Food Security: The Economic Value of Urban Agriculture in the United States

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# Abstract

As the population of the World continues to increase the need for increased food production rises and a new business model for agriculture is needed. With limited resources, urban agriculture provides a viable solution as well as creating economic value through increased food security in the United States. This study aims to provide evidence that urban agriculture is an answer to generating and meeting future food needs and creating food security for citizens of the United States. In this context, food security means that all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food (International Food Policy Research Institute, 2021). Looking back on the history of agriculture in the United States, from the Native Americans to the present day, there is an economic trend where advancements in technology as well as scientific discovery fuel agricultural prosperity. This trend could be applied to the technological advancements and farming methods that urban agriculture uses. Today, with the current distribution systems and employment opportunities within the agriculture sector, adaptations are needed to meet the needs of the growing population. Urban agriculture provides the means to produce food with limited resources while shortening distribution channels, providing new employment opportunities, and increasing access to nutritious food. To generate interest and cultivate enthusiasm in future generations, the applications of urban agriculture should be introduced into the public education system.

*Keywords:* urban agriculture, food security, economic trend

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# Food Security: The Economic Value of Urban Farming in the United States

Agricultural development is known as one of the most powerful tools to fight and eradicate poverty and hunger around the world. Growth within the sector is 2-4 times more effective in raising incomes when compared to other economic sectors (World Bank, 2020). Thus, agriculture also stands crucial to economic growth. In 2018, agriculture accounted for 4 percent of global gross domestic product (GDP) which was about $86 billion dollars, and in some countries accounted for more than 25 percent of their GDP (World Bank, 2020). However, even though agriculture contributes such a seemingly insignificant share of the world’s economic output, the industry employs almost 30 percent of all employment(World Bank, 2020). Even though farming is diverse around the globe it is still an important foundation for the world economy and even in developed countries like that of the United States.

# Current Economic Standing of Agriculture

Many economic events make headlines today, but it is unclear due to political rhetoric and economic jargon for the everyday consumer to understand what caused the particular events. To understand the economic future of agriculture, one must understand the basics of economics as they are known today. According to Lionel Robbins, a distinguished British economist, economics can be defined as the study of the use of scarce resources which have alternative uses (Shizgal, 2012). In reality, there is never truly enough of anything to satisfy everyone who desires it completely, thus creating a constraint or scarcity, and no matter what kind of economy is in play, the scarcity still exists. There are limited resources to meet what appears to be unlimited wants. This forces individuals to make decisions about how to allocate resources with efficiency. Economics then studies the results of the choices that are made about any resources that go into producing the volume of output on that a country’s standard of living is based (Beattie, 2020). A market system economy is driven by supply and demand. When the demand for an item is high there can be a higher price for the item, until the supply overreaches to the demand in which due to its availability the price of the item declines to maintain competitiveness. Resources also rarely have only one use case, thus economics is also centered around the alternative uses of resources. For example, water itself has numerous uses and iron ore can be used to build skyscrapers or make paper clips along with many other things. However, economics focuses on the number of resources that should be dedicated to each use and allocating said resources efficiently. Efficiency within production affects the standard of living of entire societies (Beattie, 2020). Another way to view economics is in terms of the incentives created rather than the goals that decision-makers pursue. This is the concept of costs and benefits and its relation to the theory of rational choice. The theory of rational choice states that people behave rationally, and they will try to maximize the ratio of benefits to costs within their decisions (Beattie, 2020). Economics also involves incentives or rewards that increase the chance of a certain outcome. It is the rationale behind why producers will produce what consumers desire. When these incentives are aligned correctly with the goals of a business then the benefits can be great. Thus, the base of economics rests upon scarcity, supply and demand, costs, and benefits, as well as incentives that explain why decisions are made (Beattie, 2020). All of these principles are applied to the economics of the agricultural industry and the industry sectors that intertwine with it within the United States and the decision made impact the standard of living and the gross domestic product (GDP).

Currently, agriculture and food make up their sector within the United States economy. The agricultural sector itself also extends beyond basic farm activities and business to include a more vast array of farm-related industries (USDA ERS, 2020). The two largest sectors that contribute to the economy of the United States are that of foodservice and food manufacturing. Agriculture, food, and related industries contributed $1.109 trillion to the U.S. gross domestic product (GDP) in 2019 (USDA ERS, 2020). Out of the entire GDP, this equates to a 5.2-percent share (USDA ERS, 2020). Out of the $1.109 trillion, $136.1 billion was attributed to the output by American farms, which is about 0.6-percent of the GDP (USDA ERS, 2020). However, with all of the other industries that rely on agricultural inputs ultimately it can be ruled that agriculture does much more than provide 0.6 percent to the nation’s GDP. Some of the related sectors are that of food and beverage manufacturing and stores, food services, textiles, forestry, and fishing. After the Covid-19 Pandemic in 2020 to the present, it will be interesting to see how the sectors shift in contribution to the nation’s GDP.

The agricultural sector and its related industries also contribute to employment within the United States. Employment is affected by supply and demand and thus is also an integral area when looking at the economics of agriculture. In 2019, 22.2 million full and part-time jobs were related to the agricultural and food sector, which is equivalent to 10.9 percent of the total employment in the U.S. (USDA ERS, 2020). 1.3 percent or 2.6 million jobs were directly individuals working on farms (USDA ERS, 2020). The largest portion of jobs provided can be attributed to that of food service, which accounted for 13 million jobs (USDA ERS, 2020). Also, one-third of United States food and beverage manufacturing employees are employed by meat and poultry plants and meat plants. Meat and poultry plants provide for the largest percentage of food and beverage manufacturing workers while being followed by bakeries, and beverage plants (USDA ERS, 2020).

# History of Agriculture in the United States

To gain an economical understanding of what the future of agriculture could potentially be, along with the necessities it may require, one must look to the patterns that history provides us with. These patterns then shed light on where the United States agriculture could need change or modification, as well as how urban agriculture could have profound impacts on the sector. The first evidence of agriculture in the United States was that of the Algonquin, Iroquois, and Lenape tribes living in what is now the mid-Atlantic and New England regions of the United States. They planted and harvested what is known as the three sisters: corn, beans, and squash. Each benefits one another as they grow (also known as companion gardening). In Europe, the concept of companion gardening was not practiced as the necessary crops were not grown in Europe at the time. The Native Americans developed wooden and stone tools and methods of using fire to create fertile land without obstructions for planting crops as well as for hunting (*The Seeds of Change*, 2018). Similarly, in 1607, one hundred and four men and boys arrived on three ships from England and built a settlement called Jamestown. These settlers were introduced to crops from the new world by the natives. These crops included maize, sweet potatoes, tomatoes, pumpkins, gourds, squashes, watermelons, beans, grapes, berries, pecans, black walnuts, peanuts, maple sugar, tobacco, and cotton (*The Seeds of Change*, 2018). Livestock was also raised within the Jamestown settlement. In 1612, Sir John Rolfe brought tobacco seeds with him to the colony, and this turned the settlement into a profitable endeavor for the Virginia Company after drought seasons and illness ravaged the settlement of Jamestown (*The Seeds of Change*, 2018). These events were the beginning of agriculture in the United States.

