

**Forum:** United Nations Environment Programme

**Issue # 17-02 :** Addressing food and water insecurity as a result of unsustainable farming practices

**Student Officer:** Miranda Delgado, Raquel Cardenas, and Sophie Pellenz

**Written by:** Miranda Delgado

---

## Introduction

According to the Food and Agriculture Organization of the United Nations (FAO), "current estimates are that nearly 690 million people are hungry, or 8.9 percent of the world population – up by 10 million people in one year and by nearly 60 million in five years." This number and its increasing trend have added pressure to the challenge at hand- to find ways of growing food in a sustainable manner while also ensuring that enough is being produced. While focusing on making efficiency the priority, the environment has been overlooked and the importance of long-term effects has been ignored. In the process, unsustainable farming practices have become responsible for soil erosion, desertification, soil compaction, eutrophication, and other factors that compromise the four pillars of food security- availability, access, utilization, and stability. It has become evident that increasing the farm inputs will not achieve efficiency because of the typically low productivity of land, rather, it will cause environmental issues with the potential of reducing yields.

The start of agriculture dates back to 12,000 years ago, a time in which our ancestors began to domesticate plants and were no longer limited to hunting and gathering. In the decades following World War II, the machinery and

chemicals that make up the modern agricultural system were first introduced, revolutionizing food production (“Unsustainable Agriculture”). These innovations lowered the number of employees needed, the vulnerability of crops against pests, and oftentimes the price of production. However, the practicality of these practices causes their negative environmental impact to be overlooked, as they are used more and more in the twenty-first century. It is worth noting that by expanding the land used for agriculture it is possible to meet demands for food currently, but in doing so, the ability for future generations to meet these demands will be compromised. For example, slash and burn is a technique in which forestal land is cleared and then burned for planting. The resulting ash provides some fertilization and the land is free of weeds temporarily. However, after several years of farming, fertility declines, weeds reappear and farmers search for more land to clear. Meaning that farmers had land which they could profit from for some years but after habitats and soil were destroyed it became unusable. The controversy is further represented by the opposing views of the European Union, which prioritizes the environment when farming, and the United States, which focuses on increasing agricultural output. The way nations address the issue at hand is of paramount significance because population growth and climate change are applying more pressure on the food system and the environment cannot keep up with unsustainable practices.

## Definition of Key Terms

### **Food security**

According to FAO, “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (1). The four pillars of food security include availability, access, utilization, and stability.

## **Sustainability**

With regards to agriculture and the environment, sustainability refers to meeting the needs of the present without jeopardizing the ability of future generations to meet their own needs. Responsibly interacting with the environment means promoting farming practices that are profitable, environmentally friendly, and beneficial for communities.

## **Pastoral Farming System**

The focus of pastoral farming (also known as livestock farming or grazing) is the rearing of livestock rather than the production of crops. Dairy farming, raising beef cattle, and raising sheep for wool are three types of this farming system.

## **Arable Farming System**

This farming system is the opposite of the pastoral, it involves the systematic use of land to grow crops.

## **Extensive farming systems**

A system of farming that utilizes a small amount of labor and capital in relation to the size of the land. Crop yield is dependent upon the natural fertility of the soil, the terrain, the climate, and the water.

## **Soil Erosion**

The gradual process of movement of the upper layer of soil material (topsoil) which is mostly caused by wind, water, and human activity (such as unsuitable or mismanaged agricultural methods).

## **Desertification**

The process by which land becomes increasingly arid, and loses its bodies of water, vegetation, and wildlife. This type of land degradation is typically the

result of drought and deforestation that is caused by climate change and inappropriate agriculture.

### **Runoff**

The portion of precipitation on land that, instead of being absorbed into groundwater or evaporating, flows over land as surface water and ultimately reaches streams.

### **Drought**

A period of time in which an area receives below-normal levels of precipitation. This is a result of drier than normal conditions, and often extreme heat which worsens the situation by evaporating moisture from the soil. Droughts can also damage crops, diminish stream flow and create a water shortage.

### **Crop diversity**

The planting of different crops (e.g. growing carrots, tomatoes, lettuce, and beans) on the same farm, as well as planting different varieties of a crop (e.g. planting various types of tomatoes). Crop diversity is important because of its role in protecting the world's food supply and ecosystems.

