International Honey Market

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A Second Point of Inflection has been attained.
A Point of Equilibrium is Approaching.
The NMR test is gaining international attention and acceptance.

Introduction

The International Honey Market has reached a Point of Inflection as predicted in the January 2017 Report. The only question immediately before the industry is how steep will the curve of rising prices be from their abyss of the past two years. In the January, 2017 *ABJ* beekeepers in the Southeast region of the U.S. reported offer prices for new crop honey as low as $0.95/lb. while white honey from Argentina and Canada was in the $0.90/lb. range.

In a speech to the Pan South American Beekeepers Conference held in the ecological jewel Iguazu Falls, I predicted a point of inflection after prices reached historic highs in 2014. These two Points of Inflection now must be resolved by reaching a Point of Equilibrium which will better balance and integrate the incentives to produce and consume honey allowing honey prices to fluctuate within more normal and modest ranges so the international honey industry can achieve greater stability and avoid the nadir and apex of prices.

Oversupply, collapsing prices, and questionable qualities have been replaced with shortages, rising prices, more powerful testing modalities and more stringent quality demands throughout the international marketplace. The honey industry needs both more powerful scientific methodologies and greater integrity to overcome the adulteration and circumvention which have plagued and haunted the industry through the collusions of cunning and unscrupulous players.

In the 3rd and 4th quarters of 2016, a flurry of highly speculative contracts at extremely low prices were made involving countries including Argentina, Brazil, Vietnam, India and Ukraine. As a result of adverse weather and the lack of incentive for beekeepers, there have been very significant delays and defaults of contracts. Fulfillment of contracts has created losses for some exporters. The collapse of prices is projected to result in bankruptcies of some beekeepers and exporters in some major exporting countries in South America, Asia and Europe. This phenomenon of the failure of speculation has become evident in March and April, 2017. The specific analysis of several major honey-producing and exporting nations, and the chart below, will hopefully shed light upon the facts, foundation and causes of the current Point of Inflection.

The Point of Inflection, now manifest in the second quarter of 2017, is a function of many variables and most decisively the use of Nuclear Magnetic Resonance (NMR) technology applied to honey. The application of NMR testing has created a Great Wall around Europe for Chinese

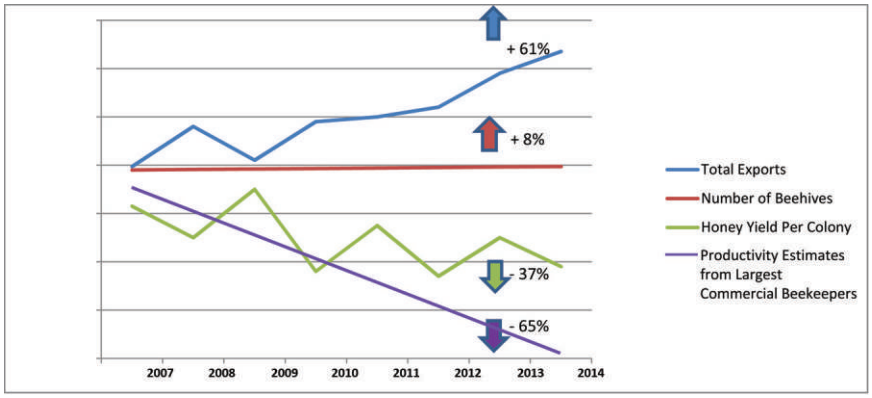

Chart 1. Global Situation: Exports, Beehives and Productivity per Hive. Sources: Prof. Norberto Garcia, Richard Adee

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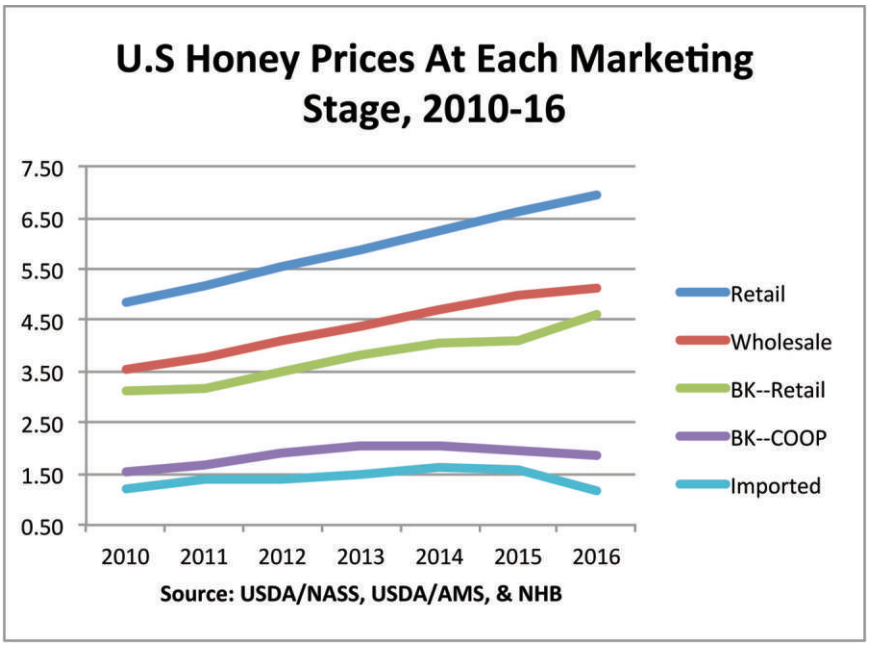

Chart 2. US Honey Prices Over 6 Years

honey and a Great Bridge for South American honey to Europe. It has also created an openly two tiered price structure for Chinese honey to Europe, i.e. honey which cannot pass the NMR test is offered in larger quantities and substantially lower prices than honey which passes the tests. There are similar constraints for some other honey exporting countries shipping honey to Europe.

