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Developments in Iran's Agriculture Sector and Prospects for U.S. Trade

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Abstract

With one of the Middle East's largest economies, a growing population, and rising incomes, Iran contributes significantly to the region's agricultural commodity consumption. Iran's rising food demand is also pushing against the limits of its own production capacity, which faces tight constraints from geography and climate. The interaction between these forces, as well as larger geopolitical concerns, will shape Iran's impact on global commodity markets, including markets in which the United States competes. Following an international agreement to remove decades-long sanctions against Iran, attention has increasingly focused on the country's agriculture sector. The Joint Comprehensive Plan of Action of 2015 grants Iran greater access to international markets and capital and could significantly affect its production, consumption, and trade of several grain and horticultural products. Moreover, the agreement's trade provisions specific to agriculture have introduced the possibility of new competition between the United States and Iran. Near-term U.S.-Iran trade is unlikely to return to levels existing before the Islamic Revolution. However, U.S. commodity shipments are currently trickling into Iran, and changing conditions in Iran's economy and agricultural sector may offer U.S. exporters a larger role in meeting Iran's growing food and feed demand. Meanwhile, as domestic and foreign investment in Iran's agriculture sector rises in the wake of the agreement, yields and efficiencies there are likely to approach levels in neighboring countries, like Turkey, that have common economic and agronomic traits. Such improvements may raise Iran's production levels and drive changes in the country's overall trade profile.

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World Agricultural
Outlook Board

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Introduction

The history of agricultural production in Iran stretches back to human civilization's earliest years. Archaeological records in present-day western Iran, which sits along the ancient Fertile Crescent, show that humans, beginning about 12,000 years ago, gradually shifted into agrarian livelihoods centered on plant and livestock production for food. Inhabitants of this region successfully selected and planted wild varieties of barley, peas, lentils, and wheat and also domesticated goats (Zeder and Hesse, 2000; Riehl et al., 2013).

A few elements of Iran's ancient agricultural practices persist to this day, but relatively modern crops and farming methods are now the norm, and new challenges—climatic, economic, and, most recently, political—confront the country's agriculture sector and food security needs. New developments in Iran's agricultural supply and demand could influence global patterns in food commodity trade, with important implications for U.S. producers.

A major development is the removal of economic sanctions on Iran under the Joint Comprehensive Plan of Action (JCPOA) that was signed in 2015. These sanctions, which isolated much of Iran's economy from the outside world, included a U.S. embargo on food imports from Iran and penalties on non-U.S. persons and entities engaged in business with Iran. Verification in early 2016 of Iran's compliance with the JCPOA triggered the sanctions relief in the arrangement, granting Iran's economy greater exposure and access to the outside world.

While the bulk of trade and financial transactions between the United States and Iran currently remains under sanction, the JCPOA's agriculture provisions could significantly affect food production and trade in both countries. U.S. agricultural exports to Iran were not forbidden prior to the JCPOA, but strict Government licensing of exports, as well as banking and financing constraints, kept U.S. sellers wary of the Iranian market. Under the new rules, however, contracts and payments can more easily be made, potentially widening the opening for U.S. exports to Iran. Moreover, over the long run, as Iran expands its access to markets for food and agricultural technologies in the West, large shifts in its own food demand and supply could drive sizable adjustments in the patterns of global agricultural trade for several major commodities.

One example of the JCPOA's possible effect on U.S. producers relates to pistachios. With relaxed import restrictions from Iran, U.S. producers potentially face new competition from the world's largest pistachio producer and second largest pistachio exporter. Decades of sanctions and trade restrictions have pushed Iran out of the large U.S. and European markets, but news reports have suggested that Iranian pistachio imports could resurge. Currently, however, Iran's pistachio exports remain restricted due to longstanding U.S. countervailing duty and anti-dumping orders and regulatory requirements.

Iran's Macro-Economy and Agricultural Economy

Demographics and Income

The World Bank classifies Iran as an upper-middle-income country, with a total gross domestic product of \$425 billion, 28th in the world, and a population of just over 80 million. In recent years, Iran's economy has experienced large swings, but overall growth averaged a modest 1.2 percent annually over 2010-14. Iran's oil and natural gas reserves are among the world's largest, and its economy depends significantly on extraction of these resources. Meanwhile, agricultural production accounts for over 9 percent of its economy and employs about 18 percent of its population. Twenty-seven percent of Iran's population is rural, and, as in many other developing economies, this number has been steadily declining due to rapid urbanization and industrialization.

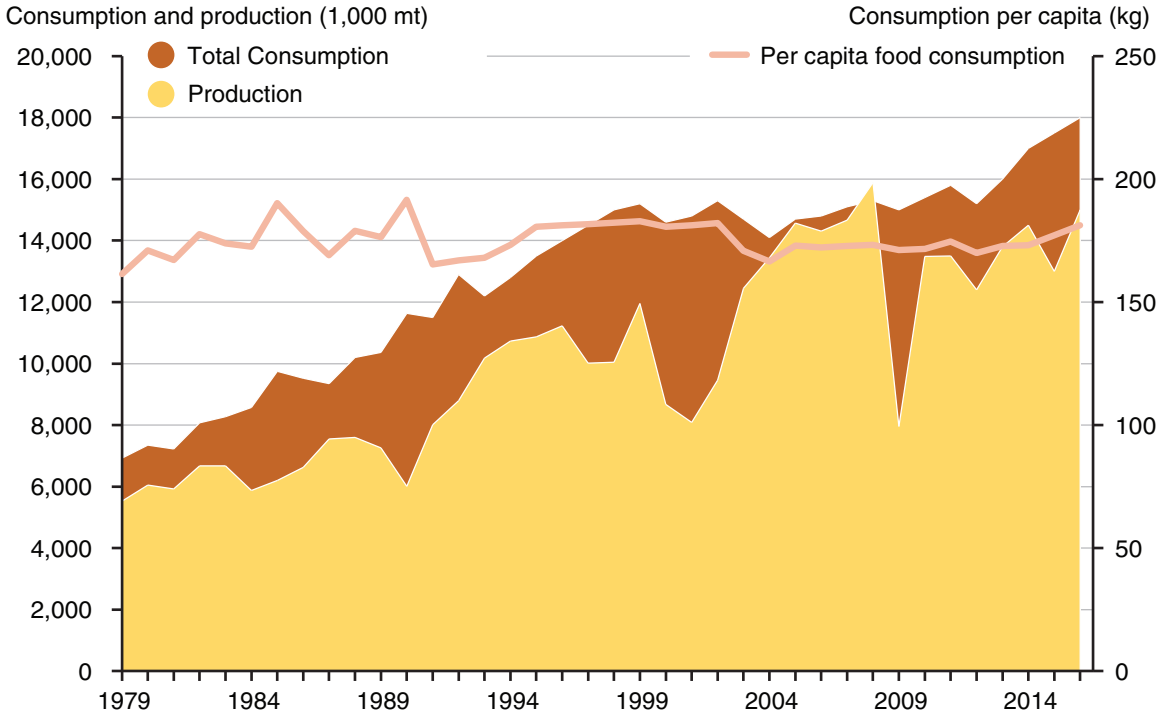
While falling energy prices have recently hampered Iran's oil-dependent economy, relief from international sanctions, particularly in reduced trade and financial transaction costs, has brightened the outlook for investments in Iran's energy sector and its overall economy. The International Monetary Fund expects Iran's economy to grow between 4 and 5 percent over the next 3 to 5 years (IMF, 2015).

Food Consumption

Wheat and rice are Iran's two main food staples (Ghassemi et al., 2002). (See figs. 1 and 2 for production and consumption data on these crops.) Bread made from wheat has traditionally served as the primary source of calories, but per capita consumption, despite ranking among the world's highest, has remained flat in recent decades. Iran's rice consumption per capita has gradually risen over time, as rice tends to replace wheat there when incomes rise (Ghassemi et al.), though in recent years the growth of rice consumption has declined. Dairy products, in the form of yogurt and cheese, are also important caloric and nutritional sources, as are fruits, vegetables, leafy greens, and nuts.