### **Monoculture farming**

A type of agriculture that is based on growing only one type of crop at a time on a specific field, this goes against the concept of crop diversity.

### **Land degradation**

Refers to the loss in the productive capacity of a piece of land. According to the World Health Organization, "Land degradation is caused by multiple forces, including extreme weather conditions, particularly drought. It is also caused by human activities that pollute or degrade the quality of soils and land utility. It

negatively affects food production, livelihoods, and the production and provision of other ecosystem goods and services" (WHO 1).

### **Nutrient depletion**

A widespread soil degradation phenomenon that occurs as a consequence of soil erosion, and mismanagement of agricultural practices. Given that the topsoil generally has the most soil nutrients and it is also what erodes fastest, techniques such as slash and burn cause this type of degradation because soil nutrients are lost and not replenished.

### **GMOs/GM contamination**

Genetically modified organisms (GMOs) are organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally. GM contamination refers to the unwanted escape of genetic material from GMOs to non-GM plants, animals, and foods. This is considered a form of pollution and it can occur in a variety of ways, such as through pollen spread and seed escape.

### **Eutrophication**

The excessive richness of nutrients in a body of water, typically run-off from the land which comes from the chemical fertilizers and animal manure used for crops. The high levels of nitrogen and phosphorus cause growth in aquatic plant life which disturbs wildlife and produces toxins harmful to humans.

### **Soil compaction**

An increase in the soil density because of the compression of pores that would otherwise transport water and air. This is often the result of unsuitable farming practices (such as the use of heavy machinery) and it can prevent roots from growing, can cause oxygen deficiency, and lead to a decrease in yield.

## **Farm inputs**

"The resources that are used in farm production, such as chemicals, equipment, feed, seed, and energy" (McCracken 1).

## **Productivity of land**

The productivity of land can be calculated by dividing the output obtained from the land by the area of that piece of land.

## **General Overview**

### **Excessive Use of Chemicals**

The excessive use of major agricultural chemicals is seen as an example of an unsustainable farming practice. These chemicals, apart from being poisonous to human health, are also toxic to microorganisms in the soil and pollinators of wildlife. Moreover, as the chemicals run off they pollute bodies of water and destroy essential soil bacteria and microorganisms, compromising the quality of the soil. Without healthy soil, crops cannot grow and the "sufficient" and "safe" aspects of food security become affected. Plant geneticist, Professor Paul Gepts, said, "Gene flow is really a regular occurrence among plants. So if you put a gene out there it's going to escape. It's going to go to other varieties of the same crop or to its wild relatives. It's clear that zero contamination is impossible at present." Meaning that the chemicals used in agriculture, such as those involved in the production of genetically modified organisms (GMOs), can affect the intended crops as well as those from other fields and farms. This concept is known as GMO contamination and it implies that the genetic material from crops can be passed on to non-GMO crop fields, water, and soil systems. The uncontrollable mix between GM and non-GM crops has caused economic losses for producers, and with the advancements in agriculture, the

safety of genetically modified foods is becoming questionable, and through GMO crop contamination, non-GMO foods have become equally dangerous.

### **Deforestation and Crop Diversity**

Alongside the dramatic effect that deforestation has on climate change, it has also been found that the world's food supply is in danger because of it. "If the Amazon were completely deforested, the Western region of the United States would experience drought, with 20 percent less rain for the coastal Northwest and a 50 percent reduction in the Sierra Nevada snowpack" (Cavarrio 3). This reduction in precipitation levels would result in water and food shortages, as well as a greater risk of forest fires. Similarly, the practice of growing monoculture crops has been tied to deforestation, the use of heavy machinery that destroys the soil, and the greater use of agricultural chemicals. Furthermore, it is worth mentioning that food security does not just refer to the amount of food produced, rather also ensuring that individuals have access to a full range of nutrients needed to live a healthy life. This can be fulfilled through crop diversity, given that it provides the raw materials necessary to continue the supply of nutritious and varied food in the future, and ensuring that even the poorest can access it. With greater diversity in genetic resources that are accessible to all, food can become available at a more stable price to fight hunger and malnutrition.

### **Water Consumption**

Currently, the agricultural sector is responsible for consuming 70 percent of the planet's freshwater withdrawals (World Bank 3). This is because, on average, irrigated agriculture is twice as productive per unit of land as agriculture dependent upon rainfall. Nevertheless, considering the population growth and effects of climate change, competition for water resources is expected to increase and the efficiency of irrigated agriculture will not justify its consumption.