From 2007 to 2013, the volume of honey exported in the world increased by 61%, while the number of beehives in the world increased by 8% during that period. In many countries, including France, the US, and Argentina, honey production and or productivity per hive have dropped to nearly half of what they were in the past 15-20 years.

Chart 1 succinctly captures the problem that has affected the international honey market. Professor Garcia and other researchers have discovered and documented several significant aberrations and inconsistencies for several major honey-exporting countries relative to total exports, beehives, domestic consumption and production. There are also aberrations between the qualities, colors, flavors and aromas of honey exports and the flowers allegedly used to produce the exported honey, the climates and geographic origins alleged. There are thus both major quantitative and qualitative aberrations coming to light through the studies of apiculturists and scientists.

Macro Trends

Trends for honey prices at different levels of the domestic market are illustrated in Chart 2, prepared by Dr. Stan Daberkow, who served for decades as an economist for the US Department of Agriculture.

Chart 3 is an analysis of US imports from selected countries over the past 24 months from January 2015 to December 2016.

Dr. Daberkow and Prof. Norberto Garcia have provided further information regarding price tendencies, export patterns, gaps between retail purchases and prices for raw honey.

When we compare the average prices from Argentina, Brazil, Canada in 2015 with those in 2016 we find:

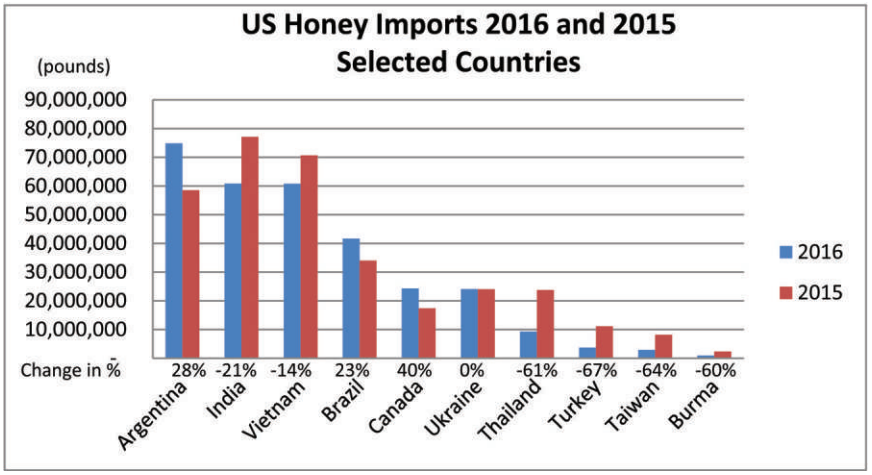

Chart 3. US Honey Imports 2016 and 2015

Average Honey Price/pound - Customs Value

Country	2015	2016
Argentina	$1.74	$0.94
Brazil	$1.70	$1.67
Canada	$1.90	$1.18

There was a lot of false information (in today's parlance, "fake news") regarding carryovers in 2015, and what now appears with more powerful technology to be circumvented and adulterated honey. That fake news and mass of adulterated honey, which brought the market to the nadir, has caused not only price collapses, but bankruptcies among foreign beekeepers and exporters.

When we look at the statistics for the past 15 years, the change of export patterns to the US market have been startling and inexplicable. For example, in 2006 the total U.S. import volume from India, Vietnam, Thailand, and Taiwan was 26,459 metric tons. By 2016, the quantity of imports from the same countries was 74,378 metric tons, an increase of 280%!

We include a graph (Chart 4) regarding the foods most frequently found to be adulterated including milk, olive oil, etc. Unfortunately, honey ranks number 3 which poses an urgent need to restore integrity to the international honey trade.

Modes of Adulteration and NMR Methodologies

The use of ultra-filtration and the more recent use of resin technology are key factors in the above aberrations in quality. Resin technology transforms dark colors to light colors, bad and dominant aromas to mild flavors creating much more versatile honey which can be used for the retail, food service and industrial markets. Resin technology also removes or reduces residues. The use of vacuum chambers to reduce moisture levels greatly increases quantities. About five years ago the aggressive marketing and export of resin technology to honey exporting countries (including countries associated with or suspected of circumvention) became known. Whether similar exports of vacuum chamber technology have been made to other countries is not known, but suspected.

After it became known that China exported resin technology to various countries, some of which erroneously claimed the FDA approved it, the US FDA explicitly stated: "Resin technology applied to honey creates products which cannot be labeled as 'Honey'."

Because the resin technology, which has been promoted and exported from China, is compact and mobile, it is easy to disguise its physical presence and use to adulterate honey. This mobility makes the

NMR test all the more crucial for detecting the application of resin technology to either disguise country of origin of transshipped honey, adulteration of honey, or fake organic honey. Resin technology lies behind transformation and aberration of qualities while the use of vacuum chambers is the foundation of aberrational increases in quantities. These considerations and the graph of the three variables suggest as Hamlet said: "Something is rotten in the State of Denmark." Attaining a healthy Point of Equilibrium will depend upon the thorough elimination of both adulteration and circumvention.

The international honey market has witnessed and suffered 3 main modes of adulteration during the past decade. They are: 1) the addition of extraneous sugars including cane syrups, high fructose corn syrup, beet sugar and rice syrup; 2) the employment of ultra-filtration and resin technology; and 3) the use of vacuum technology to reduce high moisture content in immature honey. When sugars and syrups extraneous to honey's natural components are added, and those sweeteners cost $0.15-.30/lb. and honey $2.00/lb., the economic motives for adulteration are considerable. The use of ultrafiltration and resin technology applied to honey are modes of adulteration which facilitate circumvention and transshipment of honey; 4) the reduction of moisture from immature honey allows beekeepers in collusion with processing factories to extract honey immediately which allows beekeepers to go on to other "fields of flowers" and greatly increase by several fold production, productivity and profits.