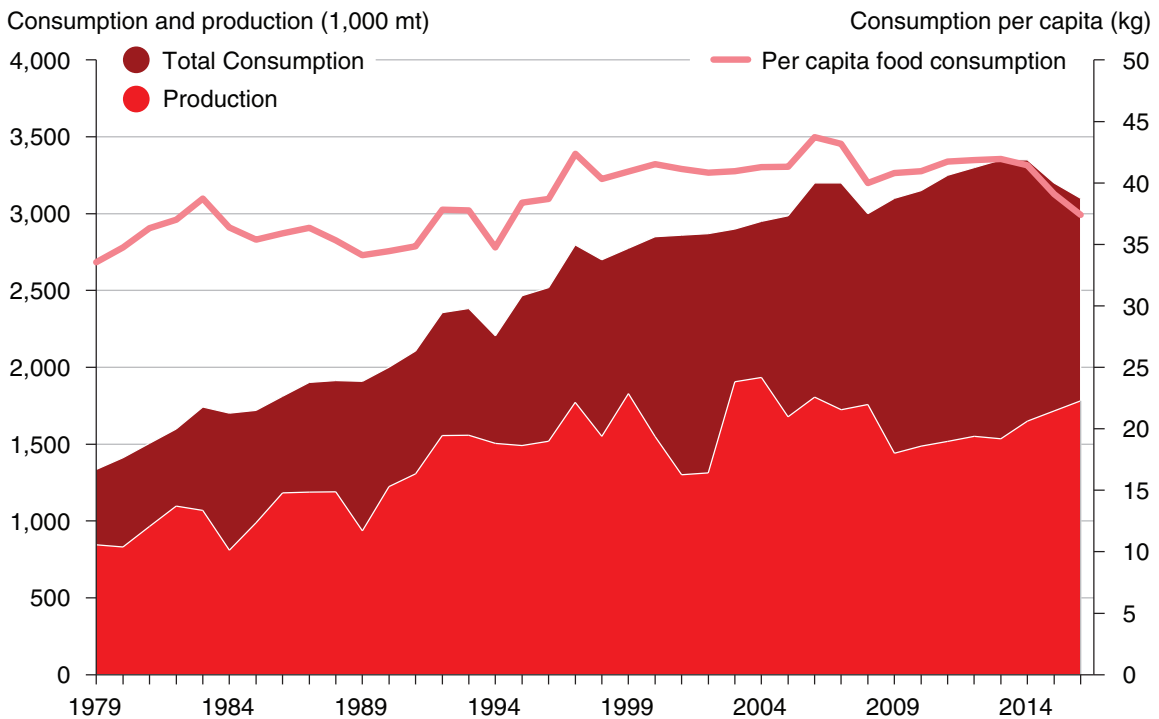
As in many parts of the developing world, Iran's rising income and growing population have raised its demand for meat products (fig. 3). Poultry, in particular, has experienced significant growth over the past two decades, gradually surpassing beef and lamb as the primary source of animal protein. To meet this growing demand, Iran's livestock sector has also expanded. Consequently, the demand for animal feeds—particularly corn, but also barley, wheat, and soymeal—has risen over the same period.

Figure 1
Historic wheat consumption and production in Iran



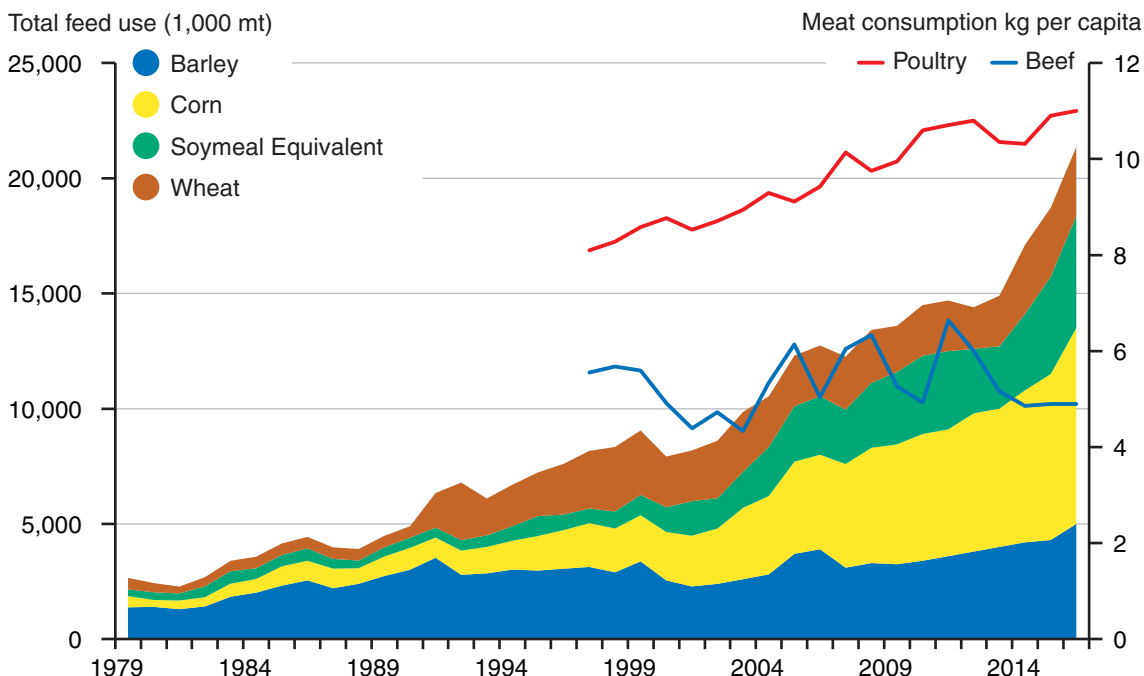
Source: U.S. Department of Agriculture, Foreign Agriculture Service, Production, Supply, and Distribution Online.

Figure 2
Historic rice consumption and production in Iran



Source: U.S. Department of Agriculture, Foreign Agriculture Service, Production, Supply, and Distribution Online.

Figure 3
Historic meat consumption and livestock feed in Iran



Note: Values for feed use are presented in stacked form to capture its aggregate rise. PSD data on Iran’s beef and poultry consumption are unavailable prior to 1997.

Source: U.S. Department of Agriculture, Foreign Agriculture Service, Production, Supply, and Distribution (PSD) Online.

Agricultural Production

According to the United Nations Food and Agriculture Organization (FAO), Iran’s total cultivated area is approximately 15 million hectares, spread mostly across Iran’s western, north-western, and northeastern provinces.¹ (See map in fig.4.) Production can be divided into two broad categories: (1) annually planted crops, including food and feed grains, and (2) horticultural crops, such as fruit trees.

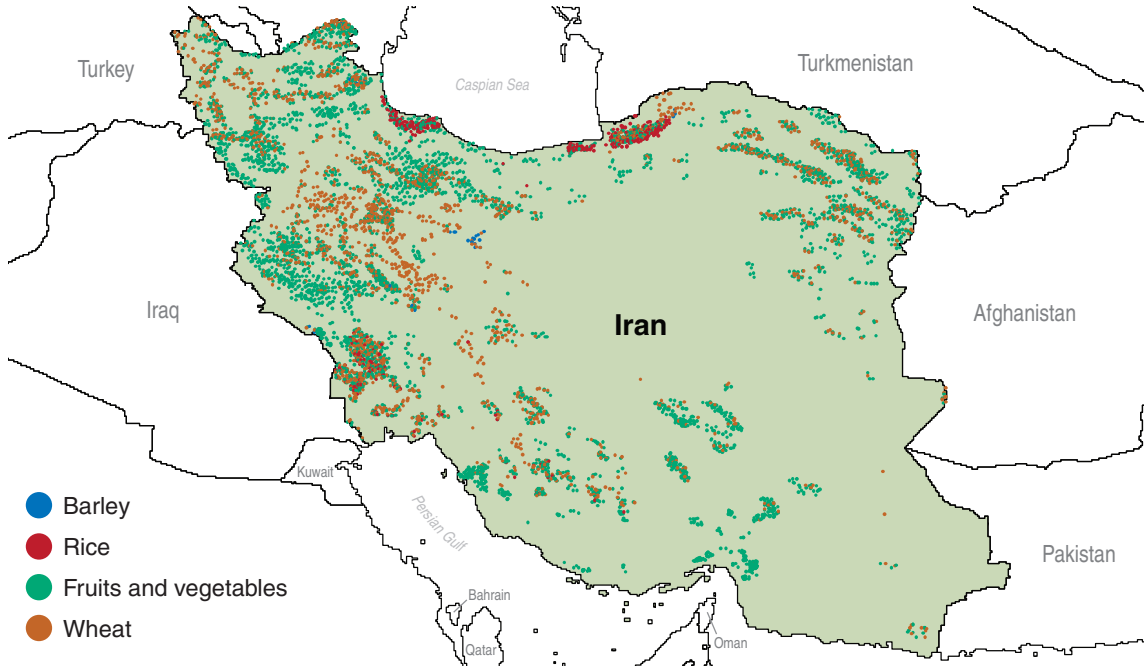
Within the first group, wheat is Iran’s largest crop by area (table 1). Wheat area has averaged around 6.6 million hectares over the last 5 years, accounting for just under half of all land under cultivation. Average production was around 13.4 million tons, placing Iran among the top 15 producers in the world. Yields averaged a little over 2 tons per hectare, comparable to those of producers in Russia or Australia. Around 40 percent of Iran’s wheat area is irrigated, with yields of around 3 tons per acre, comparable to U.S. rain-fed wheat yields.²

Barley is Iran’s second largest crop by area, averaging about 1.6 million hectares over the last 5 years, with production around 3 million tons, or 1.9 tons per hectare. By comparison, U.S. yields average about 3.5 tons per hectare. Rice and corn round out the remaining cereal grains, accounting for around 10 percent of total cultivated area, with yields averaging 4.2 and 6.3 tons per hectare (FAO, 2016a; USDA, 2016a).

¹For a variety of reasons, FAO estimates often differ from the USDA’s PSD estimates. Throughout this report, the default source for information is PSD, but in cases where certain commodities are unreported in PSD, we rely on FAO data.

²Source: Fertilizer use by crop in the Islamic Republic of Iran (FAO, 2005). Irrigation details from FAO’s GIEWS Country Brief: Iran (FAO, 2016b). Production and area details are from PSD (USDA, 2016a).

Figure 4
Agricultural production in Iran, circa 2005



Note: 1 Dot = 5,314.28571. Each dot has a value of approximately 5,300 mt. Data for this map were collected from International Food Policy Research Institute's MapSpam project.
 Source: United Nations Food and Agriculture Organization.

