industries, that country tends to lose credibility. For many years, GATT, and its successor organization, the World Trade Organization (WTO) were able to narrow the number of exceptions so trade liberalization could advance. However, as the WTO has grown to almost 200 member countries, at very different levels of development, the obstacles to agreement have become larger, and the multilateral negotiating process has stalled. More and more countries have turned to bilateral or regional trade agreements. Smaller countries have been willing to enter bilateral deals in order to win access to the markets of larger trading partners. Larger countries have been willing to entertain such deals because they can assert considerable leverage over the terms of the deals. For example, large trading partners, like the European Union, can retain protection of key industries while also requiring smaller trading partners to accept the EU's standards on labor, the environment, food safety, health, intellectual property and technical issues.

Most analysts believe that a multiplicity of overlapping bilateral and regional trade deals leads to a "second best" situation compared to a comprehensive, multilateral trade agreement. For example, they create trade distortions when a more efficient supplying country is excluded from a market, while a less efficient supplier is given preferential access, just because the latter has entered into a bilateral agreement with the major trading partner. Many examples of this can be cited for trade in fresh apples. When a country like the United States, for internal political reasons, is reluctant to negotiate bilateral trade deals, its apple exporters find themselves frequently at a disadvantage in third country markets. In contrast, even though Chile is a relatively small country, it has been very aggressive about negotiating trade deals with as many trade partners as possible. This gives it an advantage in many major markets both in access and in terms of trade.

As previously discussed, two major trade agreements are now being negotiated, that could affect economies that account for more than half of world GDP. The first is the Transatlantic Trade and Investment Partnership (TTIP) which aims to lessen barriers to trade and investment between the United States and the European Union. Completion of the TTIP has become less assured because of mounting opposition within the United States and numerous other rifts within the European Union that are blocking common action. The second is the Trans-Pacific Partnership (TPP) which has been signed by the United States, Japan and ten other Pacific Rim nations. The TPP must be ratified by member governments, with ratification by the U.S. Congress being the major stumbling block. The TPP would reduce tariffs on many items, including fresh apples, and streamline trade protocols among member countries. The hope is that it would be so attractive that other Asian powers, including China, India and Indonesia, would be eager to join. Once again, there is great uncertainty about if, or when, the TPP could come into force.

Despite all these problems, trade liberalization continues to move ahead, admittedly much more slowly than its promoters would like, because it continues to provide mutual benefits to participants. It allows countries to specialize in producing the products they do best. It remains one of the best tools a government can use to stimulate competition among domestic industries and to force them to innovate and adapt to changing markets.

The table below shows fresh apple export prices in euros per metric ton for the EU-28 in total, and for its ten member countries with the largest apple exports, for the calendar years from 2008 to 2015. This period covered the onset of the Great Recession, and the years of recovery since. Average EU-28 export prices for fresh apples fell between 2008 and 2010, recovered between 2011 and 2013, and then fell again in 2014 and 2015. Although there were substantial differences in price levels between the major EU-28 exporters, there was a strong tendency for all prices to move up and down together. For example, EU-28 average prices and all country prices moved upward between 2012 and 2013, and moved downward between 2013 and 2014.

In general, prices were higher for major Western European countries like France and Italy, and substantially lower for Eastern European countries like the Czech Republic and Poland. This suggests that buyers recognize substantial quality differences between these different types of suppliers. Export prices for Austria, Belgium and the Netherlands can be misleading because their exports include such a high proportion of transit shipments. Export prices for Germany are among the lowest in Western Europe, driven down as they are by large net imports.

EU-28: Average Fresh Apple Export Prices of Major EU Exporters, 2008-2015

(Euros per metric ton)

Exporter	2008	2009	2010	2011	2012	2013	2014	2015
Austria	761.18	398.32	523.35	671.83	647.95	771.78	643.04	583.14
Belgium	679.18	510.51	548.93	556.78	699.21	781.24	626.00	538.55
Czech Republic	254.76	172.40	238.16	364.69	219.34	292.18	232.54	215.07
France	776.87	696.71	690.42	729.76	855.05	900.39	777.66	875.97
Germany	687.63	546.92	565.74	670.30	582.37	774.10	635.34	597.93
Greece	477.61	402.46	379.63	474.90	479.08	522.90	460.65	415.43
Italy	814.22	652.35	680.89	731.25	780.61	892.65	753.52	757.36
Netherlands	831.80	629.39	676.51	729.80	812.03	1,148.31	944.06	903.44
Poland	334.72	259.17	281.49	375.43	355.36	360.40	321.05	323.33
Spain	536.30	496.88	501.89	602.41	659.10	687.22	664.80	708.82
All EU-28	672.31	522.39	550.22	628.14	632.24	676.51	594.90	577.93

In addition to being the world's largest exporter of fresh apples, the EU-28 is also the largest importer. The table below shows the average prices paid for fresh apple imports from all sources, and from the ten leading foreign suppliers to the EU-28. Four of the supplying countries are in the Northern Hemisphere, while six are off-season suppliers from the Southern Hemisphere. Average import prices were substantially above average export prices in all years covered. Average import prices also fell between 2008 and 2010, rose between 2011 and 2013, and fell again in 2014 and 2015. Clearly, export and import prices are affected by similar forces.

The differences in price levels also indicate that different suppliers cater for different segments of the EU-28 market. For example, until recently, Turkey and China tended to be the lowest cost suppliers to the EU-28 market. This was no longer true in 2015. The United States and Canada tended to be relatively high cost suppliers. The United States ships mostly specialty and organic items, while Canada focuses on late season deliveries. Even among Southern Hemisphere suppliers, there have been wide discrepancies in pricing. Brazil has been consistently the lowest-priced supplier, while Australia has been the highest priced supplier, mostly of its premium Pink Lady apples. Among other Southern Hemisphere suppliers, New Zealand has supplied the highest volume at the highest average prices. Supplies from Argentina, Chile and South Africa have tended to be in the middle price range.

EU-28: Average Fresh Apple Import Prices of Major Exporters to the EU, 2008-2015
(Euros per metric ton)

Exporter	2008	2009	2010	2011	2012	2013	2014	2015
Argentina	918.80	851.07	912.22	904.75	1,087.06	1,259.93	1,042.33	1,225.09
Australia	1,132.01	967.85	1,541.86	1,282.33	1,285.97	1,637.52	2,746.62	2,107.18
Brazil	828.09	750.93	815.91	798.45	848.09	959.12	895.29	967.97
Chile	920.24	906.79	890.97	876.08	1,008.70	1,214.76	1,027.28	1,260.82
New Zealand	1,082.74	984.80	1,096.27	1,083.15	1,234.31	1,321.26	1,301.97	1,407.74
South Africa	807.13	791.92	925.51	881.90	995.84	1,089.90	1,130.82	1,183.94
China	772.38	741.43	769.13	935.15	963.94	908.86	977.38	1,401.98
Turkey	591.39	656.08	686.10	639.80	973.27	750.58	761.15	1,084.28
Canada	894.05	1,025.66	883.53	1,038.86	1,163.83	1,184.57	1,133.17	1,746.82
United States	1,058.28	1,041.50	1,089.93	1,173.07	1,318.09	1,435.31	1,267.60	1,417.71
All Sources	735.50	633.74	663.03	693.00	725.72	804.86	710.18	667.76

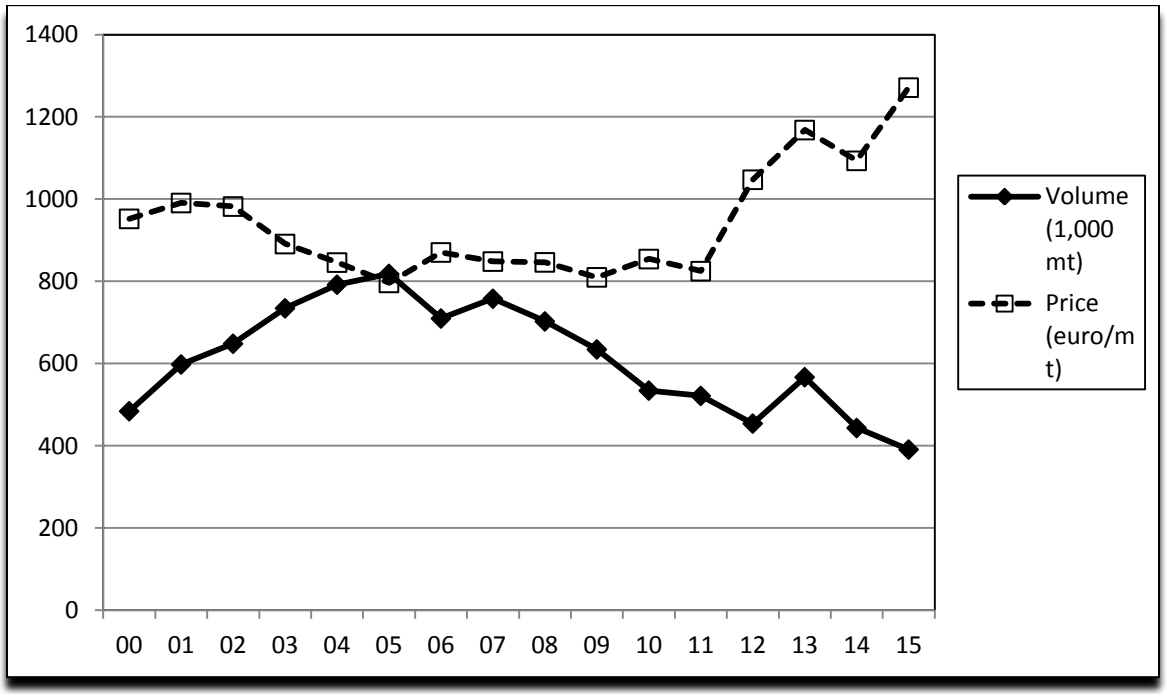
Recent Developments in World Fresh Apple Trade