Due to colonization and the profit that raw material brought to their mother countries, agricultural operations expanded dramatically and brought with it new demands. In the year 1619, the first African slaves were brought to Virginia to work the agricultural landscape of cash crops in the southern United States (*The Seeds of Change*, 2018). Slavery, a dark period for human rights as an industry brought to the Americas in response to the demand for cash crops like cotton and tobacco. By 1700, the number of slaves in the United States was displacing southern indentured servants (*The Seeds of Change*, 2018). During the early 1700s, agricultural technology also consisted of: oxen and horses for power, rough wooden plows, sowing by hand, cultivating by hoe, hay, and grain cutting with a sickle, and threshing with a flail (*The Seeds of Change*, 2018). Tobacco led North American agriculture due to the favorable weather and soil conditions in the southern states, and the high demand among European consumers. Crop rotation was already becoming commonplace, and wheat and corn were readily available grain staples; all three products shipping regularly from the port of Norfolk (*The Seeds of Change*, 2018).

As the century came to a close, many inventions and technologies helped to increase the demand for raw materials and the continuation of increased farm productivity, especially that of cotton. These inventions include the following (*The Seeds of Change*, 2018):

* Steam power
* Flying shuttle
* Spinning jenny
* Cotton gin
* Cast-iron plow

By the mid-18th century, the southern United States was providing three-fifths of America's exports with the highest being that of cotton (*The Seeds of Change*, 2018). During which time the value of tobacco fell, rice exports stayed steady, and sugar thrived but only in Louisiana and the slave trade continued to grow as the need for labor increased steadily (*The Seeds of Change*, 2018). In July of 1776, the Declaration of Independence was signed, and the colonists declared their independence from British control. One of the reasons for creating and desiring such freedom was due to the British control over farm exports, restrictions on land titles, as well as limitations on western settlement (*The Seeds of Change*, 2018). According to scholar Staughton Lynd and Temple University historian David Waldstreicher, the roots of the American Revolution were due to economic issues like that of taxes on imported goods, the requisition of resources during the Seven Years War, the imperial currency manipulation that left the colonies destitute, and the prohibitions placed on trade with the French West Indies (*The Seeds of Change*, 2018). However, even after the Revolutionary War, the Americas were left with high taxes and deflation due to the economic crisis that followed the Revolution. This led to revolts by farmers like that of Shay’s rebellion. In 1791, the First National Bank was chartered and signed by in order to create a standard currency which would help minimize the debt faced after the Revolutionary War. However, rebellion amongst farming groups continued like that of the Whiskey Rebellion due to the taxes placed on grain, which is a major ingredient in whiskey, to reduce the national debt (*The Seeds of Change*, 2018). This rebellion lasted from 1791 to 1794 when troops finally had to be deployed to defuse the rebellion. In 1790 the Public Land Act was authorized signaling the beginning of settling and farming the west.

Moving into the 1800s, new technologies were introduced allowing for agricultural surplus, growth in population, and the increase in agricultural exports. As the railroad era began in the United States, the number of agricultural exports increased significantly. From 1800-1809, the average annual value of agricultural exports equaled 75% or $23 million of total exports (*The Seeds of Change*, 2018). Whereas, from 1850 - 1859, the average annual value of agricultural exports totaled 81% or $189 million per year of the total exports (*The Seeds of Change*, 2018). By 1850, fewer land and labor hours were needed to produce the same number of crops even just 20 years before 1830 (*The Seeds of Change*, 2018). The technologies available made this possible. However, another trend that was occurring between 1800 and 1850 was that the percentage of the labor force that was made up of farmers was decreasing steadily. In 1850, the average total U.S. population was 23,191,786, the farm population was estimated to be about 11,680,000, and farmers made up 64 percent of the labor force (*The Seeds of Change*, 2018). This result was partly due to technological advances in the agricultural industry as well as the rise of new industries that would provide different types of employment than farming.

The early 1800s also led to the distinctions between farms and plantations being defined. Typically, a plantation was a large landholding of over 250 acres with a distinct division of labor and management. The management was primarily administered through an overseer and they usually produced only one or two cash crops. Farmers on the other hand had significantly smaller parcels of land and grew a variety of crops. They also consumed much of their harvests themselves while being operated by the owner and small workforce. Another differentiation that began to appear in the 1800s is that of the economies of the Northern and Southern states. The Northern states began to industrialize and export manufactured goods by the 1800s. This attracted immigrants looking for new employment opportunities. The Southern state’s population became stagnant during this time and by 1850 only one-third of the population lived in the southern states. Their economy relied on producing and exporting cotton, sugar, rice, tobacco, and wheat (*The Seeds of Change*, 2018). The South also relied on imported food from the Northern States. The economic dependence on the export of cash crops made the Southern economy increasingly dependent on slave labor to keep its prices competitive (*The Seeds of Change*, 2018). Inventions and technological advances also helped to increase production and made slavery profitable.

However, from 1861 to 1865, Americans fought a turbulent Civil War over the Southern state’s way of life and the Northern state’s desire to end slavery. Many farmers left their farms to fight in the war, and by the end of the war, many farms were laid in ruin. However, the Southern states surrendered in 1865 ending the Civil War and slavery and led to a new era in agriculture. During the Civil War, there were some developments within the agricultural industry. In 1862, President Abraham Lincoln created the United States Department of Agriculture, or USDA (*The Seeds of Change*, 2018). It was meant to be a department for the people and Lincoln said it was created to “acquire and to diffuse among the people of the United States useful information on subjects connected to agriculture” (*The Seeds of Change*, 2018). In addition, that year, the Morrill Act helped to establish and maintain agricultural colleges by giving each state thirty thousand acres of public land for each seat held in Congress. Government support of science, technology, and education in the area of agriculture gave American farmers an advantage over the rest of the world (*The Seeds of Change*, 2018). As the USDA advanced and shared its discoveries with the American public the landscape of farming began to change as they began to experiment with these new methodologies and technologies to improve their production.

From 1850- 1870, the U.S. experienced its first agricultural revolution. Increased railroad networks and the generation and use of more efficient farm technologies created a greater demand, domestically and foreign (*The Seeds of Change*, 2018).These increases and efficiencies also made it possible for less land to be used to produce crops for domestic and foreign demands. This led to a decrease in the number of farms even though the population continued to increase in the United States. In 1860 the average farm size was 199 acres, whereas in 1920 the average farm size was 148 acres (*The Seeds of Change*, 2018). Another outcome was that the percentage of the labor force that was made up of farmers decreased. This makes sense economically because there would have been more than enough food being produced. Therefore, people could seek out jobs in other industries than farming. By 1920, only 27% of the labor force was made up of farmers compared to that of 58% in 1860 (*The Seeds of Change*, 2018).