Under standard international definitions of "honey" the artificial and mechanical addition or extraction of any materials to natural honey is regarded as adulteration that includes "Water in, Water Out" as one packer succinctly described resin technology. In the past 5 years there has been extensive use of these 3 modes to facilitate circumvention and avoid antidumping duties, and earn illicit profits for those engaged in elaborate and sophisticated modes of collusion among exporters, importers and packers. Honey is a natural and pure by-product of the interaction of botanical and zoological life forms, the pollinated and the pollinators. The future of the international honey industry depends upon adherence to that historic fact which has made honey esteemed throughout the history of our multicultural world.

There are a variety of scientific methodologies to detect the artificial manipulation and adulteration of honey. Among the methodologies, NMR is the most sophisticated and powerful. It also has the most comprehensive global data base of samples of honey from diverse flora sources and diverse geographic regions. That extensive and growing international data base of many thousands of samples includes honey sent in 2016 and 2017 from leading beekeepers in North and South America.

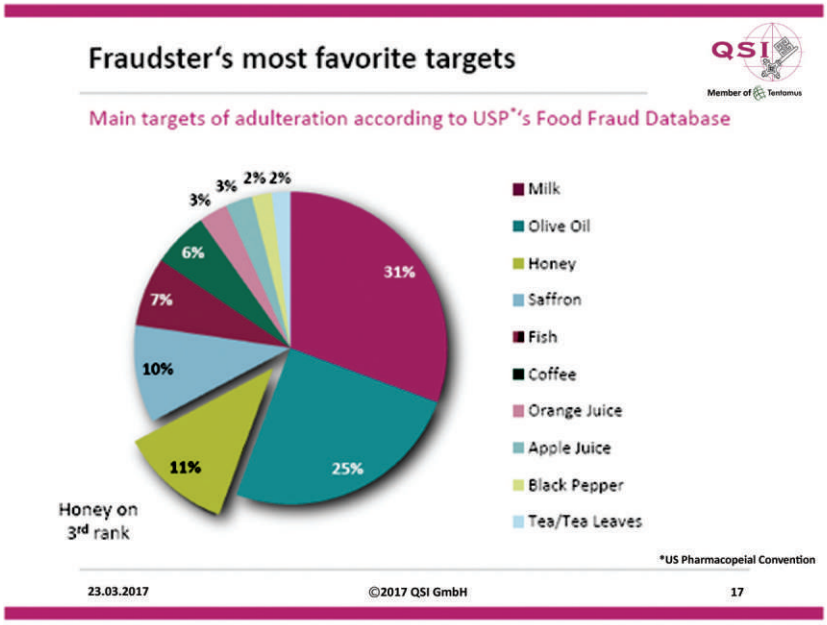

Chart 4. QSI – food adulteration

In the October, 2016 issue of the *ABJ*, experts from Columbia Food Laboratories and QSI laboratories, including Dr. Dübecke and Dr. Lüllmann, stated "Our database already contains several thousand reference profiles. To ensure authenticity of our reference samples, we performed more than 50,000 additional analyses to test for general quality parameters and markers for adulteration. Based on that foundation of comprehensive data of HoneyProfiling™ we are not only able to extract information on geographical and botanical origin from NMR-profiles, but they additionally provide information on adulteration, such as with sugar syrup."

The European Joint Research Center (JRC) published a report of their study of honey samples collected from various points in the supply chain from EU member countries in March, 2017. After several years of analysis of many samples from European production and European imports, they found that a high percentage of samples fell into the "suspicious" category. This report sent mild shock waves through the EU honey market. The conclusions employed honey analysis methodology which included EA/LC-IRMS. The Nuclear Magnetic Resonance test was not employed for this study, but its use in 2015-2016 has found dramatic and pervasive adulteration. European beekeeping associations that produce very high quality acacia honey complain they cannot sell their high quality honey in their own domestic mar-

Fig. 1. Vacuum chamber machinery (concentrator) (Photo of Chinese equipment)

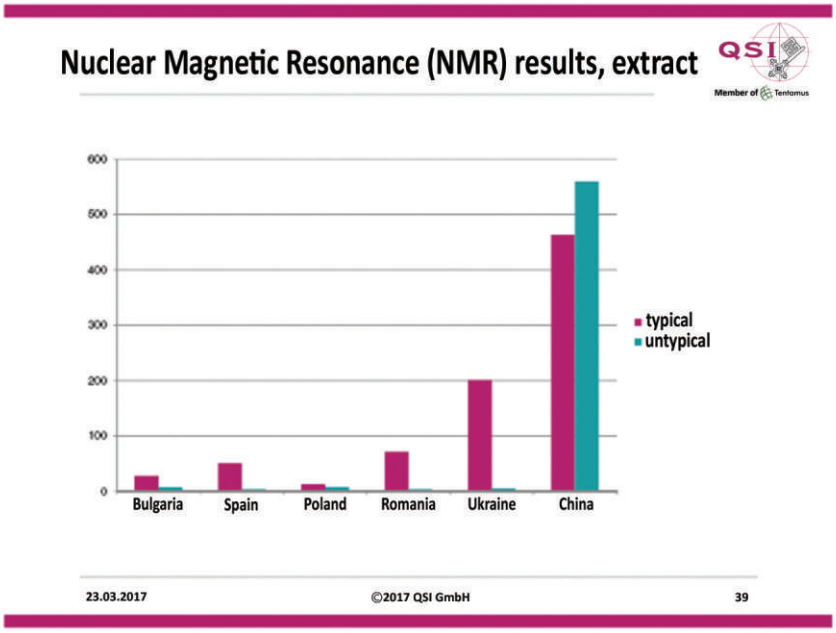

Chart 5. Source: QSI

ket. International beekeeping associations are urging the use of NMR to help create a level playing field upholding the integrity of honey.