A number of other developments in world trade will have widespread, long-term effects throughout the apple world. One of the most significant is the decreasing importance of the EU-28 market to Southern Hemisphere exporters of fresh apples. The chart below shows the annual volume and average prices of fresh apples imported into the EU-28 from the Southern Hemisphere between 2000 and 2015. In general, the volume of imports trended upwards between 2000 and 2005. However, since 2005, they have been on a long, downward trend that was only broken briefly in 2013. Imports in 2015 fell below 400,000 metric times for the first time in two decades, and were less than half the peak level in 2005. Average import prices fell from about 1,000 euros per metric ton between 2000 and 2002 to above 800 euros per metric ton between 2004 and 2011. Lower volumes at lower prices is a clear indicator of reduced absolute demand. However, since 2011, average import prices have moved sharply upwards, indicating that there are more premium varieties included in the reduced volume imported by the EU-28.

There are a number of reasons for the decline in Southern Hemisphere imports, including the prolonged economic slump in Europe, new import licensing requirements placed on suppliers, problems with the EU's minimum residue limits, and greater demands for certifications from European retailers. As Asian and other markets have become more attractive, this trend is not likely to reverse soon.

EU-28: Imports of Fresh Apples from Southern Hemisphere Suppliers, 2000-2015

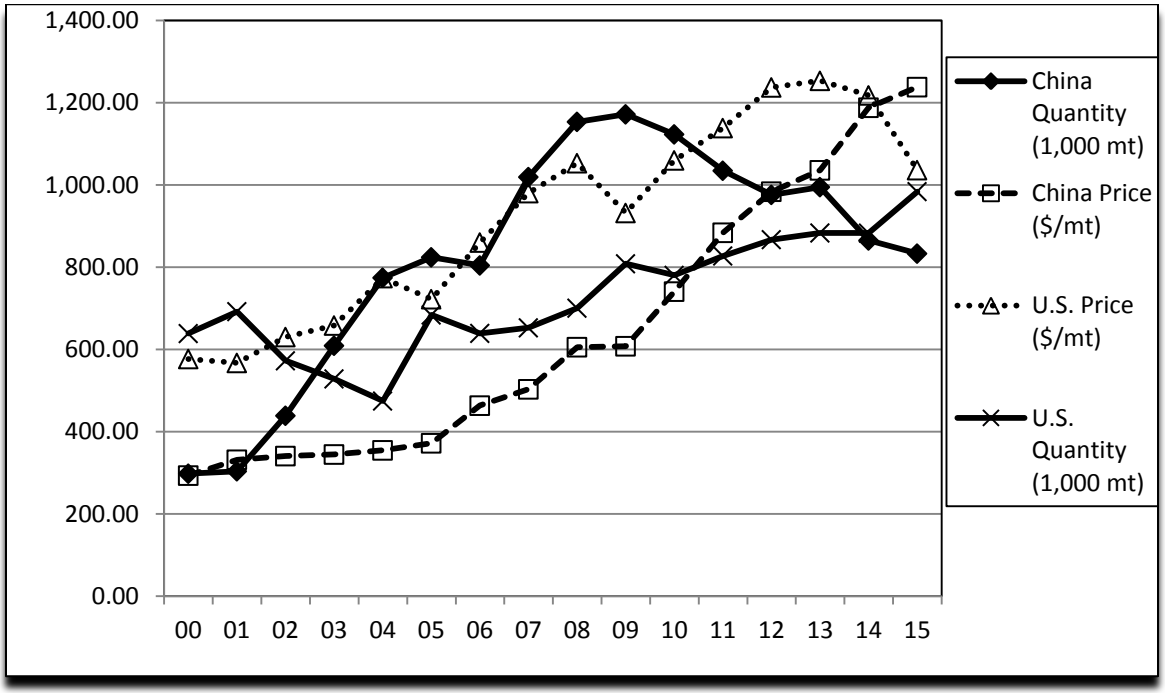
(Quantity, 1,000 metric tons, and Price, Deflated Euros per metric ton)



Another development with worldwide ramifications is the cessation since 2009 in the dramatic growth of Chinese fresh apple exports, and the accompanying sharp increase in average export prices of Chinese fresh apples. The chart below shows the volume and average price of Chinese fresh apple exports between 2000 and 2015. Also shown for contrast is the volume and average price of fresh apple exports from the United States, China's major competitor in many Asian markets. The solid black line with black star symbols shows trends in the volume of Chinese fresh apple exports. These almost quadrupled between 2000 and 2009, but fell in five of the six following years, reaching a level in 2015 that was 29 percent below the 2009 peak. One contributing factor to the slowing exports was the rapid rise in Chinese export prices after 2005. They rose more than threefold between 2005 and 2015. Part of the rise was due to the devaluation of the Chinese currency against the U.S. dollar beginning in 2005. Another part appears to have been due to increased domestic demand for fresh apples as the Chinese economy surged. This occurred even though total Chinese production of all apples increased by over 20 million metric tons between 2000 and 2015.

China and United States: Volume and Average Prices of Fresh Apple Exports, 2000-2015

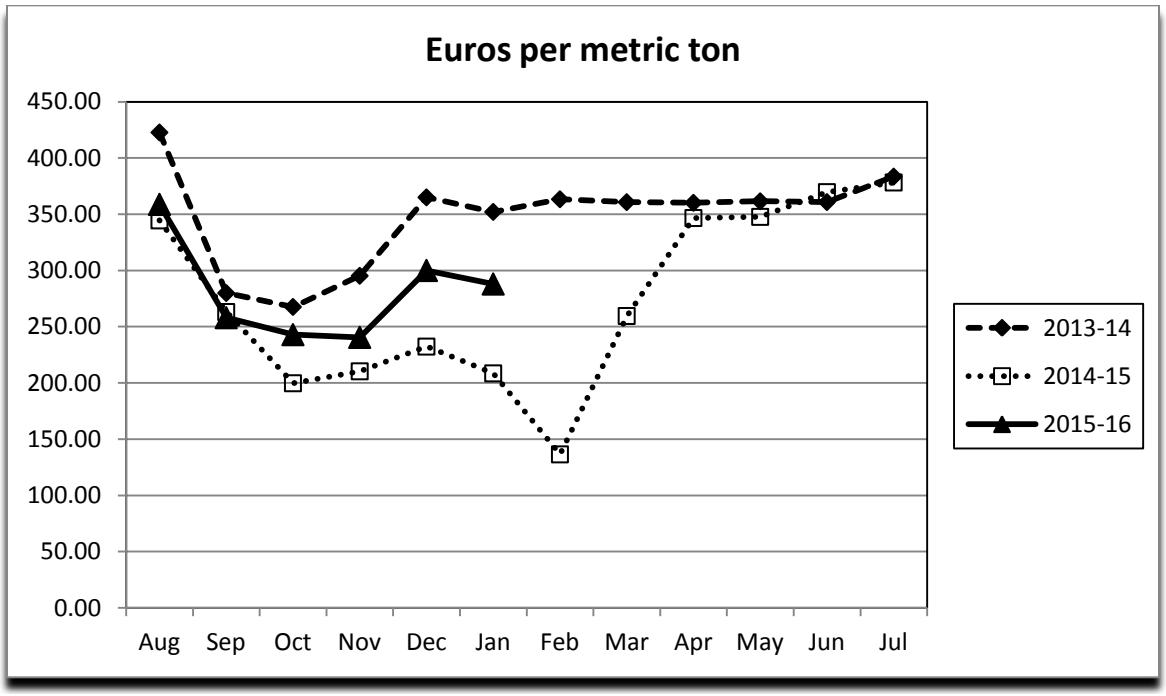
(Quantity, 1,000 metric tons, and Price, US$ per metric ton)



The volume and average prices of U.S. fresh apple exports appear to have been affected by the fluctuations in Chinese export volume and export prices. When Chinese exports were rising rapidly between 2000 and 2009, and Chinese export prices were relatively low, U.S. apple exports (solid line with the X symbol) moved sideways. They began a strong upward thrust in 2009, and reached record levels in 2015. Average U.S. export prices were far in excess of Chinese prices until 2008. However, thereafter, the gap gradually narrowed until, in 2015, Chinese prices exceeded U.S. prices for the first time. Clearly, the terms of competition between China and the United States in fresh apple export markets reached a new stage in 2015. Past history is likely to be little guide in predicting how the future competition will evolve.