Following the Civil War, the agricultural scene shifted and changed amongst the southern states as much of their developed resources were devastated by the war. Post-war farming practices were changed forever as former slaves were emancipated. This generated the shift from large plantations to smaller farm plots that could potentially be worked by one man, his family, and any contracted help they could afford (*The Seeds of Change*, 2018). Another factor to consider was that mules and horses and the grain to feed them had become scarce during the Civil War. One outcome was that of sharecropping, which is a tenant farming system that would employ those who needed a job, to farm fields of the landowners in exchange for part of the harvest (*The Seeds of Change*, 2018). However, this system often left sharecroppers cheated and exploited by landowners.

In 1870, nearly half of all Americans worked as agricultural laborers, and the majority of America’s exports were agricultural goods (*The Seeds of Change*, 2018). The Westward Expansion to the Great Plains, with the Homestead Act, offered 160 acres of free land to settlers who would farm it for five years. This eventually allowed for the Great Plains to become America's breadbasket with its rich soil bearing large harvests of wheat and corn. Markets also expanded due to the construction of the continental railroad, which provided reliable transportation for those who had moved west (*The Seeds of Change*, 2018). This transportation also provided a means of distribution for the crops and produce in the Midwest United States to go to either the east or west coasts. The railroads also provided the markets or the people in which to sell their goods too (*The Seeds of Change*, 2018). The addition of land and transportation created new opportunities for discovery and development with the agricultural sector. Before the turn of the century in 1899, scientific developments changed the number of people needed to work a farm. One of these developments was that plants could be selectively bred for disease resistance. This principle also encompassed other desirable traits in plants, like being drought resistance and having greater nutritional value (*The Seeds of Change*, 2018).

Industrial technology had brought widespread improvement to farmers by 1900. One technology was dams, as they supplied irrigation water to dry land. Also, USDA scientists introduced American farmers to new plants like broccoli, nectarines, and seedless raisin grapes (*The Seeds of Change*, 2018). These new plants would expand what American farmers could produce as well as what people could enjoy at their dining tables. America also had maintained a surplus of food and its increase at the turn of the century created a demand for its produce (*The Seeds of Change*, 2018). Therefore, Europe became America’s largest customer. Due to the exportation of American produce, Congress passed the Pure Food and Drug Act in 1906. This Act required the USDA to inspect the cleanliness of agricultural goods in order to maintain its exports with countries that already had such practices in place (*The Seeds of Change*, 2018). These higher standards improved foreign trade while also benefiting Americans through the improvement of food quality. Machinery increased in improvements at this time as well which reduced the amount of manpower necessary for farm production. This freed more people to seek out and pursue new endeavors in other societal areas and industries. Fewer people and less land could produce the same amount of food (*The Seeds of Change*, 2018). By 1914, with war lurking on the horizon and the Industrial Revolution that pulled people from rural areas to cities it was soon recognized that even with the advancements in agriculture more people were needed to continue in the production of food and other raw materials. The USDA in response supported college programs for soldiers and land grant colleges with programs to educate farmers and future farmers (*The Seeds of Change*, 2018). There was also a call for farmers and ranchers in America to increase production further as Europe became engaged in World War I and were having trouble feeding its peoples (*The Seeds of Change*, 2018). American agricultural exports soared and farm prices more than doubled due to supporting allies in World War I. In 1916, President Woodrow Wilson signed the Farm Credit Loan Act which provided long-term loans to farmers (*The Seeds of Change*, 2018). With access to monetary resources, farmers purchased nearly fifty thousand tractors and put forty million acres of new land into production just a year later (*The Seeds of Change*, 2018). This heightened state created an environment for scientific discoveries as more land was sought for production. One example being that of dry farming, which made it possible to grow wheat and hay in arid areas of the United States without standard irrigation (*The Seeds of Change*, 2018).

When World War I came to its resolution the wartime market faded and this created a surplus of products which caused prices to plummet. In the 1920s the quality of life for many rural households was low compared to those in the cities, and city life became increasingly coveted. As the wartime market dissipated agricultural producers could not make the payments on their loans than they had taken out for machinery, land, and seed during the war. Banks began to foreclose, and a nationwide agricultural depression set across the nation (*From Defeat to Victory,* 2018). Over a million farmers had to seek out other means of employment in cities. The agricultural depression of the 1920s was only the beginning of the Great Depression that would affect Americans for another decade (*From Defeat to Victory,* 2018).

The stock market crashed in October of 1929 and by 1930 was impacting rural America the most. As the depression ravished, prices for almost all agricultural products fell almost a billion dollars was lost in exports during each of the early years of the decade (*From Defeat to Victory,* 2018). Due to flooding and droughts in different areas of the country the number of acres harvested and the yields per acre also decreased for most crops during the first years of the depression (*From Defeat to Victory,* 2018). The drought and flooding made livestock a struggle to feed. The Hoover Administration took efforts to help the industry by creating the Federal Drought Relief Committee, which recommended that rail rates for hay, feed, and water be reduced while construction of roads and dams be constructed in drought areas (*From Defeat to Victory,* 2018). In 1932, the price of a bushel of corn dropped to twenty-nine cents and beef prices dropped to five cents per pound which were drastically decreased from what they were in 1929 (*From Defeat to Victory,* 2018). The USDA saw that those in the agricultural sector lacked understanding of how the market worked and was producing surplus crops that were not needed. Therefore, the USDA tried to teach farmers to balance supply with demand (*From Defeat to Victory,* 2018). They asked farmers to readjust by voluntarily planting fewer surplus crops and instead plant less plentiful crops like tomatoes. This would allow for farmers to generate more income and ultimately lead to better success for the sector (*From Defeat to Victory,* 2018).

When President Franklin D. Roosevelt took office, he firmly believed that solving the agricultural problems was fundamental to relieving the Depression. Many of Roosevelt’s New Deal programs were designed to help farmers and included the Agricultural Adjustment Acts, the Civilian Conservation Corps, the Farm Security Administration, the Soil Conservation Service, and the Rural Electrification Administration (*From Defeat to Victory,* 2018). The USDA acted quickly to implement these programs and improve the economy and close the deficit between the urban and rural standard of living. Newly constructed dams helped to provide electricity which led to increased farm production. Exports between 1930 and 1960 continued to decrease from 32 percent of total exports in 1930 to 22.9 percent of total exports in 1960 (*From Defeat to Victory,* 2018). However, even though exports decreased the amount of food and fiber a single farmer could now produce was equal to that of what was necessary to support 10.7 people by 1940 (*From Defeat to Victory,* 2018). Therefore, again fewer farmers could work and produce enough resources for the growing population. This was a major increase in productivity to previous times thanks to technology, machinery, and scientific discoveries.