The European Commission sent an inquiry in April, 2017, to Apimondia and several European beekeeping associations regarding the possible use of "ion-exchange resins" to honey and beeswax to products later described and sold as "organic."

NMR is being discussed with the regulatory authorities in both Europe and North America. The Canadian beekeepers wrote to their government requesting use of NMR testing for honey. The demand for NMR testing has come from European retailers of honey who are aware of the power of the test. In order to avoid documented accusations of adulteration and to preserve consumer confidence, those retailers, especially in Europe and the UK, are requiring of the honey packers supplying them that the honey passes NMR. The impact of these growing demands from both regulatory authorities and retailers are already felt in shifting patterns of exports.

The Point of Inflection that became manifest in January, 2017, is a direct result of these improved data bases and more sophisticated methodologies, including the NMR.

HONEY MARKETS BY COUNTRY

Argentina

As the crop was about to finish, people were describing it as "the worst harvest in history" with a yield of about 33-39 lbs. per hive. Prices at the beekeeper level began to increase in April. Some have attributed the poor crop to increasing deforestation in the north of Argentina, floods in some areas and drought in others. Massive forest fires also affected Argentina.

The situation changed profoundly with the late 2016-2017 crop. The current crop is estimated to be about 45,000 metric tons compared to previous crop of 70,000 with a 30,000 metric ton carryover. Exporters report "We are not getting much white honey, most is 50mm or above."

The changes in the European market due to the use of the NMR test have led to increased demand from Europe for Argentine honey and increasing prices. Speculative contracts at low prices that were entered in the 4th quarter of 2016, when the majority of importers had persuaded a majority of exporters that prices would remain at their low levels have created delays, defaults and renegotiations.

Argentine exports to the U.S. during 2015-2016 showed changes in quantity and price, with volumes increasing from 58.5 million pounds to 74.8 million pounds in 2016, and average prices decreasing 46%. As of March, 2017, imports into the U.S. are up compared to 2016, reaching 17 million pounds for the first quarter.

Brazil

Exports for the first quarter of 2017 were 5,332 metric tons. Prices were rising through the first 4 months. Crops in Sao Paulo were good, but below average in some other areas as of the end of March.

The demand for organic honey has continued and the prices have been strong. Brazil has occupied the major role for supplying organic honey. The wide price gap between conventional and organic honey has resulted in two developments: 1) stimulation for other countries to obtain organic certification and develop their organic production; and 2) reports of smuggling of conventional honey from Uruguay and northern Argentina into Brazil. The Brazilian honey exporters reported this to their authorities, including criminal investigators, who are investigating the specific parties alleged to be involved. The Brazilian Association of Honey Exporters issued a statement in March, 2017, denouncing the entry of illegal honey into Brazil and requesting government agencies to inspect illegal honey traffic. The vast majority of exporters are very conscientious and do not want to have the high reputation of their products affected.

In addition, the statement of the European Commission regarding awareness of the possible use of resin technology to create fake organic honey may become a major issue of concern for other nations seeking to compete with Brazil. The role of the Nuclear Magnetic Resonance in weeding out fake organic honey is very important. Brazil's organic honey industry has sent many authenticated samples of organic Brazilian honey for the NMR database.

Vietnam

Vietnam's total honey exports to the US in 2016 reached 80,267,000 pounds at an average price of $0.77/lb. Arrivals in the first quarter 2016 and 2017 were, respectively, 17,500,000 pounds compared to 26,387,000 pounds. The development of the Vietnamese honey industry over the past 2 decades has been startling. The export quantities increased from 34.6 million pounds in 2007 to 103 million pounds in 2014. Since then, US imports have declined, and the higher prices of 2015 collapsed by nearly 60% in 2016.

Vietnamese honey exporters report the following regarding the current 2017 crop: "Early cold and rain delayed and reduced the crops, including cashew, rubber, litchi and longan. The price in the local market is hot day by day. The main reason is the poor crop, down at least 30% compared to last year. Even though the price is high, there is no honey." News reports indicate that unseasonal rain has disrupted the 2017 coffee harvest and worsened coffee bean quality.

The Vietnamese rubber crop will finish by the end of April. While Vietnam suffered a serious drought in 2016, heavy rains during the peak period of rubber production in March and April in 2017 reduced the rubber crop to only 1/3rd of normal. Domestic prices rose steeply and rapidly; the average price to beekeepers doubled. With the collapse of pricing in 2016, many beekeepers left the industry. From January to March and April, prices rose over 60% compared to the beginning of the crop. This is encouraging the beekeepers to resume tending their bees and revitalizing their colony numbers.

Vietnamese honey exports have been deeply influenced by the fact that in about 2006 *Acacia mangium* became the dominant floral source, superseding rubber, coffee, cashew, litchee, longan and melaleuca. As is well known, the *Acacia mangium* has extraordinary and disturbing color instability which fact has led to Vietnamese honey being predominantly Amber and Dark Amber. This quality problem of severe color instability contributed to rejections, discounts, returns, etc. It is important for the Vietnamese honey industry to pay attention to the quality requirements of their consuming market.

The Vietnamese honey exporters are trying to export to Europe, where the tolerance level for carbendazim is significantly greater than in the US. The Vietnamese honey industry was very pleased in January, 2017, when Vietnam's Ministry of Agriculture announced a ban on carbendazim use on various crops.

Nonetheless, honey exporters in Vietnam are in a difficult position because they owe contracts made in 2016 and early 2017 below the prevailing market.