Table 1
Distribution of area across all crops in Iran 2013

| Crop | Area (hectares) |
|--|-------------------|
| Wheat | 6,399,992 |
| Rice, barley, and other cereals | 1,635,001 |
| Pulses | 1,324,899 |
| Other annual crops | 1,977,732 |
| Tree fruits and nuts and other perennial crops | 1,806,000 |
| Total | 13,143,624 |

Source: FAOSTAT (2016a).

Iran's horticultural production is diverse and high-value, and much of it is grown for export markets. (See table 2 for a summary of Iran's top horticultural products.) Pistachios are not only the highest value horticultural crop in Iran, but also the country's second highest value export after petroleum. Walnuts and tomatoes rank third and fourth in value among all crops produced in Iran.

Table 2

Horticulture value, production, and area in Iran

| | Crop | Value in 2013 (million U.S. dollars) | Average production, 2009-13 (mt) | Average annual area, 2009-13 (ha) |
|----|------------------------|---|-------------------------------------|--------------------------------------|
| 1 | Pistachios | 7,517 | 463,218 | 253,100 |
| 2 | Walnuts, with shell | 4,318 | 438,121 | 60,900 |
| 3 | Potatoes | 4,214 | 4,551,350 | 162,116 |
| 4 | Tomatoes | 2,669 | 5,776,643 | 157,654 |
| 5 | Fruit, fresh | 2,394 | 1,737,636 | 107,833 |
| 6 | Apples | 1,520 | 1,779,754 | 137,971 |
| 7 | Grapes | 1,288 | 2,173,961 | 218,155 |
| 8 | Lemons and limes | 1,184 | 621,577 | 38,407 |
| 9 | Dates | 1,183 | 1,049,968 | 157,107 |
| 10 | Cucumbers and gherkins | 1,027 | 1,623,661 | 71,563 |

Source: FAOSTAT (2016a).

Climate Conditions for Agricultural Production in Iran

Moisture availability is the greatest limitation on Iran's agricultural production. Across most of the country, the climate is arid or semi-arid, with long-run average annual rainfall estimates ranging from 200 to 230 millimeters per year. However, the low average obscures considerable variation. Iran's interior deserts receive less than 50 mm per year and its western and northwestern areas around 500 mm, while areas along its Caspian Sea coast enjoy a more plentiful 1,000 mm. In addition to rainfall, Iran relies on surface and groundwater sources to irrigate nearly 9 million hectares of its cultivated area. Currently, a historic 7-year drought in the country has hurt yields and led to increasing pressure on groundwater supplies that cannot soon be replenished.

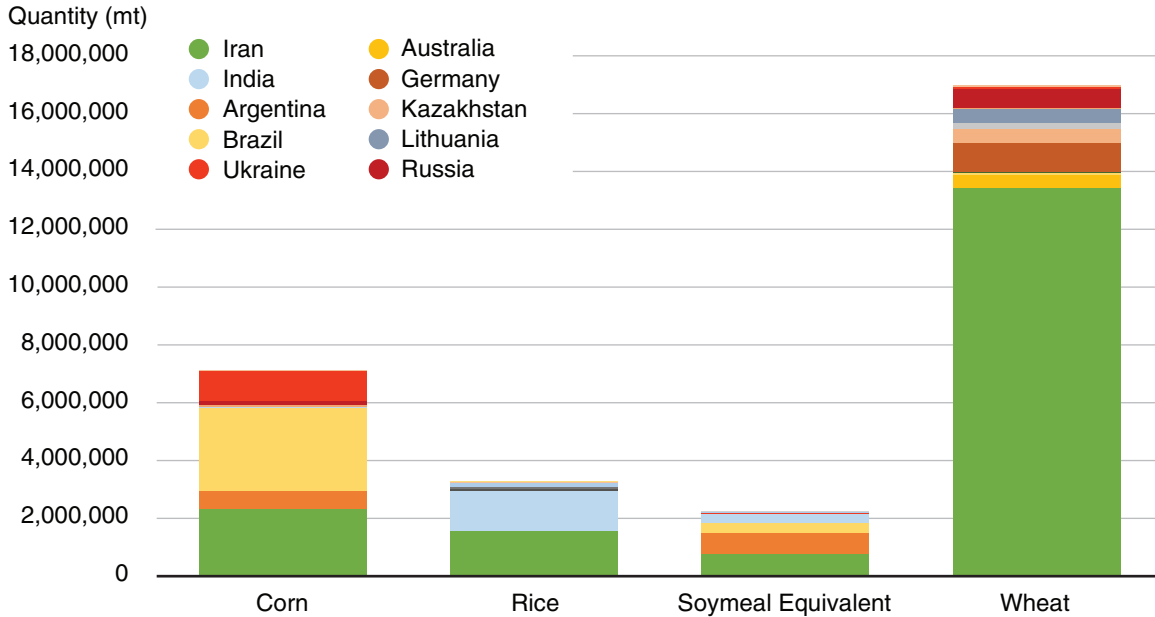
Meanwhile, temperatures in Iran can reach some of the highest measured on Earth. One consequence is the rapid evaporation of what little precipitation reaches the ground. Climate change, and the associated upward trend in temperatures, has added new stresses to an already challenging production environment.

Agricultural Trade

Given the physical constraints on its production, along with its rising population and income, Iran relies heavily on imports to satisfy its demand for major grain crops. From 2011 to 2015, the import share of consumption averaged 23 percent for wheat, 29 percent for barley, 52 percent for rice, and 71 percent for corn. Figure 5 presents a country-specific import summary of wheat, rice, soy products, and corn, compared with Iran's production of each grain. Iran buys most of its corn from Brazil, with additional supplies coming from Argentina and Ukraine. Iran's rice imports originate almost entirely from India. Soy product suppliers include Argentina, Brazil, and India. Over the 2011-2015 period, wheat purchases were spread over Australia, Europe, and Central Asia. Iran's agricultural exports center mainly on horticultural crops, including tree nuts, fruits, and vegetables. As noted, pistachios are Iran's most valuable export crop, and, along with walnuts, account for nearly a billion dollars of agricultural sales overseas. Figure 6 presents the annual values and destinations of Iran's major agricultural export crops averaged over 2011-2015. Major destinations

Figure 5

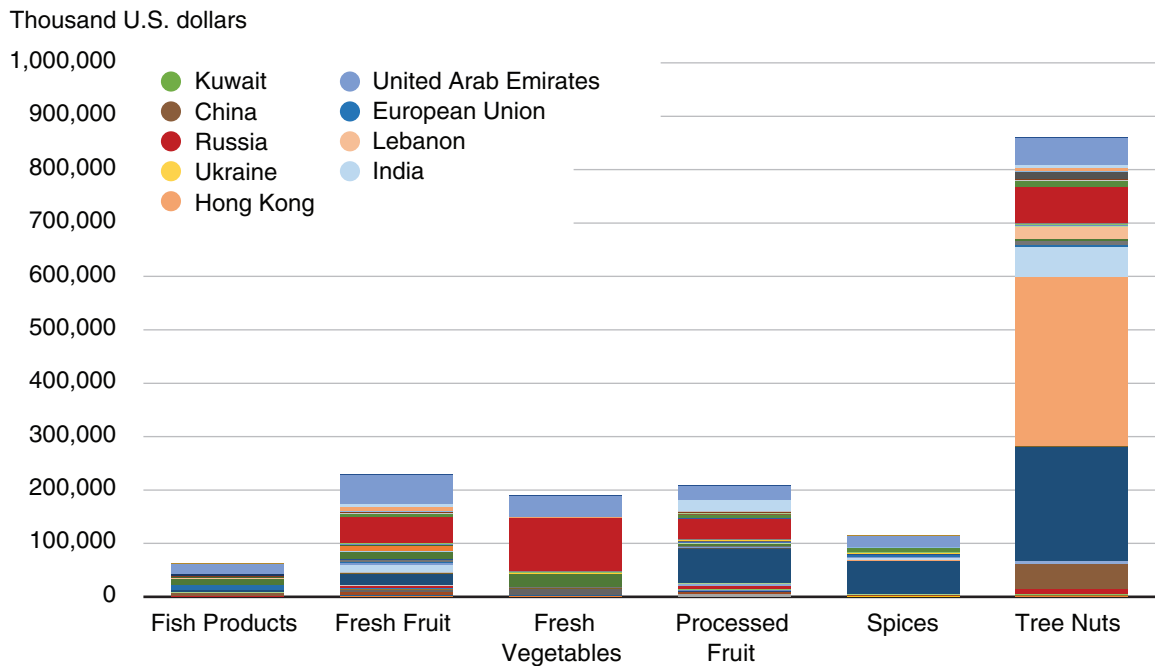
Iran's major commodity production and imports, averaged over 2011-15



Note: This graph identifies Iran's major suppliers but also reflects shipments from smaller suppliers, indicated by the unlabeled color bands. Soymeal equivalent is calculated by multiplying soybean volumes by 0.8 and adding that value to actual soymeal volume. Import data are collected from Foreign Agriculture Service's Global Agricultural Trade System, searching over all countries' exports to Iran for each commodity. Iran's production data, taken from Production, Supply, and Distribution (PSD), is included for comparison.