In 1939 the prospect of war again loomed and caused trouble for American farmers. The unknown states and future of foreign markets along with their closure due to the war caused surpluses to surge. Unlike with World War I where the wartime efforts immediately called for increased production, farmers were asked to only produce what was needed at home. However, when the United States Allies were in need, the situation changed. In 1941, the USDA again asked farmers to increase production in everything across the board. At the same time, American families were asked to conserve as many resources as possible as supplies could run out quickly due to the second World War. Initiatives such as the National Victory Garden program were instituted to encourage the growing of food within the home. As the manufacturing of new armaments for the military increased, more jobs became available, men, women, and minorities left farm work for the higher wages offered in manufacturing. Machinery replaced animals and hybrid corn was introduced to increase production across the United States in response to World War II.

When World War II came to a close, four million acres of crops were plowed up to prevent the return of the agricultural depression that had occurred before the War. Even with prevention, the economy was not as it was post World War I. Instead, war-torn Europe and Asia had a high demand for agricultural imports. In response, the U.S. sent millions of tons of food abroad (*From Defeat to Victory,* 2018). Under the post-war legislature, agricultural supplies were sent overseas, and European farmers visited the U.S. to learn American farming techniques to help rebuild Europe’s agriculture (*From Defeat to Victory,* 2018). As the rest of the world entered into the post-war recovery period, agricultural improvements continued with research in areas such as plant and animal science and soil conservation (*From Defeat to Victory,* 2018). The post-war boom was in full effect and new changes in agriculture lay on the horizon.

Due to the prosperity brought about by the end of World War II, U.S. farm exports surged. In 1940, there were about two billion dollars in farm exports, however, by 1950 it doubled to nearly four billion dollars in farm exports (*From Defeat to Victory,* 2018). Farmers prospered due to post-war economies, legislation, production, and prices reached a new high. Life in America also experienced a shift as the standard of living increased bringing about increased ownership of homes and cars as well as more educational opportunities. The economy’s base shifted and was now based on consumerism as the appetite for new products surged among Americans. Farms now had the science and technology to become mechanized and used pesticides to increase yields. Agriculture had become more efficient and there were fewer farms, but the size of farms increased. With machines to help the farming industry again, more people were free to pursue new careers and dreams, thus people were leaving the countryside for the cities and suburbs.

Moving forward a similar pattern can be seen during pre-war and post-war times with the wars the United States faced during the 1950s and 1960s. However, in 1953, after the Korean War had ended, President Eisenhower took office and removed many of the restrictions and federal controls on farmers (*Into a New Millennium, 2018*). He believed that a free market economy within agriculture would reduce the bottlenecked flow of business and would reinstate competition within the sector (*Into a New Millennium, 2018*). The USDA also established a new branch to seek solutions to surplus issues. This branch, known as the Agricultural Marketing Service, worked to improve the packaging of perishable fruits and vegetables, establish better warehousing and food storage systems, as well as develop new terminal facilities in large cities (*Into a New Millennium, 2018*). The goal was to save both growers and the public money and improve the quality of America’s foods. Overall, the advances and governmental decisions lead to one farmer supplying the food and fiber for 15.5 people in the 1950s to a single farmer supplying the food and fiber for 25.8 people in the 1960s (*Into a New Millennium, 2018*).

The 1970s brought in a new wave of agricultural prosperity and brought United States agricultural exports to make up 19% of all exports. This was easily accomplished with the advances in technology for more efficiency and sciences with the discovery and development of pesticides, herbicides, and fertilizers (*Into a New Millennium, 2018*). Another reason for the decade’s agricultural prosperity was that of the Soviet Union and other small communist countries opening their borders to trade. In 1972, the Soviet Union experienced a major wheat crop failure, which allowed for a massive surge of countries looking to purchase American grain (*Into a New Millennium, 2018*). Farmers were encouraged to expand their practices and again many took out loans to do so. However, the cycle of prosperity would abruptly come to an end in the 1980s.

Export markets began to shrink in the early 1980s due to European subsidies, and interest rates in the U.S. increased (*Into a New Millennium, 2018*). In January 1980, President Jimmy Carter strategically canceled sales of American grain to the Soviet Union in response to their invasion of Afghanistan (*Into a New Millennium, 2018*). Periods of drought also affect many regions in the U.S. during the decade. In 1981, President Ronald Reagan signed the 1981 Farm Bill to try and help American farmers compete with European Farmers (*Into a New Millennium, 2018*). However, even with the government aid farm prices, income, and land values continued to decrease causing many farmers to not be able to make payments on their debt that they incurred in the 1970s. In 1985, another Farm Bill was passed that provided increased aid to farmers who implemented conservation farming practices set forth by USDA (*Into a New Millennium, 2018*). Discoveries made by the USDA and other scientific professionals were providing farmers with more ways to manage their land with environmentally sound practices. President Reagan, to further fair trade, began a series of negotiations in 1986 that would lead to the creation of the World Trade Organization (WTO) which sets rules for trade between nations (*Into a New Millennium, 2018*). One benefit from the 1980s was the creation of the Sustainable Agriculture Research and Education program started by the USDA in 1988. The program funded projects and conducted outreach to improve and advance farming systems that were profitable and environmentally sound (*Into a New Millennium, 2018*).

The entire world faced dramatic changes during the 1990s. With the Berlin Wall no longer standing the Soviet Union had disappeared by 1991. Also, the emergence of Internet business created rapid growth and fueled a stock market boom. The boom was also enhanced by timely telecommunications and new information technology (*Into a New Millennium, 2018)*. The Human Genome Project identified thirty thousand genes in human DNA, which sparked genome projects for farm animals, plants, as well as microorganisms (*Into a New Millennium, 2018*). Which all of the advances and scientific discoveries government and private organizations made investments into launching biotechnology industries to develop new medical and agricultural applications (*Into a New Millennium, 2018*). Economic conditions for farmers also improved with low-interest rates. President George H. W. Bush signed the North American Free Trade Agreement (NAFTA) between the United States, Canada, and Mexico. NAFTA eliminated trade barriers between these countries and allowed the U.S. to again increased food exports to Canada and Mexico (*Into a New Millennium, 2018*). Towards the end of the decade, there was an increased need for food safety regulations, and the Food Safety Initiative was launched by President Bill Clinton (*Into a New Millennium, 2018*). The USDA and its scientists developed methods to increase food safety. They include the following (*Into a New Millennium, 2018*):

* Rapid tests to identify germs in food
* Irradiation is safe and effective for decreasing or eliminating harmful bacteria in food

Smaller farmers began to market their products as organic and specialty products successfully and aggressively to consumers due to the increased public demand for high-quality and safe foods (*Into a New Millennium, 2018)*. Large Agribusinesses began contracting with farmers and ranchers to raise products that specifically met their needs and standards. This is known as vertical integration, which allows food companies to control the quantity, quality, and price of the foods and products entering their facilities (*Into a New Millennium, 2018)*. By the end of the decade, looking forward to the turn of the century, it was clear that farming had changed. Farms were larger but decreased in numbers, and all farms were more specialized and efficient.