India

Reports from India are that the early 2017 crop was very poor, and prices have nearly doubled at the beekeeper level. The export crop, especially from mustard, will be reduced by 50%. White honey from India is reported to be scarce in 2017, and a startling fact is that import volumes of white colors from India dropped from 8.5 million pounds in 2015 to 569,000 pounds in 2016.

U.S. honey import volume from India in 2016 declined by about 21% relative to 2015, and import customs values declined from an average of $1.49/lb. in 2015 to $0.89/lb. in 2016! The total value of Indian imports in 2016 declined by about 53% relative to 2015!

Looking back, U.S. honey imports from India doubled between 2010-2015, hitting their peak of 36,123 metric tons in 2015. Prices increased 20% over those 5 years.

The development of Indian honey exports shows a huge increase since exports began in 2001 with about 1,000 metric tons. Imports of white colors declined, and light amber colors increased significantly in recent years. The yield of Indian beehives was stable and slightly decreased over the last 10 years, according to reports from FAOSTAT. We note that while India is reported to have had 4 million beehives in 1961, there were no exports of honey until 1995. Within a 20 year period, their exports increased from a tiny amount to over 40,000 metric tons.

From 2001 to 2015, about 90% of India's exports have been made to the U.S. India is generally regarded as a "high risk" country in both Europe, where Indian honey has a very small presence, and in the U.S. Exports of white, extra light amber and light amber are now being augmented by organic honey.

Indian honey was involved in transshipment cases over the past two decades. Many Indian exporters have worked hard to clean up the industry and prevent circumvention. The data on beehives, production, and productivity per hive, show many unresolved contradictions and questions. Independent and comprehensive analysis of India's beekeeping and honey industries is needed.

Canada

U.S. imports from Canada increased from 3,917,203 pounds in 2016 to 7,485,873 pounds in 2017 for the 1st quarter, compared to the previous year. Canadian prices

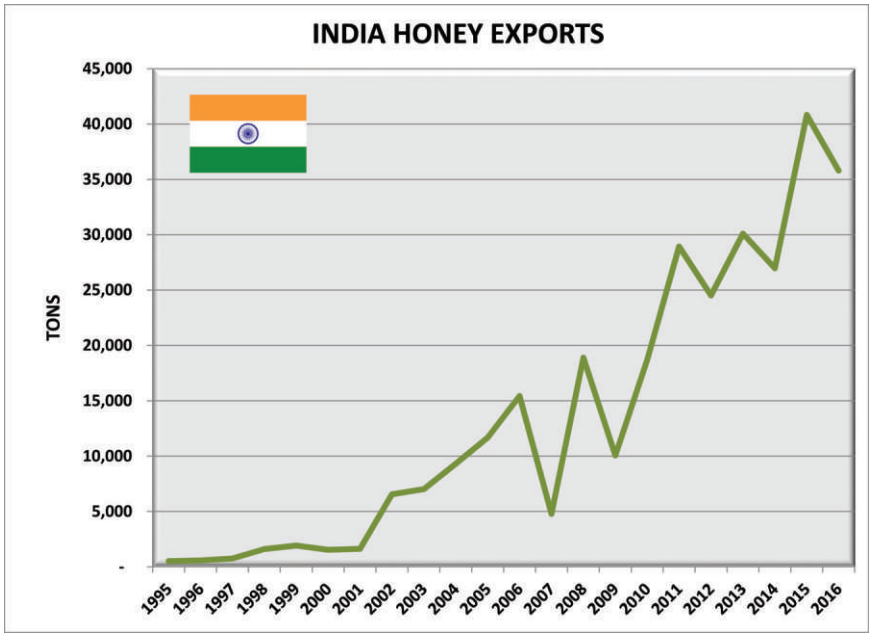

Chart 6. Source: Prof. Norberto Garcia (USCOMTRADE)

of honey experienced a terrible collapse in parallel with the 2016 price decline. The value of Canadian honey dropped nearly $53 million in 2016, from $210 to $157 million. According to an article in the Canadian Grocer, the reason is competition from "cheap products diluted with other sweeteners." In 2015, 69% of Canada's honey exports, which totaled 11,701 metric tons, went to U.S. destinations.

As is well known, Canada has very white honey. However, as Canada's clover honey has declined in volume and its canola honey has significantly increased, Canada's water white honey has changed its flavor profile to a more neutral character.

The Canadian honey industry is very proactive to do their utmost to remove adulterated honey, whatever the form, from the market. Kevin Nixon, former President of the Canadian Honey Council, has urged the Canadian government to invest in nuclear magnetic resonance (NMR) testing. "He would like to see the Canadian Food Inspection Agency invest in nuclear magnetic resonance (NMR) testing, which can detect the sweetener's composition and place of origin, and create a profile of domestic honey to compare imports against." The CFIA has identified honey as a sampling priority since 1998, and uses the carbon isotope ratio method. A spokesperson indicated that they plan to increase the amount of samples they collect this year (*Canadian Grocer*, March 13, 2017).