Figure 6

Annual value of Iran's major agricultural exports and their destinations, averaged over 2011-15



Note: This graph identifies Iran's major buyers but also reflects shipments to smaller markets, indicated by different colors. Tree nuts consist primarily of pistachios and walnuts. Data are collected from USDA, Foreign Agriculture Service's Global Agricultural Trade System, searching over all countries' imports from Iran for each commodity.

include the EU-28, Russia, the United Arab Emirates, China, and India. presents a country-specific import summary of wheat, rice, soy products, and corn, compared with Iran's production of each grain. Iran buys most of its corn from Brazil, with additional supplies coming from Argentina and Ukraine. Iran's rice imports originate almost entirely from India. Soy product suppliers include Argentina, Brazil, and India.

Food and Agriculture Policy

Given Iran's geopolitical concerns, agricultural self-sufficiency ranks among its most important policy objectives. To help achieve this goal, the Government has relied on a combination of supports to producers and trade policies that ensure the protection of its domestic food production capabilities, particularly for wheat, and the financial well-being of its farm sector (Yazdani and Vaezi, 2009).

Historically, Iran's producer supports have taken the form of subsidized prices for fertilizer, pesticides, feed, and seeds, as well as for equipment and basic inputs like water and energy (Yazdani and Vaezi). Lately, policy has shifted toward offering low-interest loans and expanded crop insurance coverage, particularly for livestock producers, in an effort to reduce some of the market distortions associated with direct-input subsidies (FAO, 2014). Apart from these supports, the Iranian Government also implemented a price floor for wheat, rice, and 18 other crops, often resulting in domestic prices paid to producers that are well above world prices (FAO, 2014).

On the consumer side, subsidies for food grains reflect another historic policy goal: improving child nutrition and reducing infant mortality (FAO, 2014). While significant strides have been made in this regard, the recent fall in global oil prices has reduced the Iranian Government's ability to sustain food subsidies, which at one point accounted for nearly 3 percent of Iran's GDP. In response to declining Government revenues, policymakers shifted away from direct food subsidies and began implementing cash transfers to households (Salehi-Isfahani, 2014).

With respect to trade, the Iranian Government maintains high levels of tariff protection for wheat and rice, with import-weighted average tariffs equaling 50 and 45 percent, respectively (UNCTAD, 2016). Import barriers are lifted, however, when domestic production cannot satisfy demand. During the food price crisis of 2007-08, the Iranian Government imposed a ban on wheat exports in an attempt to ensure a sufficient and affordable supply for domestic consumption. With respect to its main trading partners, Iran's agricultural exports on average face tariff and nontariff barriers equivalent to 17 percent (Kee et al., 2008, 2009).

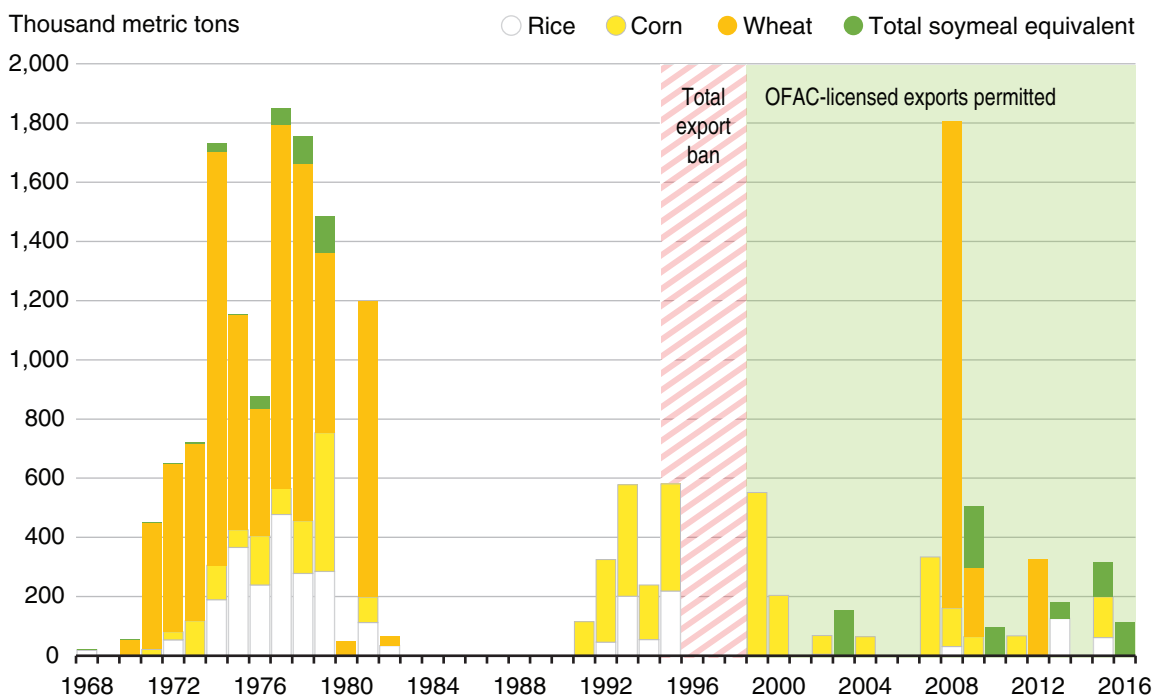
Iran Sanctions and Agricultural Trade

Over the past 35 years, the United States, often in concert with the international community, has imposed multiple waves of economic sanctions against Iran that have entailed a combination of trade embargoes; restrictions on investment, banking, and finance; limits on technology transfers; and freezing of foreign assets. U.S. sanctions have not only prohibited U.S. firms from doing business in Iran but have penalized foreign firms as well. Such “secondary sanctions” have further isolated Iran from the world economy. (While a full discussion falls outside this report’s scope, a thorough presentation of the details of the various U.S. sanctions against Iran can be found in Katzman, 2011).

Prior to the Islamic Revolution in 1979, agricultural trade between the United States and Iran was frequent and substantial. Figures 7 and 8 depict the quantities of major agricultural goods traded between the two countries from 1967 to 2015. As both graphs reveal, sizable quantities of goods were exchanged before 1979, with U.S. exports to Iran consisting largely of wheat, followed by rice, soymeal, and corn, while Iran’s shipments to the U.S. included dried fruits, edible nuts, and spices.

In 1980, relations between Iran and the United States collapsed in the aftermath of the Islamic Revolution, when university students seized the U.S. embassy in Tehran and took over 60 Americans hostage. In response, President Carter ordered all Iranian overseas assets to be frozen and soon after banned all imports from Iran. The ban was lifted following the release of the hostages in 1981, at which point imports from Iran resumed. U.S. agricultural exports, while not the target of any explicit U.S. or Iranian policy, nevertheless plummeted.

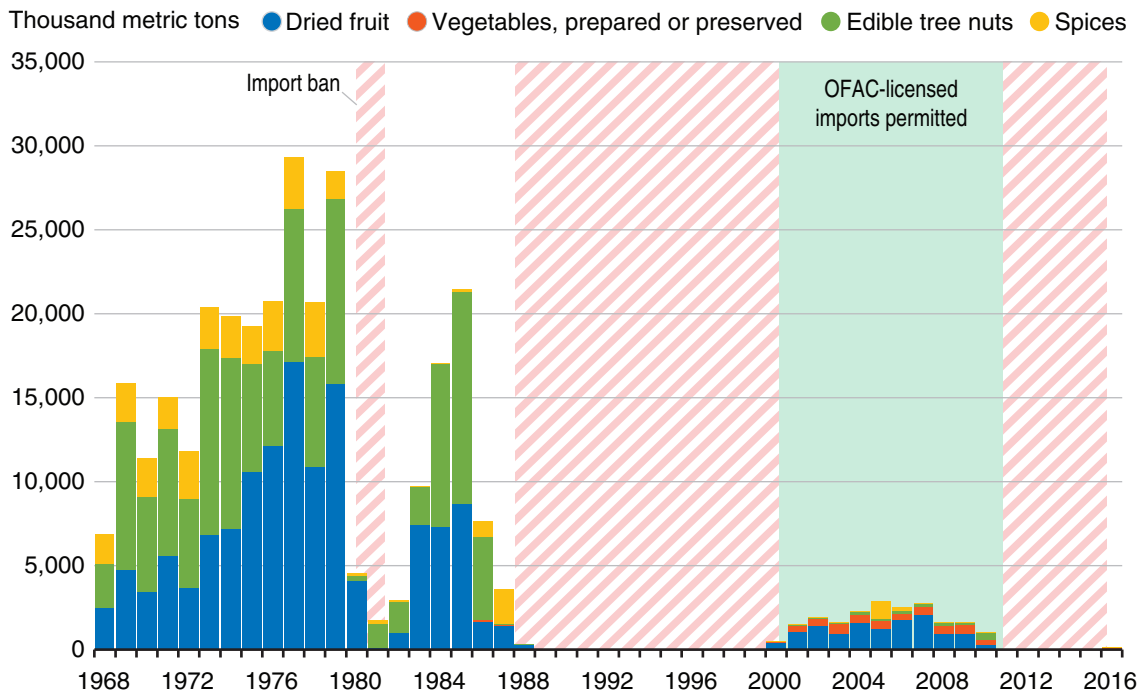
Figure 7
U.S. exports of major agricultural commodities to Iran



Note: OFAC = Department of the Treasury, Office of Foreign Assets Control.
Source: U.S. Census Bureau Trade Data.

Figure 8

U.S. imports of major crop commodities from Iran



Note: OFAC = Department of the Treasury, Office of Foreign Assets Control.
 Source: U.S. Census Bureau Trade Data.