The final major development in the world apple market centers around the relationship between Russia, usually the world's largest importer, and the European Union, especially Poland, recently the world's largest exporter. That relationship changed dramatically when Russia slapped a ban on EU suppliers of perishable products, including fresh apples. As the major supplier of fresh apples to Russia, Poland was hardest hit.

Poland: Monthly Export Prices of Fresh Apples, 2013, 2014 and 2015 Seasons



The chart above shows the average monthly export price of fresh apples from Poland during the year immediately before and subsequent to the embargo. It shows that average monthly prices in August 2014 began falling below prices for the same month the previous year. The decline in Polish prices became wider each month until February 2015 when they were over 60 percent below the February 2014 level. Within two months, the gap had almost disappeared, and prices for April through July 2015 were almost identical to those for the same period in 2014. However, the crisis was not yet over. Prices in August and September 2015 were similar to those in the same period in 2014, but thereafter prices ran about half way between the 2013-14 base and the depressed levels of 2014-15. In February 2015, prices were still 18 percent below those of February 2013. Thus, the Russian embargo continues to cause stress in the apple industry, both in Poland and in many third countries affected by re-direction of Polish exports.

Future Prices to Continue under Pressure

A number of factors are in place in both supply, demand and international trade that are likely to keep downward pressure on fresh apple prices around the world. Exports from many countries appear poised to continue growing. At the same time, outright bans like that imposed by Russia, and a multiplicity of protectionist measures by major import markets, are likely to continue to threaten import demand. World economies continue to struggle to escape recession, and many low-income consumers continue to bypass fresh fruit in favor of denser snack products. Of course, this situation could suddenly reverse if there were widespread failures of the apple crop around the world, something that has happened occasionally in the past. However, it would be unwise for major apple producing countries to rely on such a misfortune to improve their economic position. They need to objectively assess the threats that the world industry now faces, and take prudent steps to make the needed adjustments.

VI. The Processed Apple Sector

Apple Processing Losing Ground

The apple processing sector in most apple producing countries has been losing ground in the last decade. In general, prices for apples destined for the fresh market continue to far outdistance those for processing apples. As a result, most new apple plantings have been in varieties that are best suited to the fresh market, and not to the needs of apple processors. Producers have an increased incentive to maximize the proportion of their apple crop that qualifies for the fresh market, and to reduce the share going to processing. In addition, almost all the efforts that have gone into breeding new apple cultivars have been focused on those that will provide best returns in the fresh market. Most apples now going to processing are apples that could not meet fresh market standards and were assigned to the fresh cull bins.

There have also been major changes on the demand side, which have been reflected in the price differences noted above. Consumers in the developed world increasingly want to eat their fruits and vegetables in fresh form. Use of most processed apple products has fallen as consumers have shied away from prepared fruits. The major exception has been in apple juice. Whether bottled in single strength form, or re-constituted from apple juice concentrate, it is seen as equivalent to a fresh beverage. The increased demand for apple juice over the last two decades has boosted the apple juice concentrate industry. However, as we shall see, even demand for apple juice has run into increased consumer resistance in the face of the many alternative fresh beverages that are now available.

Processors have reacted to these trends by closing many older or smaller plants in traditional apple growing locations, and have concentrated their manufacturing operations in fewer, larger, more efficient plants. It is now as advantageous to locate apple juice processing near to major ports, as near to domestic apple producing areas, as imported AJC has come to dominate the raw material supplies for apple juice processing. This has allowed manufacturers of milk products and other beverages to enter the apple juice industry.

In turn, many apple producers have lost access to their local processing plant for their processing apples. This has provided them with a further incentive to remove processing cultivars, and to replace them with fresh cultivars.

World: Apples for Processing, by Region, Selected Periods, 2000-2016
(1,000 metric tons)

Region	2000-02	2003-05	2006-08	2009-11	2012-14	2015-16
EU-15	2,173	1,958	2,118	1,720	1,660	1,874
Other Europe	2,216	2,315	1,924	1,825	2,191	2,394
Russia	916	1,277	949	686	485	370
North America	1,890	1,793	1,735	1,763	1,768	1,838
Asia	2,515	4,418	6,755	5,488	4,278	3,855
Southern Hemisphere	1,337	1,470	1,399	1,417	1,189	1,058
Total, 31 countries	11,047	13,231	14,881	12,899	11,571	11,389

The table above shows estimates of the volume of apples going to processing, by region, in 31 major apple producing countries. Although these data are subject to revision as more complete information becomes available, they give useful guidance on the major trends that have impacted apple processing in the last 15 seasons. The data presented are averages for three consecutive seasons between 2000-01 and 2014-15. The final entry is estimates for the latest, 2015-16 season.

Overall apples going to processing in the 31 countries rose by over one-third between 2000-02 and 2006-08, but have trended downward since. In 2015-16, they were estimated to be 23.5 percent below the 2006-08 peak. A key contributor to those rises and falls was Asia, especially China. Apples for processing in Asia rose by 169 percent between 2000-02 and 2006-08, then fell by 43 percent to 2015-16. Changes in most other regions were less dramatic. The volume of apples for processing fell between 2000-02 and 2015-16 by 60 percent in Russia, 14 percent in the EU-15 and 21 percent in the Southern Hemisphere. In contrast, 2015-16 supplies in Other Europe and in North America were similar to 2000-02 levels.

The table below shows trends in the volume of apples available for the same periods for the major apple processing countries, ranked by the volume of apples processed in 2012-14. In the case of the world leader, China, the volume of processing apples almost tripled between 2000-02 and 2006-08, but has since fallen by almost 45 percent from that peak. Russia experienced a similar zigzag in supplies. Despite some fluctuations from period to period, supplies from the United States, Poland, Hungary and France were relatively stable, while those for Germany and Argentina were sharply down.

Top Ten Apple Processing Countries, Selected Periods, 2000-2016
(1,000 metric tons)

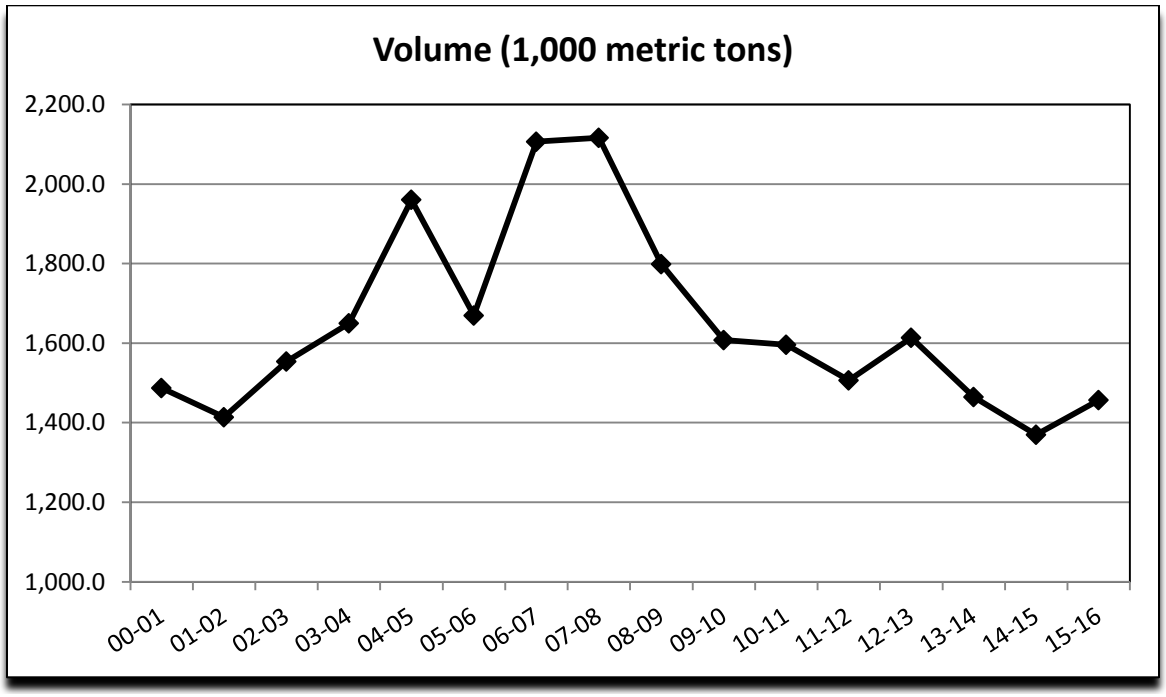
Rank	Country	2000-02	2003-05	2006-08	2009-11	2012-14	2015-16
1	China	2,357	4,152	6,520	5,253	4,083	3,600
2	United States	1,634	1,576	1,460	1,506	1,548	1,612
3	Poland	1,521	1,466	1,309	1,182	1,411	1,620
4	Germany	853	773	850	648	636	604
5	Hungary	464	393	270	307	509	443
6	Russia	916	1,277	1,309	686	485	370
7	Chile	367	396	391	393	350	320
8	Argentina	531	587	436	443	312	310
9	France	312	266	292	284	276	285
10	Brazil	0	0	219	307	144	31
-	TOP TEN	8,855	10,886	13,056	11,009	9,754	9,195
-	% of total	80.2	82.3	87.7	85.3	84.3	80.7

AJC Production Halts Slide

World production of apple juice concentrate (AJC) rose dramatically between 2000 and 2007 in step with the increases in supplies of apples for processing shown above. This was largely due to expansion of AJC processing capacity in China. However, the Chinese industry seriously over-estimated the world's ability to absorb further dramatic increases in AJC, even at very low prices. As a result, the AJC industry has been in the process of consolidating plants and firms and gradually tailoring capacity to better match demand.