For this reason, future demand on water across all sectors will require 25 to 40 percent of water to be reallocated to higher productivity, and due to its high share, a significant amount is expected to be deducted from agriculture. This factor has added pressure to the challenge of achieving food security and the need to increase production. It has become a trend that while many search to become more efficient, they end up leaving their land vulnerable to numerous other factors with the potential of affecting yield. For example, many have chosen to plant crops on their entire pieces of land, not knowing that it would leave their land bare for soil erosion resulting from water runoff.

### **Impact on Climate Change and Pollution**

Agriculture has been identified as the leading source of pollution in many countries, and the livestock sector has been deemed responsible for 18 percent of all greenhouse gas production. The slash-and-burn technique has been connected to the buildup of greenhouse gases in the atmosphere because as the land is cleared for agriculture, the carbon stored in the intact forest is released. Furthermore, the use of pesticides, fertilizers, and other chemicals manage to pollute the air, soil, and marine ecosystems as well as waterways and coral reefs through fertilizer runoff.

### **Impact on Poverty**

For three-quarters of the world's poorest people, farming is the only viable livelihood option. Through subsidies, the U.S. and European governments encourage overproduction which in turn manages to lower global prices for food while negatively impacting the environment. When producers are facing declining harvests from cleared lands, they move onto neighboring land and lead to a biodiversity loss. With the cultivation of monoculture crops, the diversity of natural vegetation and the habitats of predators are destroyed, leading to an abundance of pests. As this cycle continues, production becomes limited



and prices continue to go up. In addition, small local farmers are at a disadvantage because they cannot compete with the prices of global corporate agribusinesses. This inevitably discourages sustainable practices, which are more common amongst small-scale farmers, and it leads to the cycle of increasing poverty.

## **Major Parties Involved and Their Views**

### **United States**

The United States' focus concerning agriculture lies in increasing crop production through the use of sophisticated technologies. This strategy allows for the employment of fewer workers, meaning an increase in farm productivity without a parallel increase in expenses. However, as the US continues to profit from their developments in agriculture, it becomes more challenging to implement extensive farming systems and avoid unsustainable water use because these do not represent the same economic growth. According to Veek et al., "California produces about 80% of the world's supply of almonds, much for export to hundreds of nations around the world" (15). Moreover, the area in which much of it is cultivated has limited water resources and water tables that are quickly declining. Farmers continue to defend their right to use the water, even though public health can be affected because of it. It was the 2018-2019 drought that forced the state to regulate water use and enforce the gradual reduction in the amount of water used by farmers.

### **China**

With a population of 1.4 billion people, China's main objective has been to achieve food security. In doing so, however, the country was faced with severe negative environmental, biophysical, and economic impacts. In turn, harming human health, the sustainability of food production, and costing a loss estimated at 7-10% of China's agricultural gross domestic product (GDP). The

pastoral farming system has also been the main cause of air and water pollution over the last 10 years in China. The use of high nitrogen fertilizer and irrigation subsidies to intensify the production of grains, and the misuse of fertilizer and manure when growing fruits and vegetables have led to eutrophication, soil acidification, and greenhouse gas emissions. Wishing to improve food safety, a Chinese campaign was designed to find and suspend counterfeit and diseased foods. The result was over 70,000 violations, the suspension of 2400 manufacturers, and US \$130 million in fines.