In the 2000s the average total U.S. population was 287,600,000 and farmers made up 1.5% of the labor force. Meaning that one farmer was supplying food and fiber for 139 people (*Information Age, 2018*). During the period from 2000 to 2011, the total agricultural exports went from 7 % to 10 %. In 2016, $135.5 billion of agricultural products were exported to nations around the world (*Information Age, 2018*). The present era of the Information Age brought many scientific advancements to allow the production of agricultural products we have today. Some of these advancements include the following (*Information Age, 2018*):

* Bioengineering
* Automated farm equipment
* Cloning
* Sequencing of plant genomes
* Genetically modified food

There were also policies introduced in the U.S. that impacted the agricultural industry to the present day. Policies on nutrition, trade, and farm aid were changes made across the span of three presidential administrations including George W. Bush, Barrack Obama, and Donald Trump. They include the following (*Information Age, 2018*):

* 2002 Farm Security and Rural Investment Act
* 2005 Energy Policy Act
* 2008 Food, Conservation, and Energy Act
* 2009 American Recovery and Investment Act
* 2011 FDA Food Safety Modernization Act
* 2012 Federal Public Transportation Act
* 2012 Agricultural Reform, Food, and Jobs Act
* The Agricultural Act of 2014
* The Agricultural Improvement Act of 2018
* 2018 United States-Mexico-Canada Agreement (USMCA)
* 2019 The Green New Deal

Sustainability and the impact that agriculture can create on the environment are also trends that exist today and will impact the plans of agriculture in the United States (*Information Age, 2018)*. Other trends include the growing popularity and availability of organic foods and produce. As the United States agricultural sector looks to the future, it is beneficial to remember the past and see the patterns that flow throughout the sector's economics. With the pattern of increased prosperity after scientific and technological applications, urban agricultural methods and technologies could be one possibility for the future prosperity and sustainability of the agriculture sector in the United States.

# Impact on Agriculture due to Population Increase

By the year 2050, there are projected to be nearly 10 billion people in existence (World Bank, 2020). This is almost 2 billion more people than currently inhabit the planet. The increase in population will create the necessity for greater food production globally. However, with economic growth and population dynamics driving the structural changes within economies, what could happen to the economy of the United States with this increase in population? As a developed economy most would like to see the United States prosper and continue in societal development. However, agriculture is and has been the backbone of the United States development, and if new stressors such as an increase in population enter into the nation’s economic mix, what would be the outcome and how can the U.S. be prepared?

Looking at the history of agriculture in the United States a pattern of advancement begins to emerge. As more scientific discoveries and technology enhancements are discovered and applied to farming, it then requires fewer resources, like that of land and labor to continue to produce an increased amount of food. A 19th-century German statistician named Ernst Engel developed an economic theory that as a country develops economically, the relative importance or significance of its agricultural endeavors declines (Johnson, 2019). Engel’s theory discovered that as incomes increase, the proportion of income that is spent on food declines (Johnson, 2019). It then follows that as incomes increase, a smaller fraction of the total resources that society is required to produce food decreases as well (Johnson, 2019). When this discovery was originally made many economists were surprised as they had assumed that the ability to feed growing populations was based upon the number of finite resources put into feeding the population (Johnson, 2019). In other words, more resources like that of land are required to continue to meet the nutritional needs of a population, but this was not the case. This fear was based on the law of diminishing return, which states that under given conditions an increase in the amount of labor and capital applied to a fixed amount of land results in a less-than-proportional increase in the output of food (Johnson, 2019). However, the law of diminishing returns does not take or foresee the changes in arts and methods of production. It also would not account for changes in other economic sectors that had a major effect on the supply of food. Therefore, it could be argued that to increase food production within the United States due to population growth the method of production must be the main focal point.

Currently, most of the crops that are currently grown in the United States are not used for human nourishment or consumption. The current farmland is mostly used to produce crops to feed and graze livestock. Of course, the animal products produced are then consumed by humans, but at the cost of nutritional value. The crops consumed by livestock have a much higher calorie count than the products that were produced. This raises questions about how to effectively, safely, and efficiently produce more food to meet the needs of the growing population. Many individuals think that the answer to this problem is simply to create more farmland for crops to grow specifically for human consumption. However, the growth of population also could mean that there would potentially be less land and fewer natural resources to use for this solution. Also, the act of creating new farmland takes a toll on the environment. Therefore, creating “new” farmland is not necessarily the best or feasible answer. This is where urban agriculture, its differing methods, and modern technology would help to generate new space safely and effectively for producing more food for human consumption, without disrupting the environment, misusing resources, or losing crops to long transportation routes in distribution.

# Definition, Origins, & Methods of Urban Agriculture

In simple terms, urban agriculture is the act of producing food inside of city limits. There are unique challenges that urban farming today faces but the benefits that it offers include increased food security, employment, decreased waste, as well as community involvement. Food security means that all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food according to the United nations’ Committee on World Food Security (International Food Policy Research Institute, 2021). To gain more insight into the benefits and methods of urban agriculture, looking at the history is beneficial.

## Origins

Urban agriculture is not a recent concept. It has been in existence for thousands of years, with different forms being invented by different people groups around the world to combat the agricultural challenges they faced. A few of the societies that introduced the concepts of urban agriculture are that of early Mesopotamians, after them the Persians, and in the western hemisphere, the Incas and Aztecs pioneered the beginnings of urban agriculture.

According to the American Society of Landscape Architects (ASLA), the origin of urban agriculture dates back to about 3,500 B.C. when Mesopotamian farmers implemented a system that set aside plots of land in growing cities to use as farmland (Green, 2012). Fifteen hundred years after the Mesopotamians, the Persians used urban aqueducts to transport water into their populated towns to produce and maintain crops. In these semi-desert towns, not only did the act of urban farming help them to maintain a steady supply of food, but it also helped to eliminate the urban waste produced by these towns (Green, 2012). In the Western Hemisphere, around the 1400s A.D., a notable instance of urban agriculture was the nutritionally self-reliant city of Machu Picchu located in Peru (Green, 2012). They built terrace beds down the sides of the mountain which helped them to be able to recycle their already scarce water supply. The Incas also designed the beds to catch the afternoon sun which helped to stretch the growing season for their bio-intensive crops (Green, 2012). Another noteworthy point in the historic development of urban agriculture is the chinampas used by the Aztec civilization. Chinampas are floating islands specifically designed for farming on the lakes surrounding their cities. This production of crops became a staple for them to support their increasing population due to farmland being a difficult resource to obtain. These are just a few of the earliest examples of urban agriculture and although more advanced similar techniques and methods we can still see today.