The chart below shows estimates of world production of AJC between the 2000-01 and the 2015-16 seasons. Between 2000-01 and 2007-08, world production of AJC is estimated to have risen by 629,000 metric tons, an increase of about 6 percent per year. It has fallen in six of the next eight years, and by 2015-16, it is estimated that it was 31 percent below the 2007-08 peak. A small uptick occurred in 2012-13 because of larger crops in Europe and China. However, that uptick was not sustained. It appears that another uptick occurred in the 2015-16 season, largely due to increased supplies in the United States and Poland. However, the size of the total apple crop in Poland, and in neighboring Eastern European countries, has been quite volatile from year to year, so it is too early to conclude that the long downward trend in AJC production has gone into reverse.

Selected Countries: Trends in Production of AJC, 2000-2015
(1,000 metric tons)



Because AJC is a storable commodity, the level of inventories available at any time can cause price turbulence. For example, in years when AJC supplies are short, processors have been caught with expensive inventory when a much larger new crop arrives. Conversely, they can be caught short of inventory when the new crop is reduced by unexpected weather events. The major apple producing countries have to deal with disruptions caused by such inventory effects as well as with the normal challenges of pricing and competition.

Apple producers, packers and marketers have considerable discretion in deciding how many apples they will allocate to each processing use and to all processing uses. The table below shows estimates of how much apples were produced in each region in 2015-16, how much in total were sent to processing, what volume of those processed apples was used in making AJC, and the volume of AJC actually produced. On average, 16 percent of all apples produced in the 31 countries went ot a processing use. In Other Europe, over 50 percent of all apples were processed, a legacy of their central planning days. In Asia, the figure was closer to 8 percent. The percent in North America was relatively high at about 33 percent, while over 20 percent were processed in the EU-15, Russia and the Southern Hemisphere.

World: Production of All Apples, Apples for Processing, Apples for AJC and AJC Produced, by Region, 2015-16p
(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	7,993.6	1,874.3	1,355.0	159.2
Other Europe	4,543.0	2,393.5	2,171.5	336.5
Russia	1,390.5	370.0	370.0	74.0
North America	5,603.9	1,838.0	702.8	116.6
Asia	46,620.0	3,855.0	3,730.0	622.1
Southern Hemisphere	5,018.6	1,058.0	975.0	148.6
Total, 31 countries	71,169.6	11,388.8	9,304.3	1,457.0

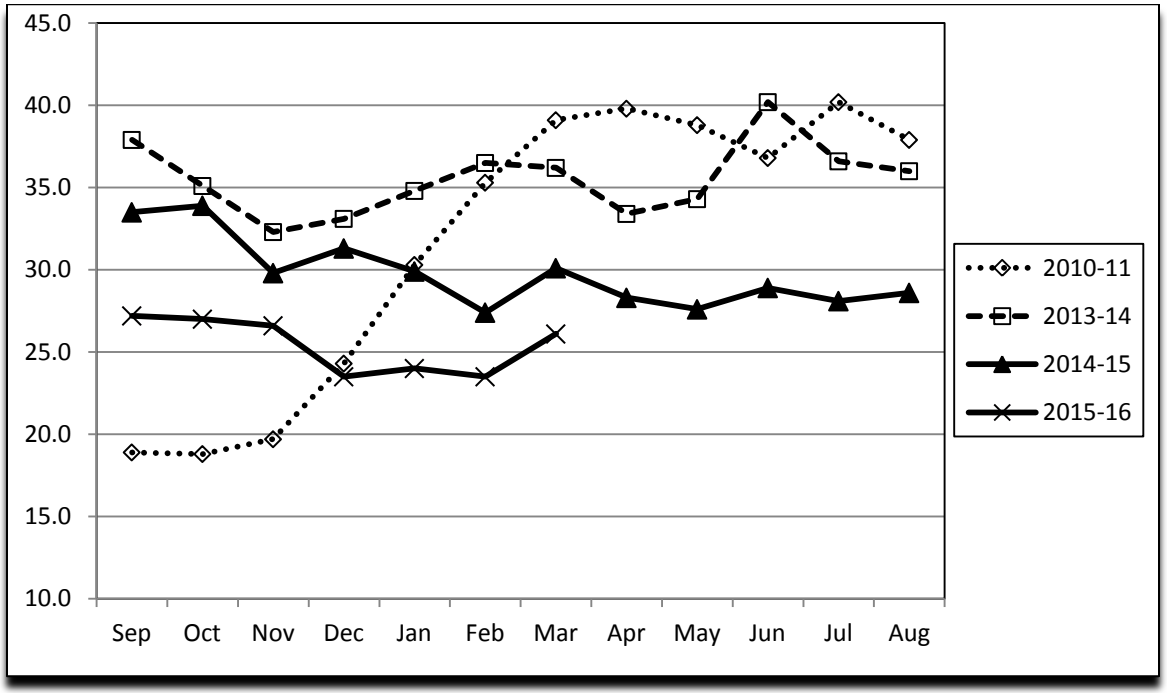
Over 80 percent of all processed apples were reportedly destined for production of AJC. This percentage may be an over-estimate, since statistical reporting of shipments to large AJC processors tends to be more complete than of shipments to small processors of niche apple products. On average, 6.4 metric tons of apples was required to make one metric ton of AJC. The conversion factor for Russia suggested that only 5 metric tons of apples were used to make one ton of AJC. This may result from under-reporting of the volume of raw apples used, or over-estimates of the volume of AJC produced just from raw apples and not from some form of pre-processed raw materials.

AJC Prices Adjust Again

The chart below shows two of the most recent swings in average monthly prices of AJC imported by the United States between the 2010-11 and 2015-16 seasons. U.S. imports are a reasonable proxy for world AJC prices. At the beginning of the 2010-11 season, import prices had been averaging below 20 cents per liter. In December 2010, as it became apparent that world supplies of AJC would be lower than expected, import prices moved up rapidly to a level almost twice as high at about 40 cents. Prices fluctuated roughly between 30 and 40 cents per liter for the next two seasons, 2011-12 and 2012-13 (not shown). The chart shows prices in 2013-14 fluctuating around 35 cents per liter. In August 2014, the Russian embargo on produce items from the European Union was instituted.

United States: Monthly Average Prices of Imported AJC, Selected Seasons, September-August

(U.S. cents per liter)



Fairly rapidly, thereafter, prices of AJC began to slowly move downwards. Between March and August 2015, they averaged 28.6 cents per liter, 15 percent below the price at the beginning of the 2014-15 season. When the 2015-16 season began, price opened almost 20 percent below the opening price in the previous season, and proceeded to fall below 24 cents per liter in the December 2015-February 2016 period. Clearly, the world AJC market has been affected by the Russian embargo and the efforts by AJC suppliers to find alternative markets. That issue will be discussed in more detail in a later section.

Trade in Apple Juice Concentrate

Since much of the output of AJC in major producing countries is aimed at export markets, trade patterns have a major influence on the viability of AJC production. Estimates of world trade in AJC are difficult to validate. Since official UN,FAO data are available only through 2011, more recent estimates have to be based on statistics from various sources in individual countries. The table below shows estimates of AJC exports for the top ten AJC exporting countries between 2007-08 and 2015-16.

Top Ten AJC Exporting Countries, 2007-08 to 2015-16
(1,000 metric tons)

Rank	Country	2007-08	2011-12	2012-13	2013-14	21014-15	2015-16p
1	China	893.7	549.7	597.4	540.0	440.0	505.0
2	Poland	186.5	165.0	232.0	233.0	245.0	230.0
3	Austria	77.4	77.3	65.0	75.0	72.6	70.0
4	Hungary	19.2	33.0	48.0	50.7	60.4	40.0
5	Germany	125.0	58.0	57.0	34.0	45.4	135.0
6	Chile	38.7	55.3	38.7	35.0	43.9	38.5
7	Italy	70.0	28.5	47.5	47.0	33.3	32.0
8	Turkey	39.9	34.0	32.0	34.0	34.0	40.6
9	Argentina	43.0	28.5	25.7	23.7	29.0	33.0
10	Netherlands	28.4	47.0	22.5	20.0	18.0	22.0
-	TOP TEN	1,521.8	1,076.3	1,165.8	1,092.4	1,021.6	1,146.1
-	% of total	91.4	86.0	89.0	88.3	88.9	87.8

These ten countries account on average for close to 90 percent of all AJC exported each season. China and Poland have consistently topped the list of the world's largest two AJC exporters. In general, since 2007-08, exports from China have been falling, and those from Poland have been rising. It is estimated that in 2015-16, China AJC exports will be 43.5 percent below the 2007-08 level, while Polish exports will be 23.3 percent higher. Together, in 2015-16, these two exporters accounted for over 56 percent of total world AJC exports. Year to year changes in AJC exports by other top ten exporters have been affected by the size of the total apple crop in each country, the quality of the fresh pack, and the prices in the fresh and processing markets.