## Ethiopia

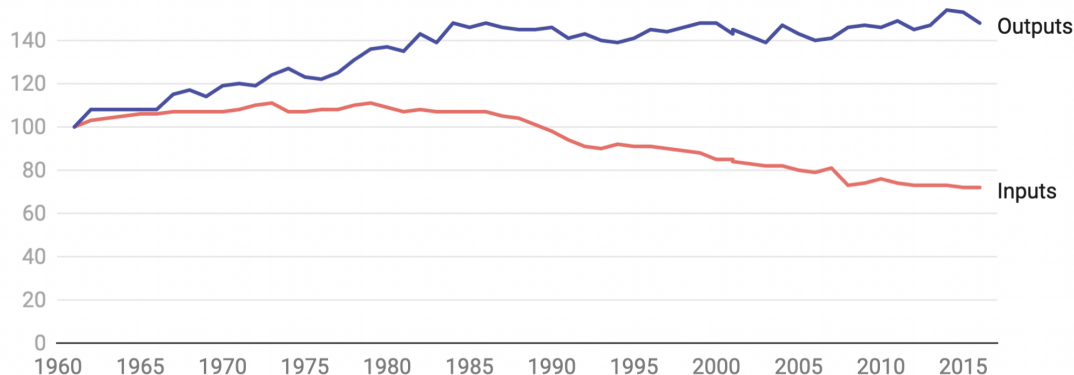
“Ethiopia's economy is dependent on agriculture, which accounts for 40 percent of the GDP, 80 percent of exports, and an estimated 75 percent of the country's workforce” (USAID 1). As a less developed country, Ethiopia does not have access to technology such as improved seeds, fertilizers, and pesticides. Even though this might present challenges, the excessive use of chemicals has also been proven to create pollution and harm the environment. Despite the reliance on agriculture, only 5% of the country's land is irrigated and crop yields from small farms are smaller than average. The importance of farming for Ethiopia is found in its potential to provide people with opportunities, improve their nutrition and solve their chronic poverty and food insecurity problems.

## Feed the Future

The U.S. Government's global hunger and food security initiative gives families in developing countries the opportunity to lift themselves out of poverty and food insecurity. Feed the Future believes in equipping people with the necessary tools and knowledge to feed themselves, rather than having them rely on aid. In 12 different partner countries, Feed the Future helps them improve the productivity of their land, to strengthen the resilience of communities, to improve nutrition, motivate innovation and encourage the exchange of ideas.

## Northwest Europe has reduced farm inputs without sacrificing food production

Farms in Northwest Europe use fewer inputs than they did in the 1960s and 1970s, particularly land, but strong productivity growth has enabled them to produce a consistent amount of food. These nations' agricultural policies emphasize conserving resources without reducing output.

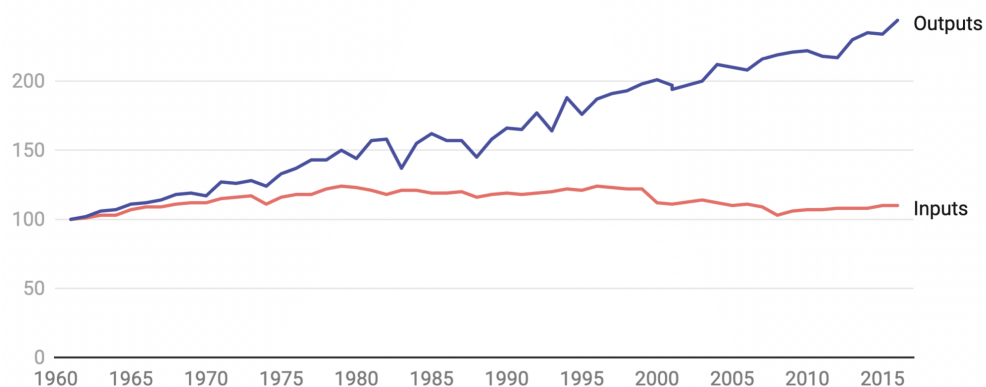


*Figure shows the agricultural inputs and outputs in Northwest Europe starting in 1961.*

*Economic Research Service, U.S. Department of Agriculture, 11 Nov. 2019.*

## Productivity growth in agriculture since 1961 has made food more abundant and cheaper in North America

This economic index of all inputs used in agriculture in North America is roughly at the same level today as in 1961. Farms now use less labor and more technological inputs, such as machinery and fertilizers. U.S. agricultural policy has used productivity gains to increase output.



*Figure shows the agricultural inputs and outputs in North America starting in 1961.*

*Economic Research Service, U.S. Department of Agriculture, 11 Nov. 2019.*

## Timeline of Events

<b>Date</b>	<b>Description of event</b>
1903-1933	Horticulturists managed to develop stronger, better varieties of crops. As a result, by 1933, hybrid corn varieties were widely available on the commercial market.
1943	The United Nations Conference on Food and Agriculture was convened by US President Roosevelt with 44 governments present. A permanent organization in the field of food and agriculture was requested.
1944	Through cross-breeding, Norman Borlaug was able to develop dwarf wheat varieties which are high-yielding and disease-resistant. This made food more accessible, saved a billion lives (primarily in Mexico and India), and launched the Green Revolution.
1945	The Food and Agriculture Organization of the United Nations (FAO) was established.
1945-1970	Horses are replaced with tractors, and there is an increase in technological practices and productivity per acre which characterizes the period as the second American agricultural revolution.
1961	The World Food Programme was established as a food aid programme with the support of the UN General Assembly.