Health Canada is proposing a ban on the

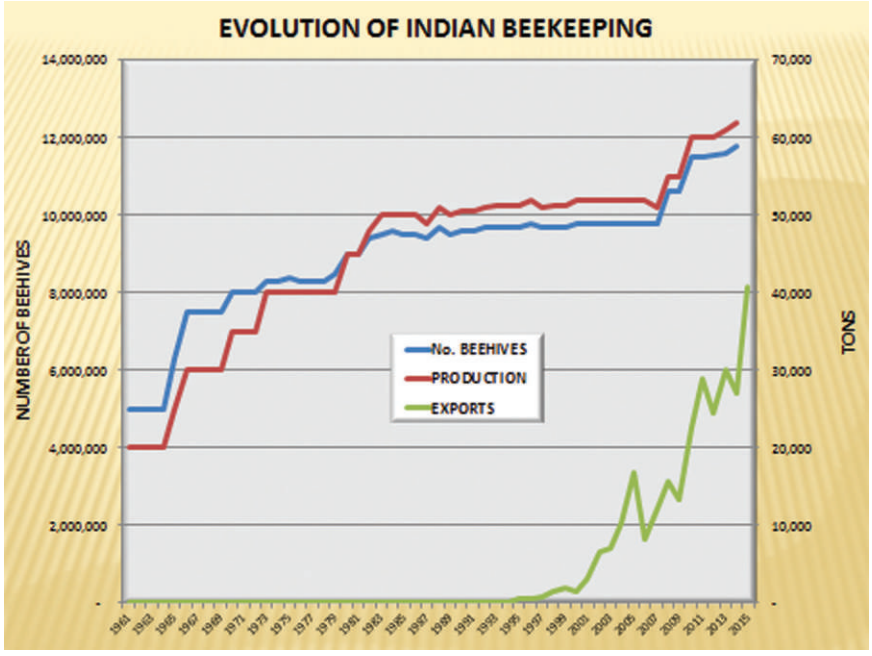

Chart 7. Evolution of Indian Beekeeping (prepared by Prof. Norberto Garcia). Source: Indian Beehives, Jonathan E. Abbott, MIT thesis, February 2016

neonicotinoid pesticide imidacloprid, saying that it is seeping into Canadian waterways at levels that can harm insects and the ecosystem. All agricultural uses would be phased out over the next 3-5 years (*Alberta Bee News*).

Mexico

As the 2017 crop begins, the reports from Mexico are that stormy weather is affecting the citrus blossoms. Drought has affected the biggest source of honey in areas where seasonal lakes were the source of water for a huge biodiversity of birds and animals.

During 2016, despite declines in production in important regions, average prices declined by 14%. The U.S. import volume was 7,043,000 lbs. (3,194 metric tons). The organic honey crop is typically very small. Mexican honey exporters traditionally have a large healthy market in Europe and complain that in the UK and some countries on the continent they are unable to compete with adulterated honey.

Ukraine

U.S. imports from Ukraine increased in the 1st quarter of 2017 compared to the same period in 2016, reaching 11.5 million pounds. As of April, little or no unsold honey was available, according to some exporters, and prices increased. News reports stated that Ukraine's honey exports to the EU fulfilled the available quota by the end of January, 2017.

U.S. import volumes from Ukraine during 2015-2016 were unchanged at about 24 million pounds/year, although prices declined by about 60% in 2016.

When consideration is made of the significant domestic consumption and Ukraine's significant export of honey, including the European market, it is clear that there are very minimal amounts of Ukraine honey left until the new crop sunflower which is August/September. Prices have risen but there is no expectation that significant quantities of authentic Ukrainian honey can be shipped either to Europe or North America before 3rd quarter, which means arrivals in the 4th quarter.

United States

The 2016 honey crop was only 150 million pounds despite a much bigger bee population than in years when domestic honey production reached 220 million pounds. Many factors have decreased productivity per hive which decline is concurrent with increased costs of production.

By April of this year the most informed estimates are that 95% of the U.S. domestic crop has been sold. The dwindling inventories were eliciting higher bids since many low priced speculative contracts for imported honey, as indicated above, were either delayed, cancelled or were being renegotiated at higher prices.

It is interesting and revealing to note that the two mature, large and sophisticated beekeeping industries of Argentina and the US with large areas and favorable flora sources for producing honey are averaging only 45,000-65,000 metric tons annual production.

The early 2017 US honey crop began with reasonable production of orange and sage honey in California and the southwest due to the heavy rains in the west coast, breaking the 5-year California drought. The traditional Florida orange honey crop has virtually disappeared. The tallow crop of Texas has been plagued by excessive rains which have washed out some nectar despite heavy blooms.

As a whole the previous crop is sold out and the main new crop honey will not be available until September 2017. The concern of American beekeepers about the depressive burdens on their industry caused by circumvented or adulterated honey remains acute.

China

China is the world's leading producer and consumer of honey. See the chart showing China honey export volumes to Europe and the changes beginning in the 2nd half of 2016:

China's honey exports have recently experienced major shifts, beginning in Europe. The use of NMR testing by European retailers of honey created a situation in which Chinese honey was being offered for export specified as passing or not passing the NMR test, resulting in a 2-tiered price structure. Reduction of high moisture honey by vacuum chambers has enabled high quantities of Chinese honey production and low prices.

As is widely known, China anticipated receiving Market Economic Status in December, 2016, as a result of the U.S.-China bilateral agreement signed 15 years earlier for China's accession into membership of the World Trade Organization.

China has held several international scientific conferences in the past four years on honey quality and planned honey trade delegations to the USA in anticipation of the removal of prohibitive antidumping duties. Efforts to show good faith in quality commitment were in process. For various reasons, Market Economic Status was not granted to China by either the USA or the EU. One probable compounding reason is China's over-productive capacity in many different industries, which has led to prices which have depressed international markets resulting in harm to many domestic industries. In the case of the honey industry, the over-productive capacity is most directly linked to the pervasive production of "shui feng mi" or "water honey."

The UK market has allowed import of Chinese honey and has been the main EU destination. NMR testing by some retailers is potentially throwing a monkey wrench into the machine of that market.

Geo-political concerns hover over US-China trade relations. There is talk that if geo-political cooperation improves, a new favorable trade agreement may follow. It is known that the Chinese government is currently pressing the U.S. government for treatment as a Market Economy in anti-dumping cases. Uncertainties, however, persist.