There were a further five European countries included among the top ten exporters of AJC, including Austria, Hungary, Germany, Italy and the Netherlands. The first three all have large non-commercial apple production that is heavily consigned to processing. They, like the Netherlands, are also involved in importing and exporting of raw apples, semi-processed juice and AJC. For all these reasons, actual imports and exports are difficult to assign to a specific country. The large increase in AJC from Germany appears out of line with recent experience. Of the remaining three top ten exporters of AJC, two, Argentina and Chile, are in South America, while one, Turkey, is in Asia. All three countries have the potential to produce much greater volumes of AJC if their crops permit and if the price incentives are present in the markets.

United States: Imports of AJC, Calendar Years, 1995-2015
(Volume in million liters, Prices in $ per liter)

Year	China (m.liters)	China (%)	Other (m.liters)	Total (m.liters)	China ($/liter)	Other ($/liter)	Total ($/liter)
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	1,570.6	0.271	0.290	0.279

There are two major importers of AJC, the United States, and the European Union. However, all of the U.S. imports come from independent third countries, whereas much of the European Union's AJC imports come from other EU member countries. The table above shows how imports of AJC by the United States have gone through a number of phases. Prior to 2001, over 80 percent of U.S. AJC imports came from countries other than China, and less than 20 percent from China. However, the Chinese share began to climb in 2003 and 2004. Between 2008 and 2013, China's share of U.S. AJC imports averaged over 82 percent. China dominated U.S. import supplies, and the price for Chinese AJC effectively set the price for all AJC imports. In 2009 and 2010, Chinese prices led average prices lower. Between 2011 and 2014, Chinese prices led average prices higher. However, the Chinese share of U.S. AJC imports fell dramatically in 2014, and again in 2015, when it reached its lowest point since 2003. Imports from other suppliers almost tripled between 2013 and 2015, as the Russian embargo on EU suppliers caused AJC to be diverted to the U.S. market.

United States: Imports of AJC, by Major Suppliers, Calendar Years, 2013, 2014 and 2015

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

Supplier	2013	2013	2014	2014	2015	2015
	Quantity	Price	Quantity	Price	Quantity	Price
	(1,000 l)	($/l)	(1,000 l)	($/l)	(1,000 l)	($/l)
China	1,393,538	33.2	918,166	34.3	834,301	27.1
Chile	111,668	31.4	258,821	29.8	232,766	26.2
Argentina	112,257	31.0	87,579	26.4	118,622	24.3
Italy	5,032	24.0	23,347	91.4	46,275	38.9
Turkey	10,813	49.1	25,589	39.5	79,745	38.5
France	2,041	288.7	3,175	29.3	3,075	27.6
Poland	299	26.1	14,883	28.6	132,217	22.9
Germany	5,174	36.7	11,342	31.8	28,528	25.1
Austria	298	51.4	10,766	24.0	18,976	23.4
South Africa	7,840	66.5	8,996	27.5	6,711	25.9
Hungary	0	n.a.	8,184	29.9	12,894	20.9
Spain	189	135.4	8,989	27.2	11,147	24.0
All Other	10,029	53.7	8,048	116.6	48,295	35.7
TOTAL	1,659,178	34.3	1,387,885	34.7	1,570,552	27.9

The table above shows in detail the dramatic changes that have occurred in U.S. imports of AJC between 2013 and 2015. As noted previously, imports of AJC from China fell by 40 percent between 2013 and 2015. Imports from Chile more than doubled in the same period. Imports from the two other leading Southern Hemisphere suppliers, Argentina and South Africa, changed little in the period. The biggest single change was for Poland, where imports soared from a negligible level in 2013, to third largest supplier after Chile in 2015. There were also very large percentage gains in imports from other European countries, including Italy, Germany, Austria, Hungary and Spain. Combined imports from all the included European suppliers rose from 11,193 metric tons in 2013 to 80,686 metric tons in 2014 and 253,112 metric tons in 2015. The European share of U.S. AJC imports rose from 0.7 percent in 2013 to 5.8 percent in 2014 and 16.1 percent in 2015. Imports from Turkey rose more than sevenfold between 2013 and 2015. Imports from all other countries rose almost fivefold between 2013 and 2015. Included were countries like Brazil, New Zealand, Ukraine, the Netherlands and Mexico, that took advantage of reduced Chinese supplies to expand in the U.S. market.

The average prices of U.S. AJC imports were little affected by the changing rotation of suppliers in 2014, when total imports fell by 16 percent from the 2013 level. However, the rush of newer suppliers helped push up total imports in 2015 by 13 percent above the 2014 level. Average prices fell by almost 20 percent. While every supplier suffered a decline in price in 2015, the level of prices, and the extent of the decline varied by country. Prices for AJC from Italy and Turkey remained 38 to 40 percent above the average, while prices for AJC from Poland, Germany, Austria, Hungary and Spain all were at least 10 percent below the average. Clearly, to gain increased presence in the U.S. market, most European suppliers had to reduce prices sharply from the 2013 levels.

The EU-28 is the other major world importer of AJC from many different sources. However, the share coming from other EU-28 member countries was 65.8 percent in 2013, 61.0 percent in 2014 and 65.7 percent in 2015. In contrast to the U.S., China's share was less than 5 percent in all three recent years.

EU-28: Imports of AJC, by Major Suppliers, Calendar Years, 2013, 2014 and 2015

(Volume in metric tons, Prices in Euros per metric ton)

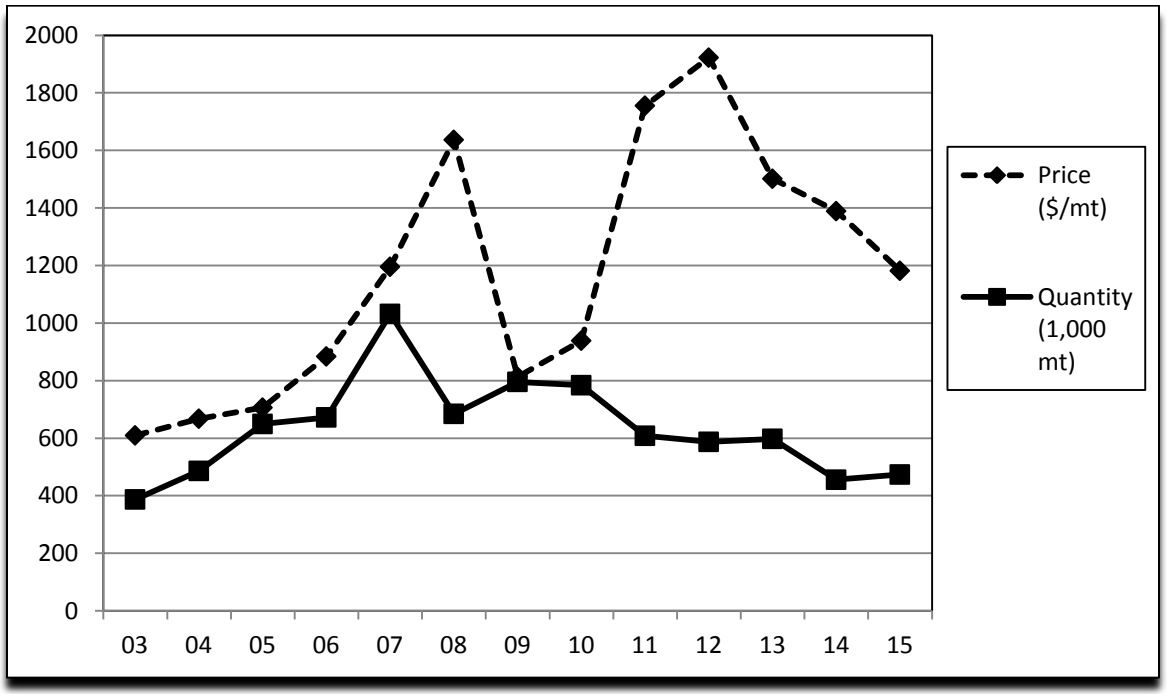
Supplier	2013 Quantity (mt)	2013 Price (euros/mt)	2014 Quantity (mt)	2014 Price (euros/mt)	2015 Quantity (mt)	2015 Price (euros/mt)
Argentina	103.6	1,289.62	30.5	1,531.15	0	0
Brazil	278.2	1,337.79	82.1	634.12	126.4	845.96
Chile	8,577.0	1,229.66	6,253.0	1,179.52	4,697.7	1,249.08
South Africa	281.2	1,093.85	905.1	1,301.22	548.7	1,157.63
Austria	96,730.9	1,355.54	82,852.5	1,161.82	75,131.8	854.64
Belgium	7,235.1	1,059.72	3,762.2	1,106.39	3,473.5	1,281.95
France	9,123.4	2,119.01	9,160.0	2,013.44	7,955.4	2,077.59
Germany	50,520.3	1,053.68	44,082.9	984.53	62,382.5	725.87
Italy	28,045.9	1,101.41	46,152.5	854.28	38,441.0	725.01
Netherlands	22,254.1	1,371.39	28,073.8	1,141.33	27,974.5	1,022.53
Spain	10,879.1	1,154.46	18,735.8	967.71	14,882.9	864.85
Czech Republic	2,813.0	1,156.34	2,141.1	737.22	2,105.4	1,021.07
Hungary	40,203.4	1,093.19	38,924.1	1,015.94	25,067.6	834.77
Poland	217,480.5	1,254.39	181,863.1	972.45	186,935.3	897.14
Moldova	30,060.5	985.59	40,224.7	702.91	36,385.8	782.61
Ukraine	69,657.8	423.77	83,698.6	448.17	73,052.0	530.75
China	33,238.1	1,218.12	11,204.2	1,034.04	20,539.8	1,052.89
Turkey	46,513.7	1,340.49	48,421.2	1,220.32	45,265.7	1,191.72
All Other	63,336.5	874.72	42,831.7	961.93	51,367.0	952.04
TOTAL	737,332.3	1,142.08	689,399.1	950.46	676,333.0	871.13