## Methods

## Presently and in recent years there has been an increasing trend in knowing where food comes from and the effect that transporting food can have on the produce. This trend has increased the consumption and purchase of locally-grown, sustainable, and organic produce, all of which can be accomplished through urban agriculture and its different methods.

The placement of urban farming is flexible as it can be started and maintained in any/every area of a city. Urban farming can take place in public spaces and parks, next to apartment buildings or condos, on building’s rooftops, next to restaurants or other businesses, and even at schools (Sayner, 2021). Therefore, people have been increasingly creative in generating unique approaches that work in a variety of different conditions and settings including that of contributing to community gardens. One method is Vertical farming, which involves the act of growing crops in layers that are stacked vertically (Sayner, 2021). This method can be accomplished by growing on shelving or wall and/or fence mounted planters. The setting of vertical farming within cities is vast and could include being housed in abandoned underground tunnels, inside buildings, or in shipping containers. Vertical farming, a popular method of urban farming, makes the square footage of a space orders of magnitudes more efficient. After all, many plants do not need vertical space to grow (Sayner, 2021).

Another form of urban farming is that of Hydroponics, a system for growing plants without soil. Nutrients are added to water that the plants are immersed in or that regularly wash over the roots (Sayner, 2021). Hydroponic systems can use chemical fertilizers, but a more common supply of nutrients is found in the form of manure. For example, the waste from fish that can live in the water that the plant’s roots are in (Also, known as Aquaponics). The water in most hydroponics systems is recycled and reused so there is less overall water usage. A conventional farm requires about 400 liters of water to produce a kilogram of tomatoes. A hydroponic system can produce the same amount only using 70 liters of water (Sayner, 2021). Hydroponic systems are a great resource in areas where the weather or soil conditions are too harsh or polluted to grow in soil (Sayner, 2021). Rooftop Farming, another form of urban farming, uses limited space and premium resources, raised beds, greenhouses, and even animals on rooftops make use of ample and often underused space. However, local legislation and building support are important to consider before starting rooftop farming (Sayner, 2021). In addition, the assembling and dismantling of rooftop farms are difficult as supplies are needed to be hauled up and down from the rooftop space.

# Employment and Distribution Models

Urban agriculture also has an impact on traditional distribution channels as well as employment. The current food supply chain or distribution network in the United States is relatively complex with there being so many different types of farm inputs with more consumer-ready products being the output (*Overview of the U.S. Food System*, 2015). A simple version of the current food supply chain (As seen in Figure 1) moves from raw materials or farm inputs to either first-line handlers or manufacturers. First-line handlers include both for-profit commodity trading companies as well as farmer cooperatives. These entities aggregate the output of individual farms to gain economies of scale and market access to the rest of the food supply chain (Overview of the U.S. Food System, 2015). First-line handlers also include companies that prepare and package fruits and vegetables, and other firms that prepare raw materials for use in the processing and manufacturing of finished food products (*Overview of the U.S. Food System,* 2015). From there the products move to wholesale and logistics which then channels food into four different categories. These categories include food and beverage services, institutional buyers, retail food stores, and food banks. All of these end with the consumption of the finished product. There is a small segmented market where farm products are sold directly to consumers (as indicated by the blue dotted line in Figure 1). Urban agriculture works to strengthen the connections between producers and consumers by providing more direct access to farm products, leading to an increase in food security. Through shortening the distribution channels by growing produce in cities, food is fresher, less expensive, and more accessible in urban areas.

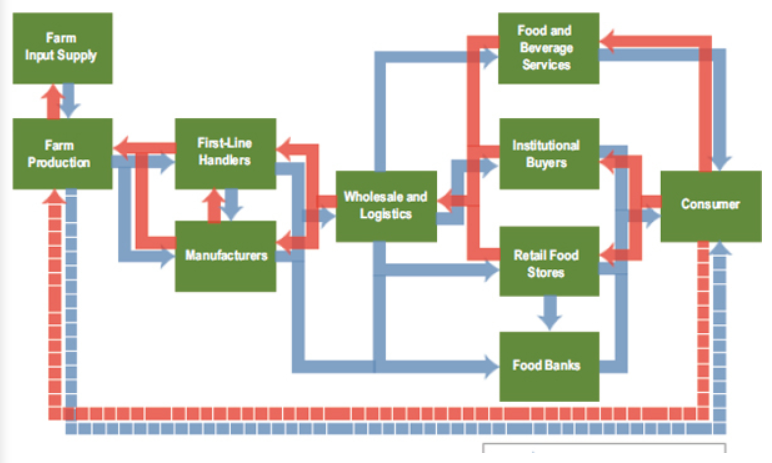


Figure 1 (*Overview of the U.S. Food System* , 2015)

Employment is also impacted by the implementation of urban agriculture. With traditional agriculture efforts, only those who live in rural areas and have access to personal transportation are capable of working on and for a farm. However, with urban agriculture people would not necessarily need access to personal vehicles and transportation. Instead, they could travel by public transportation like bus or train as well as walking. It provides jobs to city-locked individuals, which ultimately leads to increased food security through employment and job security. As the population increases and the need for food increases, there will need to be a larger workforce until a stable surplus is generated. This will create economic stability within the other industries and an increase in development and innovation, but it all starts with agriculture.

# Urban Agriculture Studies & Cases Globally & In the U.S.

There are a variety of Urban agricultural efforts taking place around the world that all provide a vast number of benefits to the surrounding societies like food security, employment, and sustainability. The following are just a few examples of practices and methods that are taking place in the world currently, abroad and in the United States. One such study was conducted within the country of Hungary to compare the relationship between sustainable agriculture (urban agriculture practices) and food security. The study looked at the relationships between food production, emission gas, gross domestic product, fertilizer consumption, organic farming, and the Hungarian population between the years 1980 to 2016 (Jaafreh & Nagy, 2020). The data collected showed positive correlations between emission gases and fertilizer use as well as showing a slight positive correlation between organic farming and the food production index (Jaafreh & Nagy, 2020). The study concluded that to maintain food security the number of sustainable agriculture practices would need to increase for Hungary (Jaafreh & Nagy, 2020). Although Hungary is small compared with the landmass of the United States, the study still showed that there will need to be a greater number of sustainable agriculture practices to maintain the level of food security that exists today.