Among the most significant concerns regarding China are: 1) the state and health of its economy, 2) its policy and practice of Direct Outside Investment (DOI) and 3) the state of its environment which suffers well known and growing toxicity of land, water and air, pollution which cannot be confined within any Great Wall or national boundary. China now contributes more greenhouse gases to the global atmosphere by some estimates than does the U.S. and the EU combined.

While China's economy continues to grow at a rate of 6.7-6.9% despite the slug-

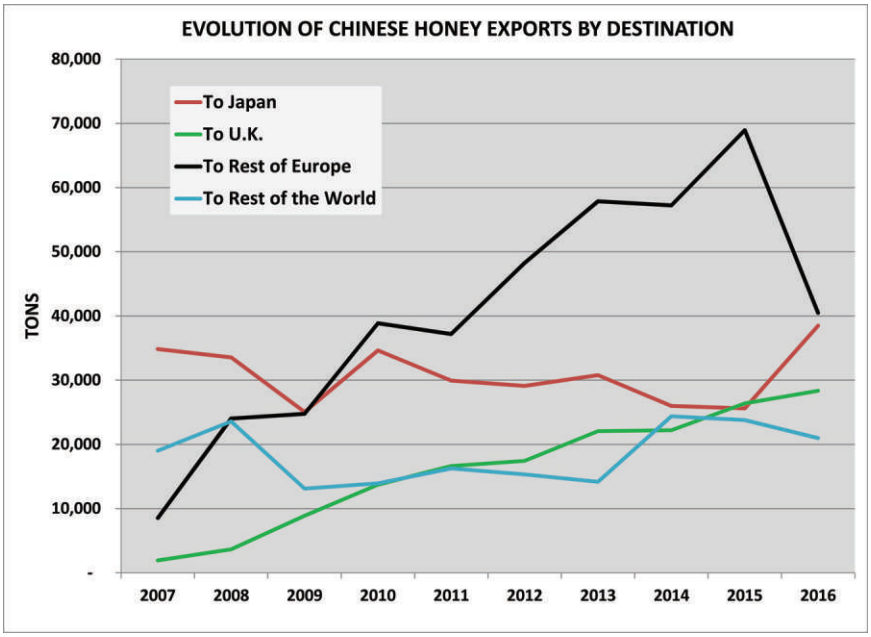

Chart 8. Source: Prof. Norberto Garcia, UNCOMTRADE

gish international economy, China has produced what economists call "ghost cities," "ghost factories," "ghost residential complexes", "roads to nowhere," over-productive capacity and a combination of both high debt to GDP and growing non-performing bank loans. All of this creates immense pressure to export products including honey which has been bottled up by antidumping duties and concerns of adulteration in each of the 3 modes discussed earlier.

China's direct overseas investment (DOI) policies are seeking international, vertical and horizontal integration in industries strategic to its economy wherever possible. Those investments include not just prestigious symbols like the Waldorf Astoria Hotel, but agricultural interests like Smithfield ($6 billion), Syngenta of Switzerland ($43 billion), mining resources, energy resources, high tech companies and very importantly, agricultural interests. Agricultural interests include purchasing farms and agricultural businesses (in New Zealand almost 40% of whose dairy industry is owned by Chinese companies), farms and agricultural processing companies in South America, Africa and Asia as well as "renting" farm lands in Russia and the Ukraine. China's DOI is pursued both directly and through surrogates including law firms, venture capitalists and vulture capitalists. China's market economy is well schooled in the practices of foreign acquisition. It is known that China has bought bee farms, honey processing companies, importers and exporters, in several countries. This has aroused concern about acquisition of strategic resources within industries and governmental agencies, including in the U.S. Congress.

The major reality facing China's role in the international honey industry concerns the fact that China must reform its fundamental ways of producing and exporting honey. If, and when, these reforms are carried out, China undoubtedly has the capacity as both a consuming and producing country to play a major and positive role in the international honey industry. But those reforms are imperative to achieve a level playing field and maintain the historically esteemed role of honey as a pure, natural, delicious and healthy food.

The Chinese economy is suffering tremendous redundancy of production in areas far larger than the honey industry, in particular the steel industry which, like honey, is subject to anti-dumping orders. That overproductive capacity has led to a collapse in steel prices and numerous actions including in the US against imports of Chinese steel.

Concerns with circumvention, transshipment and adulteration of Chinese products subject to US antidumping laws are not confined to the honey industry. The circumvention of honey through a variety of forms has attracted tremendous media and governmental attention and threatens the strategic interest of American beekeepers, American agriculture, food security and food safety; these concerns parallel concerns for Chinese steel, solar panels and other products. The current administration signed an executive order in April, 2017 requesting a 270 day review to determine whether steel imports were harming national security. A *New York Times* article asserts: "The steel is pouring out of Chinese factories…global steel makers and industry experts blame China for shipping its surplus steel to other countries, which drives down prices and prompts those countries to further process ["tweak" in violation of the principle of equivalents in patent law]… for export to the United States. " "China does concede it has too many steel factories making too much steel." China is an obvious target of the order, although the impact could ripple worldwide. The same phenomenon is occurring for solar panels.