In 1987, following renewed conflicts between the two countries, the United States reintroduced a complete ban on Iranian imports. Again, U.S. agricultural exports remained unrestricted, and within a few years, U.S. shipments to Iran, mostly corn and rice, gradually resumed. By 1995, however, Iran’s involvement in terrorist activity and its efforts to develop a nuclear program provoked a new series of executive orders, as well as legislation entitled the Iran Sanctions Act,³ which imposed a complete trade embargo between the two countries. No agricultural goods or services flowed between them from 1995 to 1998.

The following year, however, in response to appeals from U.S. agricultural producers who faced low prices and increased competition overseas, the U.S. Government changed course and introduced a licensing process to permit food exports to several previously prohibited destinations, including Iran. In 2000, Congress passed the Trade Sanctions Reform and Export Enhancement Act (TSRA), which formally codified these changes and also reopened U.S. markets to several Iranian goods, including tree nuts, fruit products, and caviar. Lifting the embargo did not remove all the barriers, however. TSRA authorized the Department of Treasury’s Office of Foreign Asset Control (OFAC) to administer a licensing protocol for all exports to and imports from Iran, adding a layer of supervision and control to the process.

In 2010, persistent disputes over Iran’s nuclear program led the U.S. Congress to pass the Comprehensive Iran Sanctions, Accountability, and Divestment Act (CISADA), which, among other actions, renewed the ban on imports of all Iranian goods into the United States. Shipments

³The legislation was initially entitled the Iran and Libya Sanctions Act, but following the resolution of disputes surrounding its involvement in overseas terrorist activity, Libya was relieved from the sanctions.

from Iran fell once again to zero. Meanwhile, U.S. exports to Iran, while permissible within the framework provided by OFAC, remained sporadic.

While the import ban remained in place, negotiations commenced on Iran's nuclear activities between the United States and Iran, along with China, France, Russia, the United Kingdom, and Germany (dubbed the P5+1), culminating in an agreement in 2015. The Joint Comprehensive Plan of Action (JCPOA) specified reductions in Iran's nuclear materials and activity in exchange for removing many of the sanctions imposed both by the international community and the United States. News headlines focused on the possible revival of Iran's oil sector, particularly owing to its renewed access to Europe's energy markets, but other elements of the nuclear deal carried significant implications for Iran's agricultural sector. Most tangible was the lifting of the U.S. import ban on Iranian agricultural products, including pistachios and caviar, representing a large new market for Iran's most valuable export crops. Arguably as important, however, was the removal of certain U.S. "secondary sanctions," penalties levied on foreign persons and companies seeking to do business in Iran, particularly in its finance, banking, insurance, and energy sectors. This significant change allows Iran to attract foreign investment, import equipment, and adopt new technologies, all of which bear on Iran's agricultural production and consumption.

In January 2016, the International Atomic Energy Agency verified Iran's compliance with the nuclear terms of the JCPOA, and as a result, the economic sanctions spelled out in the agreement were officially lifted. Imports of Iran-grown pistachios and dried fruits have begun trickling into the United States.

JCPOA Could Alter the Pattern of Production, Consumption, and Trade

Effects on Iran's Macro- and Agricultural Economy

The JCPOA's removal of sanctions from Iran is expected to significantly boost Iran's economy. In an analysis by Ianchovichina et al. (2016), reopening European Union (EU) markets for Iran's oil exports and reducing trade and financial transaction costs associated with the sanctions results in gains to Iran's economy ranging from \$17 billion to \$31 billion, an improvement of about 3.7 to 6.5 percent in Iran's per capita welfare. The effects on Iran's agriculture sector are mixed, as reduced trade and financial transaction costs make it cheaper to both import and export food commodities. According to Ianchovichina et al., agricultural imports will rise by 23 percent and exports by almost 17 percent.

Reducing trade costs reflects just one dimension of the impact of the JCPOA on Iran's agricultural sector. Another expected outcome is Iran's pursuit of investment in its agricultural productivity (Sinclair, 2016). This could include improvements to its deteriorating irrigation systems, accessing new seed varieties that generate higher yields and resist drought, new agricultural machinery, chemical fertilizers, and other inputs that could raise yields across the full range of Iran's agricultural sector. For fertilizers in particular, the removal of sanctions is likely to lead Iran to further develop and extract its reserves of natural gas, a key input in the country's domestic production of ammonia and urea (Michaelson, 2016). Greater efficiency in Iran's nitrogen-based fertilizer production could boost yield growth across Iran's agricultural sector. While the nature and timing of these changes and their corresponding impacts are uncertain, other countries in the region with similar economic and agricultural features could serve as an example of what Iran's agriculture sector could achieve as the economy and markets adjust to the removal of sanctions.

Comparing Iran to Turkey

One comparable country is Iran's neighbor to the west, Turkey. Like Iran, Turkey is a populous, upper-middle-income country in the Middle East, with an agricultural economy centered on wheat production and high-value horticultural crops. Table 3 compares several major economic and agricultural characteristics of the two countries. Both countries possess common temperature, moisture, and soil features, suggesting a similar potential for agricultural production (figs. 9-11). Turkey's historical experience does not include economic sanctions from the United States, Europe, or other members of the international community, making it a useful counterfactual for analyzing Iran's recent past and its likely near-future.⁴

⁴A recent exception to this history, however, is the dispute between Turkey and the Russian Federation resulting from opposing views on Syria's ongoing civil conflict. Following the downing of a Russian jet over Turkish airspace, Russian authorities banned Turkish imports of fruit, vegetables, and poultry, among other items. Losses from the ban on food shipments are estimated at around \$760 million, but this represents only a small fraction of Turkey's total agricultural production value (Girit, 2016). Recent reports have indicated that portions of Russia's ban on Turkish agricultural goods have been lifted (TASS, 2017).

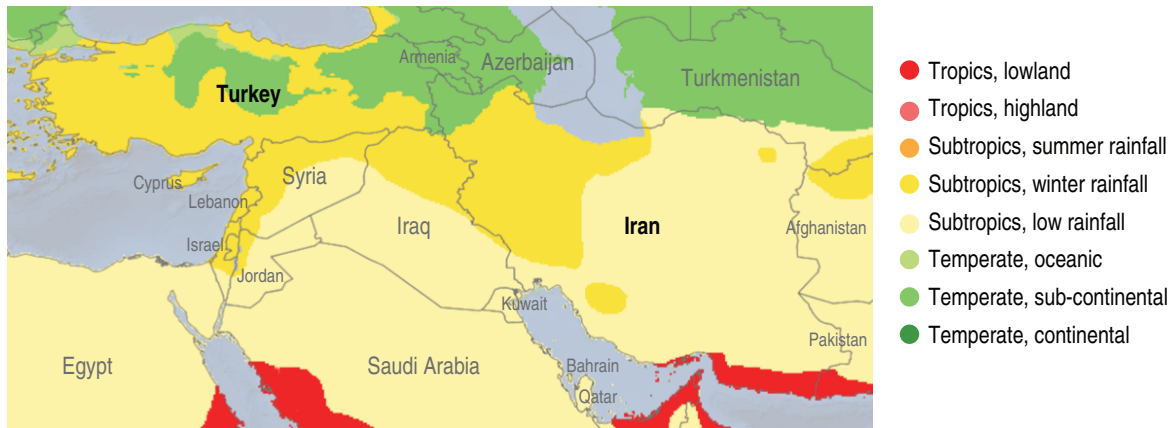
Table 3

Iran and Turkey, selected economic and agricultural variables

| | Iran | Turkey |
|--|--------|--------|
| Macro-economy | | |
| Population in 2014 (millions) | 78.14 | 75.9 |
| Gross Domestic Product (GDP) in 2014 (U.S. billion dollars) | 425.3 | 798.4 |
| Per capita GDP (U.S. billion dollars) | 5,443 | 10,519 |
| Agriculture economy | | |
| Percent GDP in agriculture (2014) | 9.3 | 8 |
| Rural percent of population | 27 | 27 |
| Percent of cultivated area irrigated | 46.1 | 19 |
| Overall cereal yield (kg/ha) | 1,963 | 2,831 |
| Wheat production (avg. 2011-2015) | 13,440 | 17,160 |
| Wheat imports (avg. 2011-2015) | 3,820 | 4,225 |
| Rice production (avg. 2011-2015) | 1,594 | 489 |
| Rice imports (avg. 2011-2015) | 1,725 | 304 |

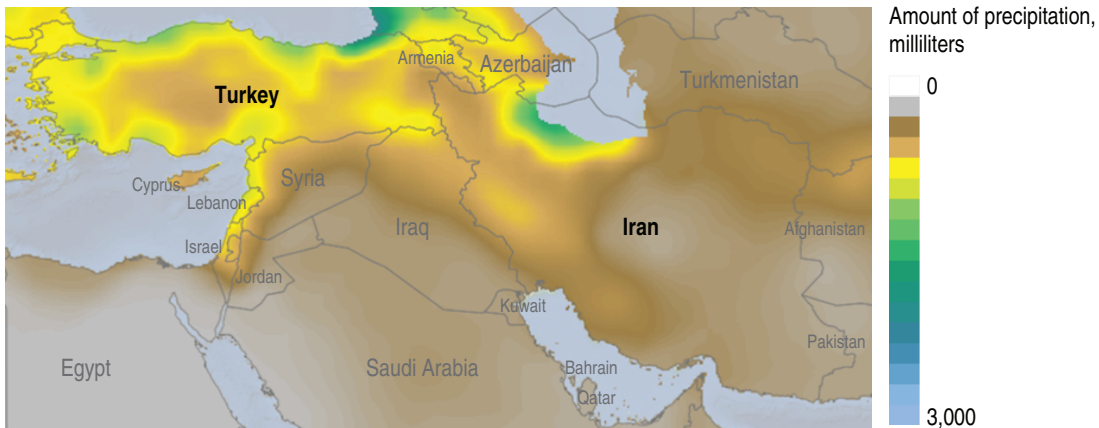
Sources: FAO's Statistics Division, www.fao.org/faostat; the World Bank's DataBank site, databank.worldbank.org; and USDA, Foreign Agriculture Service, apps.fas.usda.gov/psdonline/psdHome.aspx.