In 2013, The World Bank published a document entailing the findings from studying four cities on the contribution of urban agriculture to livelihoods, urban resource use, and the environment in each city (World Bank, 2013). The cities studied included Accra, Ghana; Bangalore, India; Lima, Peru; and Nairobi, Kenya (World Bank, 2013). The results of their study showed that even though the settings, resources, and methods varied amongst producers and cities, the food security of those who practiced any form of urban agriculture provided greater stability and a better livelihood than those who did not practice (World Bank, 2013). Urban agriculture allowed residents within the city to have a greater chance of employment and diversify income generation which allowed them greater food security (World Bank, 2013). Urban agriculture also heavily contributed to producers' ability to diversify their food intake as they were able to save money and purchase other foods that they did not produce (World Bank, 2013). The World Bank found food security to be the most beneficial outcome of urban agriculture from the study of the four cities around the world.

Urban agriculture is also currently being practiced in the United States. An urban agricultural operation that is located in Philadelphia, Pennsylvania is the Mycopolitan Mushroom Company. Founded in 2013, the farm has less than 0.1 acres located in the basement of an old warehouse in which they cultivate their signature product, mushrooms (Rangarajan & Riordan, 2019). Mycopolitan grows a variety of specialty culinary mushrooms including King Trumpet, Nomeko, and Shitake. They take advantage of several waste streams for grain from local four mills and sawdust from local sawmills to use as their substrate (Rangarajan & Riordan, 2019). Mycopolitan has found success in servicing farm-to-table restaurants within the Philadelphia area (Rangarajan & Riordan, 2019). Overall helping to lead urban mushroom cultivation, with short distribution channels, directly to consumers.

Another Urban agriculture effort within the United States is Growing Home in Chicago, Illinois. In 2001, William Brown, the founder of the Chicago Coalition for the Homeless (CCH), hired Harry Rohodes to create a program that used farming to help recently displaced individuals to develop job readiness skills to reenter the workforce (Rangarajan & Riordan, 2019). Growing Home was introduced in 2002 and integrates production and marketing of products with employment and job training (Rangarajan & Riordan, 2019). They operate as a certified organic farm on about 0.9 acres, with five high tunnels, outdoor growing areas, a farm stand, and a two-story building. They grow and sell over 50 different crops and 200 varieties provide about one-third of the overall farm budget (Rangarajan & Riordan, 2019). Soon they hope to be more involved with farm-to-table restaurants. Even though Growing Home is supported through aid and donations they are providing greater societal benefits than simply owning and running a business. They strive to not only be a social enterprise that promotes urban farming but also to provide job training, affordable food, and provide a living wage to its trainees (Rangarajan & Riordan, 2019).

# Conclusion

Based upon the economic trends of technology and scientific discoveries within the industry of agriculture, urban agriculture is a potential trend for the present and future of agriculture in the United States. Urban agriculture provides many benefits that bring economic value to society, however, the most prominent being that of food security. As the world's population continues to increase, agriculture will need to continuously adapt to meet the food and nutrition needs of people. Urban agriculture not only provides for shorter distribution periods and increased employment opportunities in heavily populated areas but also allows for greater accessibility of fresh nutritious produce. To continue to develop as a nation in other industries, economic theory states that a country must be able to maintain a steady surplus of crops (Johnson, 2019). Therefore, for the future of the United States to further its development the agriculture sector needs to be supported and adapted to meet the needs of the people. Urban agriculture would help to maintain the surplus of crops as well as provide an increased state of food security among citizens. There are current examples of businesses and programs that are urban agriculture-based that are thriving already in the United States, but the efforts and numbers will still need to increase as needs increase. One way to support the growth of urban agricultural efforts would be to include urban agriculture and its application within the public education system. It would be able to generate greater interest and spark passion within the next generation.

# References

Anderson, J. C., II. (2013). An exploration of the motivational profile of secondary urban agriculture students. Journal of Agricultural Education, 54(2), 205+.

*A protocol for evaluating the sustainability of agri-food production systems -- A case study on potato production in peri-urban agriculture in The Netherlands.* (2014). Ecological Indicators, 43, 315+. <https://link.gale.com/apps/doc/A369076448/GRNR?u=philbibu&sid=GRNR&xid=64ef108b>

Aurora University. (2020, May 08). History of urban agriculture and urban farming policies. Retrieved January 31, 2021, from <https://online.aurora.edu/history-of-urban-agriculture/>

Austin, T., Lu, X., & Ross, D. (2015). Agro-urbanism: Peri-urban developments. Landscape Architecture Frontiers, 3(1), 123+.

Beattie, A. (2020, November 2). Four Economic Concepts Consumers Need to Know. Investopedia. <https://www.investopedia.com/articles/economics/11/five-economic-concepts-need-to-know.asp#:~:text=At%20the%20most%20basic%20level,many%20decisions%20that%20humans%20make.>

Board on Agriculture and Natural Resources, Institute of Medicine, National Research Council, Oria, M., &amp; Yih, P. T. (2015). Overview of the U.S. Food System. In M. C. Nesheim (Ed.), Committee on a Framework for Assessing the Health, Environmental, and Social Effects of the Food System. essay, National Academies Press (US).

Daily, G., & Dasgupta, P. (1998). Food production, population growth, and the environment. Science, 281(5381), 1291+.

Dennis, M., Beesley, L., Hardman, M., & James, P. (2020). Ecosystem (Dis)benefits Arising from Formal and Informal Land-Use in Manchester (UK); a Case Study of Urban Soil Characteristics Associated with Local Green Space Management. Agronomy, 10(4), 1cw+. <https://link.gale.com/apps/doc/A633466798/GRNR?u=philbibu&sid=GRNR&xid=b16e3647>

De Pascale, G., Colantuono, F., La Sala, P., & Conto, F. (2018). Regional nodes in European areas to boost innovation transfer and knowledge uptake. A social network analysis of building relationships in "Short Food Supply Chain Knowledge and Innovation Network (SKIN)" H2020 project. Rivista di Economia Agraria - REA, 73(3), 133+. <https://link.gale.com/apps/doc/A584495985/PPAG?u=philbibu&sid=PPAG&xid=f57f70ef>

Dimitri, C., Effland, A., & Conklin, N. (2005, June). The 20th Century Transformation of U.S. Agriculture and Farm Policy (Rep. No. 3). Retrieved March 09, 2021, from USDA website: <https://www.ers.usda.gov/webdocs/publications/44197/13566_eib3_1_.pdf>

Dobbins, C. E., Edgar, D. W., Cox, C. K., Edgar, L. D., Graham, D. L., & Perez, A. G. P. (2021). Perceptions of Arkansas Agriculture County Extension Agents Toward Urban Agriculture. Journal of Agricultural Education, 62(1), 77+. <https://link.gale.com/apps/doc/A658912989/PPAG?u=philbibu&sid=PPAG&xid=e55803fd>

*From Defeat to Victory 1930 - 1949*. growinganation.org. (2018). <https://growinganation.org/content/show-content/from_defeat_to_victory/>.