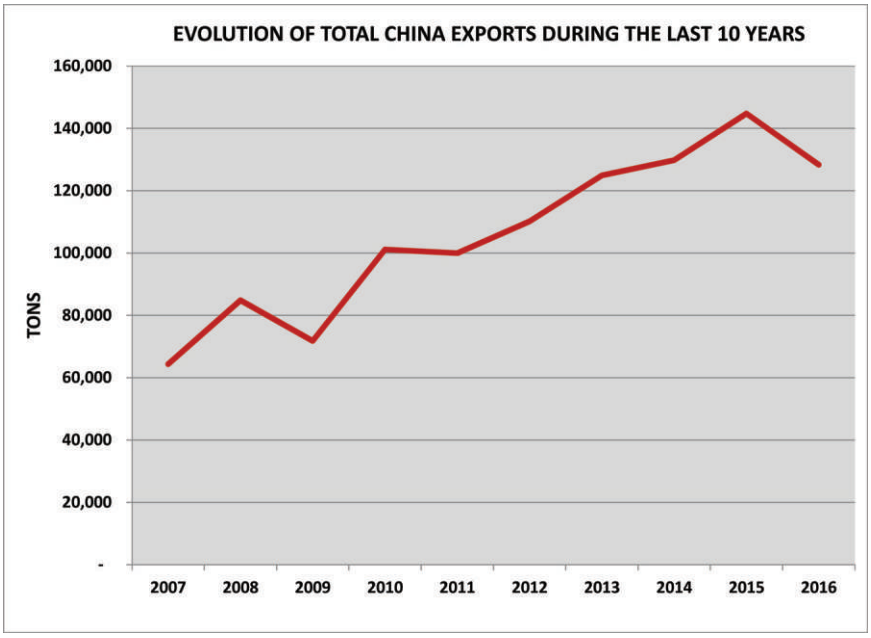

Chart 9. Source: Prof. Norberto Garcia, UNCOMTRADE

The negative ecological consequences of over-productive capacity and redundancy in the steel industry are very significant. China's ability to assume a more constructive role in international trade will require fundamental reforms on a number of levels.

Climate

The scientific data points to the continuing warming of the planet, the rise of sea levels and increased volatility, severity and frequency of severe weather events including droughts, floods, hurricanes, heat waves, forest fires. This phenomena covers the entire globe and all continents. The scientific data regarding melting of icebergs and the retreat of glaciers and the permafrost are especially alarming.

White and light colors reflect up to 95% of solar energy back into Space. As global warming continues there is a global reduction of light colors into darker colors of blue, green, brown which absorb and trap heat. Under the vast permafrost nearer the Poles of the Planet, vast quantities of methane gases are trapped. The release of those gases is ominous because the heat trapping capacity of methane gas is 25 times greater than that of carbon dioxide. These processes are, thus, self-feeding in nature compounding the climate dilemma facing humanity, a dilemma which increasingly attracts the attention of both scientists and religious leaders.

Global temperature for 2016 reached the hottest levels on record. Our world is not only plagued by refugees of war but also climate refugees currently concentrated in North Africa and the Middle East where potential droughts are involving major migrations of "climate refugees."

The warming of the planet is leading to changing geographic distribution of both botanical and zoological life forms. The phenomena of El Nino and La Nina have affected honey production in several major honey-producing nations including Argentina, Vietnam, Mexico, etc.

2017 so far has confirmed the global warming trend of recent years as global surface temperatures in January, February and March were the third-warmest, second-warmest and second-warmest for those respective months, NASA's Goddard Institute for Space Studies reported. Average temperatures in March 2017 were the 2nd highest in 137 years and only the eighth month on record in which the temperature anomaly exceeded 1 Celcius (1.8 F). Significantly, this March was the hottest on record in the absence of the warming effect caused by the natural El Nino weather system.

From 1880 to 2017 there has been a steady warming of the Earth (See Chart 10).

Two recent studies in the Journal *Nature* highlight a far greater amount of glacier melt than previously thought. "Most polar scientists have considered water moving across the surface of Antarctica to be extremely rare – but we found a lot of it over very large

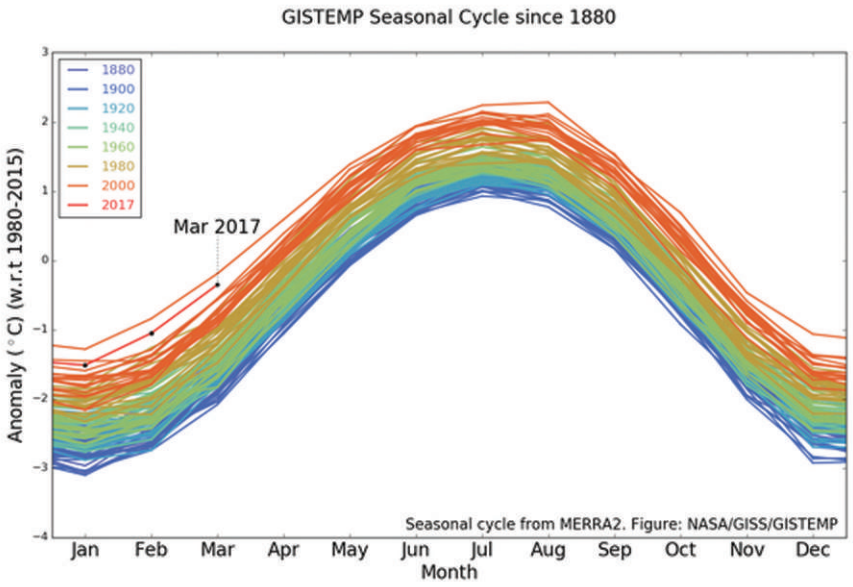

Chart 10. Global Temperatures Seasonal Cycle 1880-2015. Source: https://data.giss.nasa.gov/gistemp/news/20170414/

areas", said lead author Jonathan Kingslake of Columbia University's Lamont-Doherty Earth Observatory while the second study's author, polar scientist Robin Bell, proclaimed "This study tells us that there is already a lot more melting going on than we thought."

Other than the obvious consequences of glacier melting on rising global sea levels, a never before observed consequence of glacial melting known as "river piracy" has resulted in reversing the course of a river in Canada's Yukon Province. "Geologists have seen river piracy, but nobody to our