Poland was consistently the EU-28's largest supplier of AJC. In 2013 and 2015, Austria, the Ukraine and Germany were the next largest suppliers. The Ukraine just pipped Austria for second place in 2014. In general, Southern Hemisphere suppliers were of minor importance, accounting for about one percent of all supplies. Turkey was either the fourth or fifth largest supplier. Thus, the EU-28 had the option of drawing supplies from many different sources. The average prices of EU-28 AJC imports fell by 17 percent between 2013 and 2014, and by a further 8 percent in 2015. However, prices varied widely around the average. The highest average prices were paid for small quantities imported from France. The lowest prices in every year were paid for supplies from the Ukraine. Not surprisingly, given Poland's large share of total imports, the average prices for Polish AJC were close to the overall average for all AJC imports.

China has continued to be the largest single exporter of AJC, even though its volume has fallen by half since 2007. Prices have fluctuated wildly in recent years as China has struggled to buy raw materials and match inventories with global demand. However, the average export price in 2015 was almost identical to that in 2007, but at about half the 2015 volume. This shows how both the supply and demand conditions for Chinese AJC have changed markedly in recent years.

China: Exports of Apple Juice Concentrate, 2003-2015

Quantity, metric tons, and Price, US$ per metric ton)



The table below shows how the direction of Chinese AJC exports has also changed over time in response to changing availability and price. In 2000, early in the Chinese industry's expansion, exports went fairly equally to the developed countries of North America, Western Europe and Asia. However, exports to Western Europe peaked in the mid 2000s, and had shrunk to less than 3 percent of the total in 2013-2015. The United States remained the largest single destination, fairly regularly taking over half of all China's AJC exports. Japan continued to be the second most important destination in recent years. Russia was the second most important destination in 2010, but the volume shipped there had been cut in half by 2015. As its total AJC exports have shrunk, China has reduced the level of exports to most major destinations, and has deferred opening up new markets.

China: Exports of AJC, by Volume and Destination, 2000-2015
(metric tons)

Destination	2000	2005	2010	2012	2013	2014	2015
Germany	9,710	91,219	40,039	19,649	8,878	2,594	16,664
Italy	2,237	550	62	0	0	0	0
Netherlands	14,000	73,430	58,977	7,529	7,736	3,593	4,218
Spain	342	6,630	626	875	561	0	308
Russia	4,288	62,031	76,441	54,702	49,080	57,031	35,925
United States	39,747	227,206	387,578	293,210	318,549	215,939	239,840
Canada	7,190	27,164	40,632	50,438	32,750	22,359	23,131
Japan	19,435	63,468	52,101	62,896	68,236	59,167	60,881
Taiwan	1,981	3,022	3,643	2,542	3,302	3,382	3,701
South Korea	837	3,954	2,908	3,622	3,198	3,297	2,898
Australia	11,519	29,616	33,266	26,170	26,625	25,407	25,400
South Africa	4,912	9,669	30,149	19,809	33,625	25,561	16,086
Others	16,117	51,504	57,722	45,940	75,557	37,470	44,777
TOTAL	142,315	649,463	784,144	587,332	597,838	455,800	473,829
North America	46,937	254,369	428,210	343,649	351,500	238,299	262,971
Western Europe	41,988	197,288	110,178	32,524	14,275	8,369	18,692
Asia	30,504	74,949	70,546	101,169	106,902	91,864	102,056

Future Prospects for the Processing Apple Sector

The processing apple sector has been in slow decline in many major producing countries in recent years. For a while, China was a major exception as it expanded processing capacity, production and exports under the apparent assumption that demand would grow in step. When this did not happen, China cut back drastically.

It now appears that apple production is on track to continue to grow rapidly in China and in Poland, the two largest producers of AJC for export. It is also likely that apple production and AJC processing will rebound in a number of Southern Hemisphere countries where apple processing is important. However, the Russian ban on imports from the EU-28 is likely to continue to distort the traditional trade flows for AJC, and to keep downward pressure on prices. In addition, Russia has fallen into a deep recession, so its demand for AJC from the rest of the world is likely to be reduced indefinitely.

If AJC supplies continue to rise and world demand remains curtailed, the industry could again be thrown into crisis. That can only be averted if efforts are made to either trim supplies or expand uses for AJC and other processed apple products in the near future.

VII. Critical Issues Facing the World Apple Industry

Heightened Importance of Productivity

The environment ahead for the world apple industry suggests one where consumption will be curtailed both by aging populations and by increasing obstacles to trade. At the same time, firms at every level of the industry have become larger and better capitalized. They have been able to acquire a wide array of new technologies that purport to increase orchard production, packing and storage capacity and marketing clout. Thus, there is a real danger that the industry's productive potential will again (as it has in the past) race ahead of potential demand. In that situation, firms often run through their spare capital in order to stay afloat. However, in the long-run, a firm's best chance for survival will depend on how productively it can use its assets. Thus, it is more important than ever for firms to focus on improving productivity.

International Competitiveness

It is difficult to measure the relative productivity of individual apple firms because much of the needed data are proprietary. However, it is possible to measure the average productivity of firms in a producing district or country where adequate public data are available. Since 1995, Belrose, Inc. has produced a ranking of the competitiveness of most major apple producing countries. For 2016, as in 2014 and 2015, 33 major producing countries have been included in the rankings. Together, they accounted for almost 90 percent of world apple production.

The Belrose, Inc. rankings, reproduced here, 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 shown at the top of the next page. Each producing country was scored on a scale from 1 (lowest) to 10 (highest) points. Thus, the maximum score any country could get 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 prestigious international rating agencies was used. In general, the criteria on production efficiency are influenced primarily by the decisions of individual investors, owners or managers. Infrastructure and inputs are influenced both by private sector decision-makers and by public agencies, like water boards. Financial and market factors are most heavily influenced by decisions of national or international agencies.

Apples: Comparative Performance Measures, 2016

Production Efficiency	Industry Infrastructure & Inputs	Financial and Market Factors
1. Percent change in production, 2007-09 to 2013-15.	7. Adequacy of storage.	16. Long-term interest rates, 2016.
2. Relative variability of production, 2005-2015.	8. Modern packing facilities.	17. Inflation rate, 2016.
3. Percent of acreage non-bearing, 2015.	9. Efficiency of distribution.	18. Exchange rate in 2016, relative to 2001-05 average.
4. Percent of production that is newer varieties, 2015.	10. Marketing system quality.	19. Security of property rights.
5. Planting Density, trees per hectare, 2015.	11. Land availability.	20. Product quality covered.
6. Average yield per hectare, 2013-15, metric tons.	12. Water availability.	21. Percent of production exported, 2013-15.
	13. Labor availability.	22. Average export price, 2013-15, US$ per metric ton.
	14. Capital availability.	23. Average distance to markets, kilometers.
	15. Input costs.	

The actual measures for production efficiency for each of the 33 countries studied in 2016 are listed on the next page. These are the six criteria over which apple firms have the most control, and that have the greatest influence on productivity in the orchard. The actual measures illustrate the great diversity in the performance of different countries within the orchard sector. For example, 19 countries experienced increased apple production between 2007-09 and 2013-15, while 14 experienced decreases. Five had increases of over 25 percent in that period, while only two had decreases of over 25 percent. There were also wide discrepancies in the volatility of production over the last decade. In three countries, the largest crop in any year was more than three times that of the smallest crop. Such volatility leads to very inefficient use of the industry infrastructure, such as storage and packing facilities. In contrast, in sixteen other countries, volatility from year to year was less than half that level.

The percent of non-bearing area is a good indicator of producers' confidence in the future of their industry. The average for all countries was just slightly above 10 percent of acreage non-bearing, the minimum considered necessary for sustainable production. However, only six countries, had non-bearing area of 15 percent or greater, China, South Korea, Turkey, Bulgaria, the Russian Federation and Slovakia. The latter three countries have been engaged in a difficult transition from centrally planned to free market production.

Major Apple Producing Countries: Comparative Performance Measures of Production Efficiency, 2016.