Figure 9
Comparing thermal climates, Iran and Turkey (1961-1990)



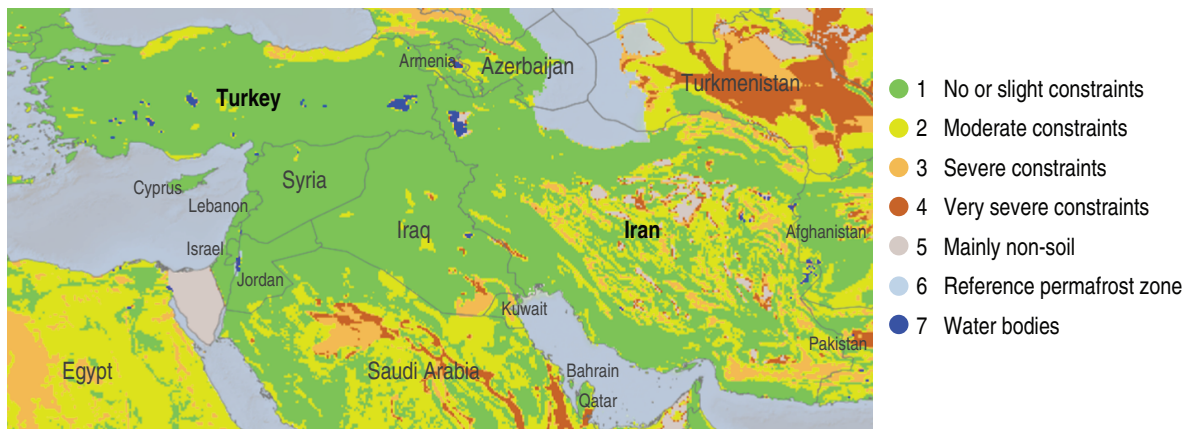
Source: Global Agro-Ecological Zones, Food and Agriculture Organization, and International Institute for Applied Systems Analysis.

Figure 10
Comparing annual precipitation, Iran and Turkey (1960-1990)



Source: Global Agro-Ecological Zones, Food and Agriculture Organization, and International Institute for Applied Systems Analysis.

Figure 11
Comparing soil nutrient availability, Iran and Turkey (1960-1990)



Source: Global Agro-Ecological Zones, Food and Agriculture Organization, and International Institute for Applied Systems Analysis.

Iran and Turkey’s Historic Differences in Production and Inputs

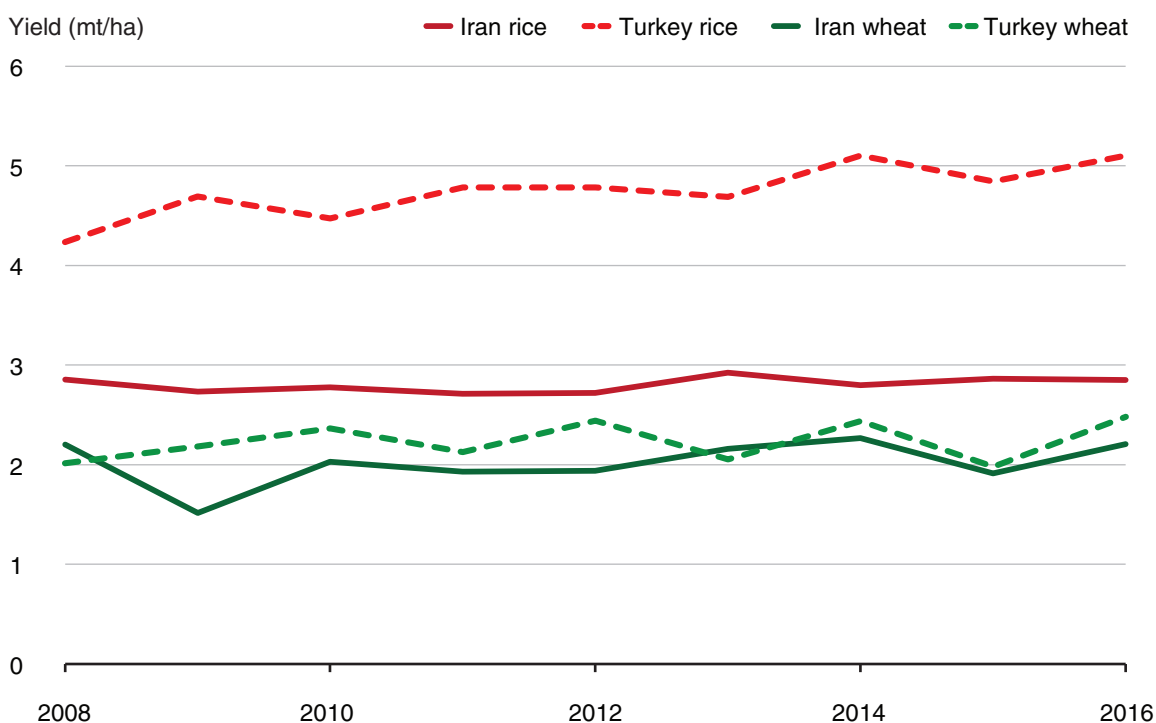
Despite the common economic and agricultural features of Iran and Turkey, differences in their production and input usage underscore the role economic sanctions likely played in Iran’s agriculture sector over the past several decades. Iran and Turkey are both large wheat producers, with most production destined for domestic use. Despite Iran’s much higher rate of irrigated wheat area—roughly one-third compared to Turkey’s negligible amount—Turkey’s yields averaged about 10 percent higher than Iran’s over the period 2007 to 2015 (fig. 12).⁵ Differences in climate and geography partially explain this gap, but Iran’s limited access to more advanced chemical inputs and machinery also likely contributed.

For rice, the differences between the two countries are greater. Turkey’s overall production is only a fraction of Iran’s, but its yields have historically been almost 70 percent higher, despite Iran’s greater rate of area under irrigation (nearly 100 percent, compared to 75 percent in Turkey) (fig. 12). While some of the yield gap can be attributed to the different varieties grown—medium-grain varieties in Turkey yield up to 25 percent more than Iran’s long-grain varieties—the bulk of the difference is likely due to input usage.

To better understand what role inputs—and by extension, sanctions—might play in explaining yield differences, figures 12 and 13 present a recent history of fertilizer, pesticide, and machinery use in both countries. Beginning in 2000, the earliest year for which data are available, Iran’s fertilizer use

Figure 12

Historic yields for wheat and rice, Iran and Turkey

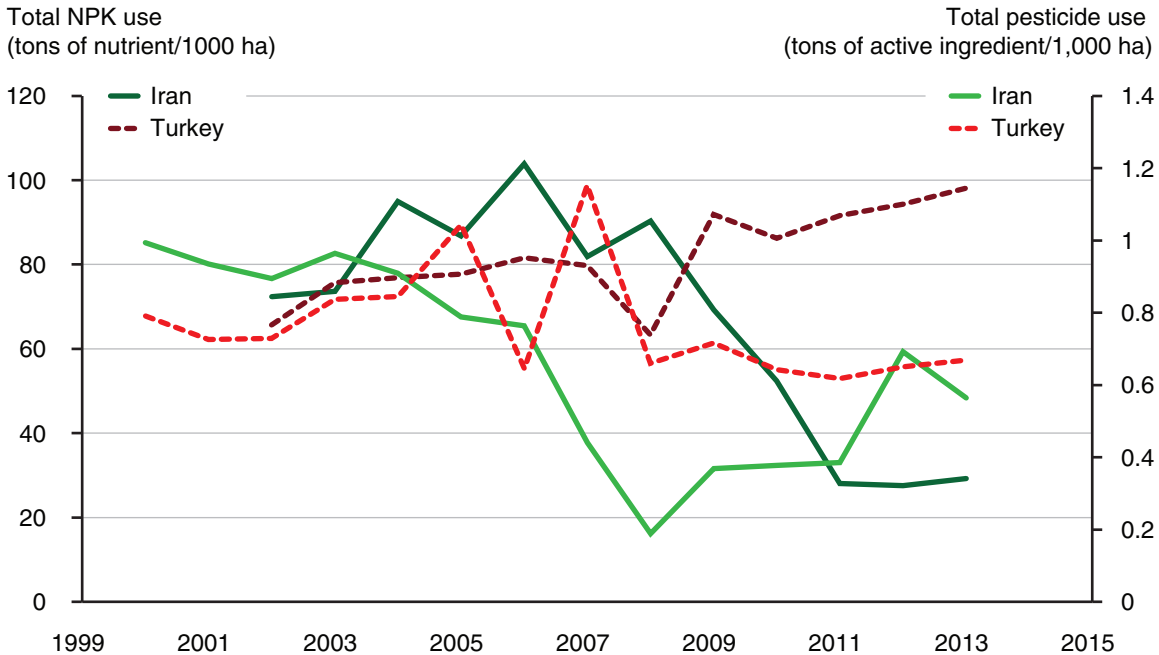


Source: USDA (2016a).