Gaus, A. (2012). Food security: a mapping of European approaches. African Journal of Food, Agriculture, Nutrition and Development, 12(3), 1+. <https://link.gale.com/apps/doc/A293949368/PPAG?u=philbibu&sid=PPAG&xid=e1a6a16c>

Green, J. (2012, May 9). Urban Agriculture Isn't New. THE DIRT. <https://dirt.asla.org/2012/05/09/urban-agriculture-isnt-new>/.

Harmon, A. (2019). Sustainable food movement. Salem Press Encyclopedia: [http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=ers&AN=89139041 &site=eds-live.](http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=ers&AN=89139041)

*Information Age* 2001 - present. growinganation.org. (2018). <https://growinganation.org/content/show-content/information_age>/.

International Food Policy Research Institute. (2021). ifpri.org. <https://www.ifpri.org/topic/food-security>.

*Into a New Millennium* 1970 - 2000. growinganation.org. (2018). <https://growinganation.org/content/show-content/into_a_new_millenium>/.

Jaafreh, O. A., & Nagy, I. (2020). Food Security and Sustainable Agriculture: A Case of Hungary. American-Eurasian Journal of Sustainable Agriculture, 14(1), 1+. <https://link.gale.com/apps/doc/A623792357/PPAG?u=philbibu&sid=PPAG&xid=9a9570df>

Johnson, D. G. (2019, January 16). Agricultural Economics. Retrieved March 09, 2021, from <https://www.britannica.com/topic/agricultural-economics/Land-output-and-yields>

Kessler, R. (2013). Urban gardening: managing the risks of contaminated soil. Environmental Health Perspectives, 121(11-12), A326.

Kwon, C.-T., Heo, J., Lemmon, Z. H., Capua, Y., Hutton, S. F., Van Eck, J., & Park, S. J. (2020). Rapid customization of Solanaceae fruit crops for urban agriculture. Nature Biotechnology, 38(2), 182+. <https://link.gale.com/apps/doc/A613408782/PPAG?u=philbibu&sid=PPAG&xid=aa193344>

LumenCandela. (n.d.). The Agricultural Market Landscape. Retrieved March 09, 2021, from <https://courses.lumenlearning.com/boundless-economics/chapter/introduction-to-the-agriculture-economics/>

Mardones, F. O., Rich, K. M., Boden, L. A., Moreno-Switt, A. I., Caipo, M. L., Zimin-Veselkoff, N., & Alateeqi, A. M. (2020). The COVID-19 Pandemic and Global Food Security. Frontiers in Veterinary Science, NA. <https://link.gale.com/apps/doc/A641133361/PPAG?u=philbibu&sid=PPAG&xid=169526dd>

Marshall, T. (2011). Basic Economics Defined. Beef, <https://go.openathens.net/redirector/cairn.edu?url=https://www.proquest.com/trade-journals/basic-economics-defined/docview/912459173/se-2?accountid=130363>

McGinnis, L. (2007). Show me the money: why economics is essential for sustainable agriculture. Agricultural Research, 55(6), 8+. <https://link.gale.com/apps/doc/A166275346/PPAG?u=philbibu&sid=PPAG&xid=b8844d7f>

Metych, M. (n.d.). Creating Corridors: The Buzz about the Bee Highway. Retrieved January 31, 2021, from https://www.britannica.com/explore/savingearth/creating-corridors-the-buzz-about-the-bee-highway

National Geographic. (n.d.). A five-step plan to feed the world. Retrieved March 02, 2021, from <https://www.nationalgeographic.com/foodfeatures/feeding-9-billion/>

Ngure, M. W., Wandiga, S. O., Olago, D. O., & Oriaso, S. O. (2020). SCALING UP CROP DIVERSIFICATION AMONG FARMING COMMUNITIES FOR FOOD SECURITY UNDER CLIMATE CHANGE: A CASE STUDY OF THE KENYAN PELIS PROGRAMME. African Journal of Food, Agriculture, Nutrition and Development, 20(7), 17025+. <https://link.gale.com/apps/doc/A649855274/PPAG?u=philbibu&sid=PPAG&xid=624475ca>

Ogunnupebi, T. A., Oluyori, A. P., Dada, A. O., Oladeji, O. S., Inyinbor, A. A., & Egharevba, G. O. (2020). Promising Natural Products in Crop Protection and Food Preservation: Basis, Advances, and Future Prospects. International Journal of Agronomy, 2020, NA. <https://link.gale.com/apps/doc/A639994183/PPAG?u=philbibu&sid=PPAG&xid=f1246eb5>

Perennial crops. (2010). Issues in Science and Technology, 26(3), 9+. <https://link.gale.com/apps/doc/A224768959/PPAG?u=philbibu&sid=PPAG&xid=66d6daf9>

Philpott, T. (2010, August 04). The history of urban agriculture should inspire its future. Retrieved January 31, 2021, from <https://grist.org/article/food-the-history-of-urban-agriculture-should-inspire-its-future/full/>

Rangarajan, A., & Riordan, M. (2019). The Promise of Urban Agriculture: National Study of Commercial Farming in Urban Areas. Washington, DC: United States Department of Agriculture/Agricultural Marketing Service and Cornell University Small Farms Program.

Sali, G., Monaco, F., Corsi, S., & Mazzocchi, C. (2016). Bringing urban food supply closer to food consumption: opportunities for five European metropolitan regions. Rivista di Economia Agraria - REA, 71(1), 459+.

Sayner, A. (2021, February 28). Urban Farming Ultimate Guide and Examples. Retrieved March 02, 2021, from <https://grocycle.com/urban-farming/>

Shizgal, P. (2012). Scarce Means with Alternative Uses: Robbins’ Definition of Economics and Its Extension to the Behavioral and Neurobiological Study of Animal Decision Making. Frontiers in Neuroscience, 6. https://doi.org/10.3389/fnins.2012.00020

Spriggs, W. E. (2021). Economics. Issues in Science and Technology, 37(2), 38+. <https://link.gale.com/apps/doc/A653456501/PPAG?u=philbibu&sid=PPAG&xid=e47b5e9c>

*The Seeds of Change 1600 - 1929*. growinganation.org. (2018). <https://growinganation.org/content/show-content/the_seeds_of_change/>.

USDA ERS. (2020, December 16). Ag and Food Sectors and the Economy. USDA ERS - Ag and Food Sectors and the Economy. <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy/#:~:text=What%20is%20agriculture's%20share%20of,about%200.6%20percent%20of%20GDP>.

World Bank. (2013, July 1). Urban Agriculture : Findings from Four City Case Studies. Open Knowledge Repository. <https://openknowledge.worldbank.org/handle/10986/16273>.

World Bank. (2020, September 30). Agriculture and Food - Overview. World Bank. <https://www.worldbank.org/en/topic/agriculture/overview>.

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