Country	**Percent change in production, 2007-09 to 2013-15**	**Relative variability of production, 2005-2015**	**Percent of acreage non-bearing, 2015**	**Percent of new varieties in production, 2015**	**Planting density, trees per hectare, 2015**	**Average yield per hectare, 2013-15**
	(%)	(ratio)	(%)	(%)	(#)	(mt)
Austria	- 5.5	1.45	13.5	49.2	2,688	28.9
Belgium	- 25.7	1.63	11.4	69.0	3,286	38.4
France	- 5.7	1.51	8.0	51.0	1,874	34.9
Germany	- 11.1	1.44	7.8	49.0	2,361	33.1
Greece	+ 4.7	.37	2.6	12.2	1,060	18.5
Italy	+ 4.3	1.27	12.0	30.6	2,351	44.7
Netherlands	- 15.1	1.49	5.6	42.7	2,538	39.6
Portugal	+ 6.4	1.32	9.6	25.8	1,591	13.3
Spain	- 10.6	1.81	7.6	24.6	1,632	16.5
U Kingdom	+ 8.2	1.40	11.3	50.5	1,687	25.4
Russian Fed.	+ 15.7	1.56	21.5	7.7	697	8.5
Hungary	+ 93.0	4.53	8.9	18.5	1,135	23.2
Poland	+ 39.1	3.09	11.7	25.2	1,221	19.0
Canada	- 18.3	1.54	12.3	24.9	990	22.8
Mexico	+ 44.2	1.70	6.7	8.6	229	13.3
United States	+ 13.0	1.25	11.5	37.7	1,100	35.9
China	+ 43.3	2.11	15.0	72.1	400	21.1
India	+ 10.9	1.66	3.7	0.0	230	7.4
Japan	- 6.7	1.39	4.9	66.7	1,110	21.4
South Korea	+ 1.3	1.35	28.3	77.1	1,020	21.8
Turkey	- 0.1	1.20	15.0	3.8	335	15.3
Argentina	- 27.5	1.68	6.7	34.0	1,062	28.8
Australia	+ 10.5	1.21	7.4	57.2	540	15.8
Brazil	+ 7.1	2.10	2.5	93.6	875	34.5
Chile	+ 0.3	1.44	9,0	74.1	550	39.8
New Zealand	+ 18.3	1.30	2.4	89.8	1,120	60.7
South Africa	+ 10.6	1.47	9.5	49.9	1,240	40.2
Bulgaria	- 7.3	2.68	19.5	6.7	1,140	13.5
Czech Rep.	- 3.8	2.01	7.2	18.5	1,279	15.4
Romania	- 2.3	1.50	13.0	1.1	577	7.6
Slovakia	+ 26.2	3.27	15.7	41.5	1,750	7.5
Slovenia	- 10.6	1.86	5.0	36.1	2,539	55.2
Serbia	+ 13.7	1.86	7.0	6.9	900	3.1
AVERAGE	+ 6.9	1.83	10.4	38.3	1,347	25.8
Ave, exc China	+ 5.7	1.82	10.3	38.2	1,378	25.9

The average density of plantings, in terms of trees per hectare, has continued to rise. However, it, too, showed wide discrepancies between countries. In general, the densest plantings were in western European countries where orchard land is scarce and urban pressures are most intense. However, most countries have been moving towards more dense plantings. One of the main factors leading to increased density of plantings has been the adoption of newer varieties. These include both varieties like Gala and Fuji, that have recently become mainstream, and newer club varieties, like Jazz and Kanzi, that have gained popularity in more recent years. Even under this liberal definition of new varieties, almost one third of the countries had at least 20 percent of production in any newer varieties. In contrast, seven countries, Belgium, China, Japan, South Korea, Brazil, Chile and New Zealand, had at least two-thirds of all production in newer varieties. The ultimate measure of orchard productivity is yield per hectare. Once again, the gap between the highest and lowest average yields was very wide. New Zealand was at one extreme with average yields per hectare in the 2013-15 period of over 60 metric tons. In contrast, five countries had average yields of less than 10 metric tons per hectare.

There were similar differences in the performance of the main apple producing countries in terms of infrastructure and inputs criteria and financial and markets criteria. These are not shown separately in the interests of space. However, making improvements on these performance measures would require the apple industry and its organizations to work with national or regional bodies that manage much of the local infrastructure, and to lobby government officials and elected representatives for changes in laws or for public funds to resolve problems. In some cases, the needs of the apple industry will parallel those of other industries, so coalitions may be possible to achieve the same ends. However, increasingly, the interests of the apple industry conflict with other organizations, such as labor and environmental organizations. In these situations, the path to problem resolutions may be quite contentious.

The table on the next page shows the competitiveness rankings of all 33 countries for 2016, in their overall ranking, and in their rankings on the three main subcategories. The overall rankings for 2016 are also compared with those for 2015. New Zealand retained its number one ranking in 2016, with 173 out of a possible 230 points. It continued to be followed closely by Chile and the United States in the next two places. The remaining countries in the top one third of the rankings were the same as in 2015, with the exception of Canada supplanting Germany in eleventh place. Five of the countries in the top third were from Western Europe, and two each from the Southern Hemisphere, North America and Northeast Asia.

Major Apple Producing Countries: International Competitiveness Rankings, 2016

Rank 2016	Rank 2015	Overall Ranking	Production Efficiency	Infrastructure & Inputs	Financial & Markets
1	1	New Zealand	Belgium	Chile	Japan
2	2	Chile	South Korea	United States	France
3	2	United States	Austria	New Zealand	Italy
4	4	Italy	Italy	Canada	Netherlands
4	7	France	New Zealand	South Africa	South Korea
6	10	South Korea	South Africa	Brazil	Belgium
7	9	Japan	China	France	Austria
8	6	Belgium	France	Austria	Germany
9	5	Austria	Germany	Italy	New Zealand
10	8	Netherlands	Netherlands	Turkey	Spain
11	12	Canada	United Kingdom	Argentina	United Kingdom
12	11	Germany	United States	Japan	Chile
13	13	South Africa	Chile	South Korea	Canada
14	14	United Kingdom	Slovenia	Belgium	United States
15	15	Australia	Japan	Netherlands	Slovenia
16	17	Spain	Australia	Germany	Serbia
17	26	Slovenia	Brazil	Australia	Australia
18	19	China	Portugal	Spain	Portugal
19	18	Portugal	Russian Federation	United Kingdom	Poland
20	20	Poland	Canada	China	Bulgaria
21	16	Brazil	Slovakia	Poland	Greece
22	21	Argentina	Poland	Portugal	Mexico
23	24	Mexico	Spain	Mexico	Slovakia
24	22	Turkey	Argentina	Greece	Czech Republic
25	25	Greece	Hungary	Slovenia	Romania
26	23	Slovakia	Turkey	Hungary	South Africa
27	27	Czech Republic	Greece	Slovakia	Hungary
28	28	Hungary	Mexico	Czech Republic	China
29	30	Serbia	Czech Republic	India	Argentina
30	29	Bulgaria	Bulgaria	Serbia	Turkey
31	31	Romania	Romania	Bulgaria	Russian Federation
32	32	Russian Federation	Serbia	Romania	Brazil
33	33	India	India	Russian Federation	India

Seven of the countries in the bottom third of the rankings were from Russia or its former satellite countries in Eastern Europe, indicating the difficulty these countries have continued to face in modernizing their apple industries. Four of the countries in the middle third were prominent Southern Hemisphere producers. These lagged far behind the two leaders, New Zealand and Chile, on many criteria.

In general, the countries that were in the top third in overall rankings also performed well in the three sub-categories of production efficiency, infrastructure and inputs, and financial and markets. However, Belgium was the surprise leader in production efficiency, while Japan was the surprise leader in the financial and markets subcategory. Japan scored highly in the financial and markets category because of its exceptionally low long-term interest rates and low inflation. Normally, as a net long-term borrower, the fruit industry should benefit from low interests rates. However, that is only true if credit is made readily available to farmers. In many cases, banks have been reluctant to lend at such low interest rates. In contrast to Japan, Argentina, Turkey, the Russian Federation and Brazil all saw their rankings on financial and market factors depressed both by higher interest rates and inflation, and by the negative effects of recessions.

Apples: International Comparisons of Rankings over Time for Countries Featured between 1995 and 2016

Rank	1995	2005	2015	2016
1	New Zealand	Chile	New Zealand	New Zealand
2	Chile	New Zealand	United States	Chile
3	Netherlands	France	Chile	United States
4	Belgium	Italy	Italy	Italy
5	United States	Netherlands	Austria	France
6	Austria	Austria	Belgium	South Korea
7	South Africa	Belgium	France	Japan
8	Brazil	United States	Netherlands	Belgium
9	Japan	Japan	Japan	Austria
10	France	Germany	South Korea	Netherlands
11	Germany	South Africa	Germany	Canada
12	Australia	Canada	Canada	Germany
13	Canada	Australia	South Africa	South Africa
14	Argentina	Argentina	United Kingdom	United Kingdom
15	South Korea	Spain	Australia	Australia
16	Italy	United Kingdom	Brazil	Spain
17	United Kingdom	Brazil	Spain	China
18	Spain	Turkey	Portugal	Portugal
19	Turkey	Poland	China	Poland
20	China	China	Poland	Brazil
21	Mexico	Hungary	Argentina	Argentina
22	Poland	Mexico	Turkey	Mexico
23	Hungary	Russian Federation	Mexico	Turkey
24	Russian Federation	South Korea (no data)	Russian Federation	Hungary

The major value of these comparative performance measures is that they provide a guide to countries about which aspects of their operations need additional attention from industry organizations, research and extension personnel, or government development agencies. Examination of trends in performance over time can also help identify which industry initiatives have worked, and which have not. The table above traces the rankings for 24 countries that were included in the analyses each year since 1995. While New Zealand and Chile have consistently been at the top of the rankings, the United States, Japan, France, South Korea and Italy have improved their relative position over time. In contrast, the Netherlands, Belgium, Austria, South Africa, Brazil and Australia have slipped in the rankings.