⁵Rate of irrigation values are calculated by the author, using irrigation data from FAO (2008a, 2008b) and crop harvest from USDA (2016a).

Figure 13

Fertilizer and pesticide use in Iran and Turkey



Note: Fertilizer use is the sum of all nitrogen, phosphorus, and potassium-based (NPK) fertilizers. Pesticide use is the sum of insecticide and herbicide used.

Source: FAOSTAT (2016). The time period reflects availability of data.

appeared on a par with Turkey’s. In 2008, however, Iran’s usage suddenly plummeted, with current levels now hovering around half those of Turkey. News reports in the Iranian media suggest that the decline was due to higher prices, low quality, and warnings by the Ministry of Health regarding excess fertilizer use (Hashemi, 2015). But outside analysts note that sanctions also constrained growth in fertilizer use (TechSci Research, 2015). Similarly, pesticide use in Iran roughly equaled Turkey’s until around 2003, when levels rapidly declined. FAO reported some modest recovery in pesticide use beginning in 2009.

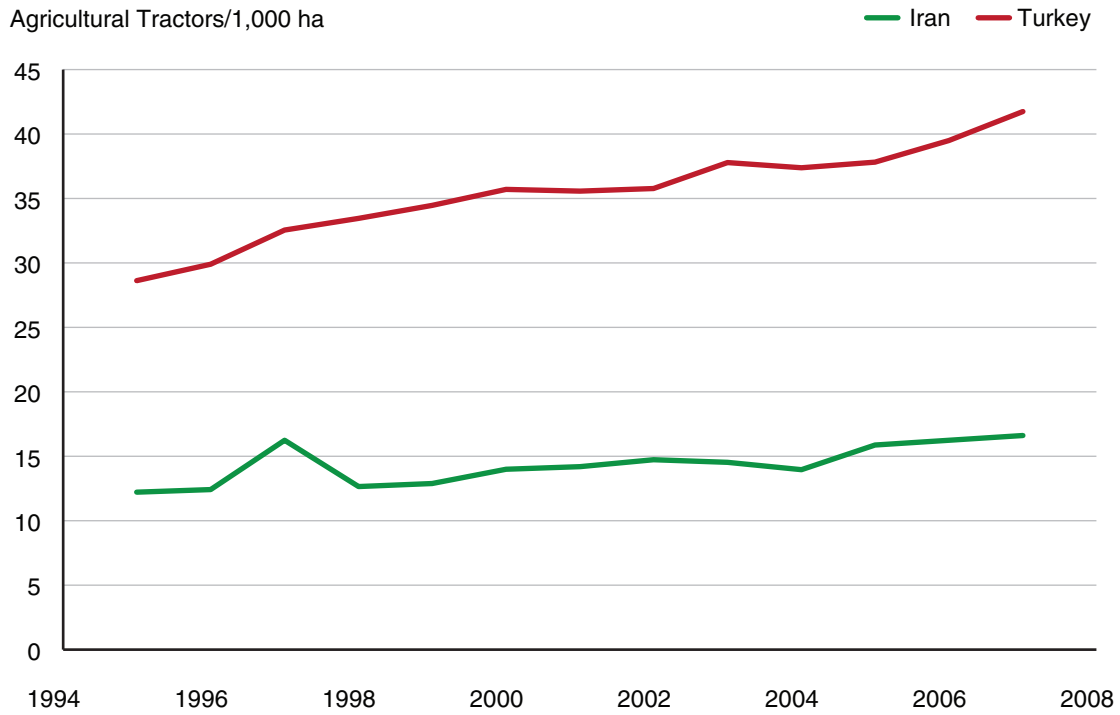
Meanwhile, Turkey’s agricultural machinery use, as measured by total number of tractors per arable land area, exceeded Iran’s by more than twice from 1995 to 2007 (the period for which FAO data are available), and its rate of growth was also faster (fig.14).

Again, much of this gap is the result of sanctions that limited Western manufacturers from entering Iranian markets over the past several decades. Iran’s domestic machinery production is limited both in scale and technological capacity (Losavio, 2016). Similar to chemical inputs, agricultural machinery offers a powerful boost to worker productivity and yields and opens the possibility of farming on previously uncultivated areas.

Figure 14

Machinery use in Iran and Turkey

Agricultural Tractors/1,000 ha



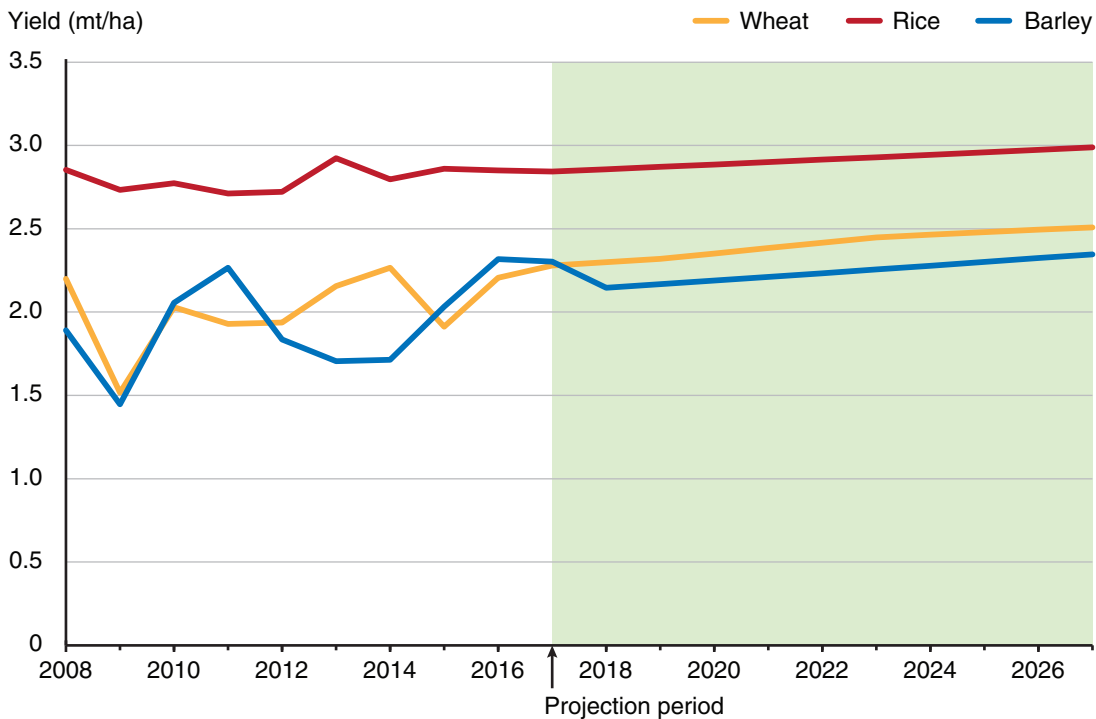
Source: FAOSTAT (2016). Data reflect two-axle agricultural tractors.

Projections for Iran's Agriculture Sector

With sanctions relief improving farmers' access to better, cheaper fertilizers, whether from abroad or produced domestically, Iran's chemical fertilizer use could rebound and reach levels currently seen in Turkey. Pesticide use may return to levels of the late 1990s. Moreover, conditions under the JCPOA have opened Iran's domestic market to international, mainly European, suppliers of tractors, as well as machines for soil preparation, fertilization, and harvesting (Losavio, 2016; Negri, 2016). With these conditions, yields for Iran's major commodity crops are expected to grow above the rate currently projected. Figure 15 touches on this, showing Iran's projected yield growth for its three major commodity crops over the next 10 years, based on USDA's Agricultural Projections to 2025 (USDA, 2016b). These projections reflect macroeconomic assumptions that account for effects of the JCPOA and amount to a lower bound estimate of the likely growth in Iran's yields.

Given the numerous supply- and demand-side shifts likely to affect Iran's agriculture sector over the near- to medium-term, the net effect of the JCPOA on Iran's production and trade profile is ambiguous. Lower trade costs and access to new suppliers can raise imports not only for agricultural inputs, but also for food and feed commodities, such as rice, barley, corn, and soybeans, for which Iran is not nearly self-sufficient. At the same time, productivity enhancements across the range of domestically grown crops could raise production and reduce the need for imports.

Figure 15
Historic and projected yields for Iran wheat, rice, and barley



Source: USDA (2016b).

Post-JCPOA U.S.-Iran Trade

While many sanctions on Iranian goods and services remain in place, the JCPOA permits the import of Iranian food products into the United States for the first time since 2010.⁶ The Department of Treasury's Office of Foreign Assets Control (OFAC) has authorized a general license for Iranian food imports, which effectively permits importers to transact sales without applying for a specific license (Federal Register, 2016). As part of this policy change, OFAC also authorized U.S. banks to process letters of credit for payments and U.S. persons to broker purchases. However, because U.S. persons remain barred from engaging with Iranian financial institutions, the JCPOA authorized third-country banks to step in and facilitate transactions, including currency conversions, so long as they are limited to products exempt from sanctions.