These results indicate that countries can both improve their competitive position, and lose ground, over time due partly to efforts within the apple industry, and partly to changes in infrastructure, financial or market factors (like recessions) that are outside their control. Programs to improve international competitiveness require both objective assessments of the sources of obstacles to improvement, and coordinated efforts by the industry focused on specific obstacles.

How to Retreat Gracefully

Producers and investors in perennial crops like apples appear to have a strong propensity to continually add more acreage, plant new varieties, expand their apple packing and storage facilities, and make other advancements in their operations. However, they appear to have great difficulty in retreating from any of these activities when markets are signaling that danger may lie ahead.

The problem is particularly acute in the world apple industry for a number of reasons. First, China, the supplier of about half the world's apples, lacks many of the economic warning lights present in a market economy. In China, investors rarely have to bear the full cost of the land and capital that they use, because those markets are so distorted by decades of policies that placed political expediency over economic realities. Without those distortions, much less apples would be produced.

In Europe, the Common Agricultural Policy (CAP) of the European Union has supported self-sufficiency in many products, including apples, since the 1960s. It includes a number of measures that keep producers in business when economic signals would encourage them to exit agriculture. As the European Union grew from six original members to 15, more of European agriculture was affected.

When ten new member states joined the EU in 2004, one of their main hopes was that their agricultural sectors would receive a boost from the EU Common Agricultural Policy. The major apple producing countries, like Poland, Romania and Hungary, expected, not only to gain open access to a large, affluent apple market, but that they would also benefit from CAP support, which, in turn, would encourage Western European entrepreneurs to invest in their apple industries. This encouraged expansion of the apple industry beyond the levels that would have been indicated by objective economic analysis.

The normal reaction in market economies is to over-estimate the potential returns from any new investment in apples, and to under-estimate the costs and risks. When these artificial incentives are added the world supply of apples is always in danger of outrunning the growth in demand. The world apple industry is almost certain to increase production steadily over the next decade just from the high-density plantings that are already in the ground. At the same time, there are already warning signs that a downturn in demand may lie ahead.

The first major warning sign is the slowing growth of the world economy. This is not a major problem for apple demand in the developed world where income growth has limited effects on demand for fresh apples or apple products. However, in the developing world, such demand is strongly affected by rises in average income levels and by the number of people entering the middle classes. One of the major drivers of growth in emerging markets has been the prolonged boom in the Chinese economy. China appeared to have an insatiable demand for many commodities and raw materials from other countries to feed its giant industrial and construction sectors. However, the growth of the Chinese economy has slowed markedly. China's imports have actually fallen in the last two years. That has slowed economic growth in many of its supplying countries around the world. At the very least, the growth in the middle classes in countries like Brazil, Russia, South Africa and Indonesia has been stalled. The problem is particularly acute in Russia, quite recently the world's largest importer of fresh apples and many other fruits, as a result of sanctions imposed because of its aggression in the Ukraine. The poverty rate in Russia is reported to have risen rapidly. Inflation has increased, the value of the ruble has tumbled, and Russians are now reported to be spending half of their incomes on food. None of this bodes well for continued imports of fresh apples or apple products.

The apple industry has faced similar supply-demand imbalances in the past. One popular strategy for apple firms in riding out the storm has been to continue their existing practices in the belief that their firm will be the fittest to survive.

There is an obvious problem with that strategy. While most firms tend to believe that their firm will be the fittest, and will survive, clearly, only a small proportion of firms will actually be the fittest among their peers. Those who are not among the fittest will see their capital gradually eroded as they absorb losses by continuing to do what they have always done.

A much more prudent approach, both for individual firms, and for the industry as a whole, is for each firm to plan its future strategies in light of the worst possible outcomes that it can expect if prices and profitability eventually become severely depressed. This also assumes that many other less enlightened firms will continue to believe in their own invulnerability.

Firms can retreat gracefully in two major ways. The first path is to improve the quality of the product the firm produces, assuming that it will receive above average prices for the varieties, sizes, colors, tastes, or other attributes that are more desired by consumers. The second path is to focus on increased efficiencies, reducing the cost of generating each additional dollar of revenue. These two paths are not mutually exclusive. However, each requires the firm to evaluate every aspect of their business to see which activities increase revenues or reduce costs, and to then prune any products, plantings, facilities or activities that do not meet one or both of these goals.

Retreating gracefully now does not mean retreating from the apple industry permanently. However, by allowing the firm to survive the most difficult times, it will provide it with a solid basis for growth when the times become more favorable.

New Products for Your Portfolio

The issue of new products in the apple industry has been mentioned many times throughout this Review. Clearly, new products can also play a role in preparing for the more difficult times that lie ahead.

New products can include completely new cultivars that have not previously been available to the apple industry. They can include cultivars that were previously commercialized in other parts of the world, but not yet available in your country or your markets. They can include variants of an existing variety, such as Kiku Fuji, that can be patented and sold as a unique product. And, they can include products given a unique identity through special packaging, labeling or certification.

Examples include Rocket apples sold in unique cylinder packs, geographic indicators like Pomme Limousin Golden Delicious, or apples such as those in France that use the "Label Rouge" mark of quality. Organic, biologic or biodynamic labels are also used. The USDA organic symbol is widely used while Demeter certification is available for apples grown using biodynamic methods.

In choosing a new apple product, the crucial questions for growers trying to decide which variety to plant, or which new product variant to adopt, are: (1) Can I earn a premium from the new variety large enough to offset the investment costs? (2) Will the new variety fit my current orchard management system? (3) Will the new variety cannibalize the sales of some of my existing varieties? (4) Is there a substantial space for the new variety in the evolving market place?

The answer to the first question will depend on a few key ingredients. First, the innate attributes of the new product must both help to distinguish it on the retail shelf, and also be superior to most of the other apple products that are already on those shelves. However, while these physical attributes are necessary, they are not sufficient to assure market success. In an increasingly crowded new product market, it will be equally important to have a name that is distinctive, memorable and likely to appeal to the most likely customer for the product. The product will need to have a "story" that will resonate with retailers and consumers. A product's story is a brief explanation of why the product is different, or superior, to products already on the shelves. For some of the most successful new products, the name is an integral part of the story. For example, the name "Pink Lady" resonates with the young women at whom the apple is targeted. A third key element will be a strong marketing team that can push the new product onto the already crowded apple section, and that can then help the retailer in encouraging consumers to pull the product off the retail shelves. Part of the strength of the marketing team will be the level of rapport that they have with their major retail customers. Only if the inherent quality, name, story and marketing team are outstanding will a new apple product have much chance of success in the marketplace.

A second key factor will be whether or not the new variety fits into the grower's current management system, or if that system can be readily adapted to fit the new needs. Key elements of the management system will include the location and orientation of grower orchards, the general climate and soil type, the period of frost free days, (or in warmer climates, sufficient cold days), the irrigation and frost protection systems, the caliber of management personnel, and the training and flexibility of the orchard crew. Growers need to be realistic about their capacity to turn a new product into a winning product.

Will the new product cannibalize the sales of some of the growers' existing products? The answer to this will almost always be "Yes." In rare cases, a new apple product will create additional demand for apples from a segment of consumers that were not previously satisfied with any existing product. However, apple consumers generally express their satisfaction with the current mix of apples available. So, the major issue will be the extent of the cannibalization that is likely to occur. Given the limitations of retail shelf space, in some cases, the retailer will request that a marketer that seeks to have it stock a new product will volunteer another product to be cut. In the best possible case, the retailer will cut a product, or products, from another supplier. The extent of cannibalization also depends on the strength of loyalty consumers have to an existing product. All these elements need to be measured if a new apple product is to expand in the marketplace with the minimum amount of disruptions.

The fourth question is inter-related with the issue of cannibalization. To an extent, the developers and sponsors of a new apple variety or apple product need to have in mind the potential new market segment that that product might create. In a world with almost limitless food options, creating a new segment in the apple market will always be difficult. That does not mean that some fresh combination of size, skin color, flesh color, health attributes, or other features might not be able to create a new apple market segment at some time in the future. Such an achievement would provide protection from cannibalization.

For any grower, packer or marketer wishing to introduce a new apple product, the chances of success will be greatly improved if the decision is approached in a systematic way and using the best objective information available. It will be vital not to be swayed by the hype that tends to surround any new product, hype that is an almost inevitable part of any new product launch.

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