Prior to the implementation of the JCPOA, U.S. food exports to Iran were authorized under a general license and required no specific permission from OFAC. Under the JCPOA, the general license remains broadly intact for food, defined as "items that are intended to be consumed by and provide nutrition to humans or animals—including vitamins and minerals, food additives and supplements, and bottled drinking water—and seeds that germinate into items that are intended to be consumed by and provide nutrition to humans or animals."⁷ Items explicitly excluded from this list include alcoholic beverages, cigarettes, gum, or fertilizer (Federal Register, 2011). As mentioned, however, the most significant change pertains to the newly authorized role for U.S. and third-country depository institutions to engage in certain exempted transactions.

As also mentioned, OFAC has licensed most U.S. agricultural exports to Iran since 1999. While the past several years have seen sporadic U.S. shipments, the recent removal of sanctions and the expected boost to Iran's economy raise the probability of increased demand-driven exports to the country. U.S. commodities already comprise much of the food-import basket in many countries of the Middle East, including Egypt, Saudi Arabia, and Turkey (Nigatu and Motamed, 2015). Considering these countries' many agroclimatic, demographic, and economic similarities with Iran, the potential exists for U.S. exports to enter this market with greater consistency and volume.

However, like other countries in the Middle East, Iran has found competitive suppliers in Central Asia, Eastern Europe, and South America. Due to the price and transport cost advantages of these countries, the ability of U.S. producers to gain market share in Iran remains uncertain. Although the U.S. ban on food exports to Iran was lifted nearly 20 years ago, ongoing bureaucratic and banking hurdles, as well as general political risk, continue to hamper U.S. exporters' efforts to expand shipments. Nevertheless, Iran's growing incomes and its increasing demand for animal products—due to long-run trends as well as the immediate impact of sanctions relief—portend greater import demand for food commodities, particularly animal feeds, consistent with the overall trend throughout the Middle East (Nigatu and Motamed, 2015). With this growing market, opportunities for U.S. crop exporters to stake a greater presence could arise.

⁶The JCPOA also lifted the import ban on Iranian carpets and other textile products.

⁷This definition emerged in response to news reports that licenses were being issued for food products, such as ice cream sprinkles, gum, and body-building supplements, that presumably did not support the overarching humanitarian objective of the export sanctions exemptions (Becker, 2010).

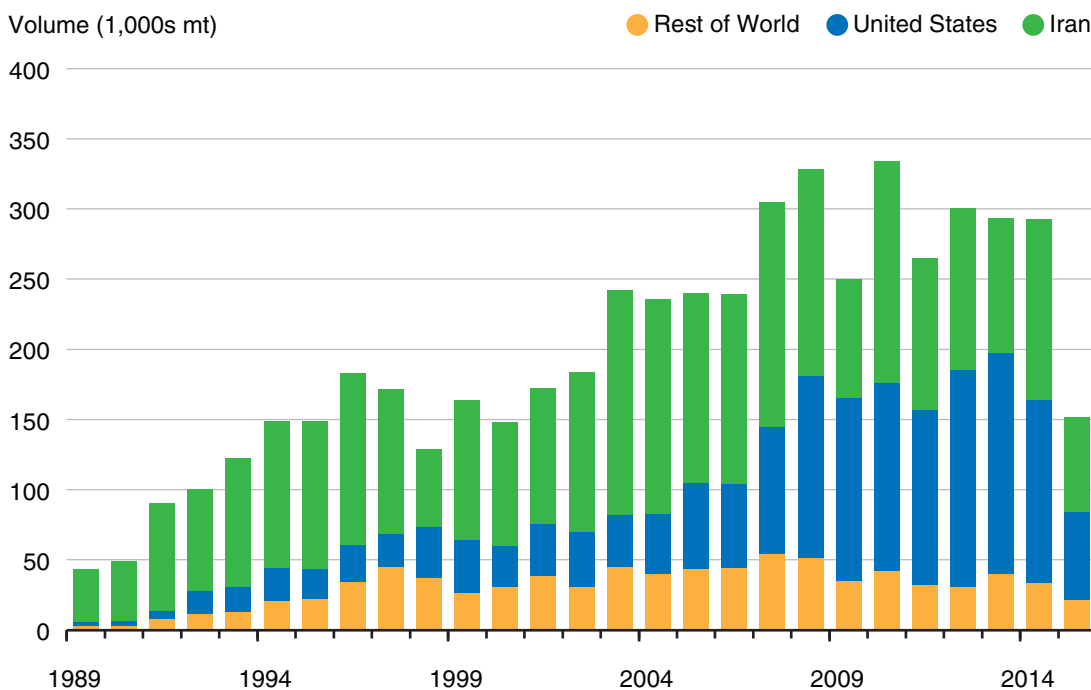
U.S.-Iran Trade in Pistachios

Iran’s major food exports, like those of many overseas suppliers to the United States, fall under the “specialty crop” designation (e.g., tree nuts, spices, and caviar). By far the most significant and valuable product in Iran’s food-export profile is pistachios. Prior to the Islamic Revolution in 1979, Iran was the world’s largest producer and exporter of pistachios, as well as the biggest supplier to the United States. But as relations with the United States frayed and economic sanctions took hold, Iran’s pistachio shipments to the U.S. plummeted. California’s nut producers rushed to fill the supply gap, lifting U.S. pistachio production from around 7,700 metric tons in 1979 to 233,000 metric tons in 2014, when production was valued at nearly \$1.3 billion.

While California-grown pistachios displaced Iran’s historic share of the U.S. market, Iranian growers continued to supply markets in Europe and elsewhere, expanding Iran’s share of the world market well into the 1990s (fig. 16). But in 1997, European regulators detected high levels of aflatoxin, a fungal infection with harmful carcinogenic effects, in Iranian pistachio shipments and imposed a temporary ban on Iranian imports (Bui-Klimke et al., 2014; Dini et al., 2012). Again U.S. producers stepped in to replace the Iranian supply, gradually eroding Iran’s share of the EU market. A few years later, even-stricter aflatoxin regulations drove Iran’s exports further down, pushing the country’s pistachios into markets in the Middle East and Asia, where regulations are relatively lax (Bui-Klimke et al., 2014). As a result of sanctions and phytosanitary requirements, in recent years Iran has lagged behind the United States in total exports (though in 2015, drought conditions in California pushed U.S. exports below Iran’s).

Figure 16

World pistachio exports by volume, 1989-2015



Note: Data are collected from FAS’s Global Agricultural Trade System, searching over all countries’ imports.

While the removal of sanctions potentially opens U.S. markets to Iranian pistachios, other trade disputes linger, namely long-standing anti-dumping and countervailing duties. In 1986, the U.S. International Trade Commission (ITC) determined that pistachio imports from Iran materially injured the domestic pistachio industry as a result of sales at “less than fair value.” A parallel investigation by the Department of Commerce (DOC) found dumping and subsidy margins that led to anti-dumping and countervailing duties on Iranian origin in-shell pistachios of 241 percent and 99.5 percent, respectively, and countervailing duties on roasted pistachios of 318 percent (ITC, 2005). While these countrywide rates persist to this day, with a handful of company-specific exceptions, they have only mattered during periods in which Iranian pistachio imports were not embargoed, such as the first decade of the 2000s. News reports have suggested that the nuclear deal’s removal of the embargo might permit Iranian pistachios to compete directly with California producers in the U.S. market (e.g., Khalaj and Terazono, 2016). But in June 2017, the ITC determined that revoking the duties would likely lead to injury to the U.S. pistachio industry, a decision that allows the duties to remain in place for the foreseeable future. Under such conditions, as depicted in the historical data in figure 8, Iran’s pistachio shipments to the U.S. will likely remain very low.

Conclusions

The ending of the U.S. embargo on Iranian agricultural products and relaxing of secondary U.S. sanctions against Iran could help restart economic activity between the two countries. With the concurrent removal of most sanctions by the European Union and the United Nations, Iran is poised to revive its antiquated petroleum sector and re-enter important energy markets, changes likely to lead to added growth and investment throughout its economy. Such changes are expected to fuel growth of consumer demand for different food varieties, particularly higher value animal products (Nigatu and Motamed, 2015). On the supply side, Iran's farm sector also stands to benefit from these important changes, as new investors and technologies gradually lift productivity to higher levels. Consequently, the net effect of outward shifting demand and supply on Iran's agricultural trade profile remains ambiguous.

Current indications suggest that U.S.-Iran agricultural trade will not be significantly affected in the aftermath of the JCPOA. For example, unless anti-dumping and countervailing duties fall, Iranian pistachios are not likely to enter U.S. markets in significant quantities. Further, Iran's own border measures would permit U.S. grain shipments to enter only after its domestic production capacity is exhausted, leaving U.S. exporters to compete not with Iran's own producers, but rather with other, well-established international suppliers.

Despite the significant changes in U.S. trade and economic policy toward Iran, direct U.S. sanctions on trade in goods and services outside of agriculture and a handful of other product categories remain in place. Moreover, the risk of selling to Iran, or financing these transactions, may be too great for U.S. exporters and overseas banks, despite the removal of trade and banking sanctions. For these reasons, changes in the U.S.-Iran agricultural trade relationship will likely be gradual and incremental. But notwithstanding the considerable obstacles that remain, the history of U.S.-Iran trade up until the early 1980s points to the potential for new opportunities for U.S. producers in the long run.

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