- 1974 The first World Food Conference was held in Rome, to examine the global problem of food production and consumption.
- 1989 After several slow years, the agricultural sector was on the rise once again and more farmers began to use extensive farming systems to limit the use of chemicals.
- 1994 Farmers began using satellite technology to plan their farming practices accordingly.
- 2008 The HLTF was established by UN Secretary-General Ban Ki-moon.
- 2012 The Zero Hunger Challenge, an initiative by the UN Secretary-General, was introduced as a way of working towards a future where everyone has proper nutrition.
- 2015 The UN summit for the adoption of the post-2015 development agenda was held in New York. Sustainable Development Goal 2 was presented as a way to end hunger and all forms of malnutrition by 2030.

## **UN involvement, Relevant Resolutions, Treaties and Events**

The United Nations Environment Programme has addressed this issue in the past by establishing and contributing towards the creation of multiple frameworks, resolutions, organizations, and task forces. The United Nations has remained consistent in combating this issue, building upon previous actions, and allowing progress to take place by constantly increasing its efforts.

- On the 29th of January of 2014, the General Assembly adopted resolution **A/RES/68/209** titled “Agricultural Technology for Development.” This outlined a series of goals that would provide support for developing countries, encourage sustainable and responsible practices in agriculture, and promote research to improve current farming techniques and technologies. More specifically, the resolution aims to enable rural women to increase sustainable agricultural productivity, reduce post-harvest losses and establish nutritional security. Furthermore, there is a desire to promote the sustainable use of water resources and to develop irrigation facilities. Apart from looking to improve agricultural technologies, the document prioritizes their dissemination to developing countries.
- In April of 2008, UN Secretary-General Ban Kimoon led the establishment of the **High-Level Task Force (HLTF) on Global Food Security**. The primary goal of the Task Force was to promote a global response to the challenge of achieving global food and nutrition security. When the unit reevaluated in December of 2008 they agreed to expand their focus to advocating for funds for urgent action and long-term investments, inspiring engagement, and improving accountability systems. Over the next years, the HLTF became successful in achieving progress concerning these various objectives. They continued to generate change through the adoption of the Comprehensive Framework for Action which invested in food assistance, raised investments in agriculture within developing countries, increased opportunities for producers to access input, and focused on smallholders to ensure their proper nutrition.

## Evaluation of Previous Attempts to Resolve the Issue

In 1985 the United States launched a program that would incentivize the protection of environmentally sensitive land. The “Conservation Reserve

Program" allowed farmers to essentially "rent" environmentally valuable land to the U.S. Department of Agriculture for 10-15 years. The voluntary program allowed for acres of land to become exempted from agricultural production, instead of providing food and shelter for pollinators and wildlife, reducing soil erosion, and improving water quality. Nevertheless, the enrollment rates were determined by crop prices. Meaning that when the price of certain crops fell, such as corn, soy, and wheat in the late 1980s and early 1990s, the enrollment did the opposite. On the other hand, when prices of crops rose, the enrollment fell. For this reason, the program was extremely beneficial to farmers, because when their product would become more expensive they would profit from that, and when the price was no longer worthwhile, the land could still generate an income. However, when evaluating the solution's attempt of resolving the issue it is imperative to consider its role in promoting sustainable practices and establishing food security. This program limits the negative effects of agriculture, such as greenhouse gas emissions, but it does not increase agricultural productivity and it takes away from the land that could be used to harvest food. Furthermore, it is unpredictable, in 2019 the acreage of protected land dropped by more than 40 percent and it reversed some of the environmental progress that had been previously achieved. With regards to food security, the effectiveness of international food aid, such as that provided by the United Nations' World Food Programme, should also be evaluated. The efforts of these organizations serve to save the lives of millions of people, and their work becomes especially valuable when unexpected challenges, such as natural disasters, arise. Despite this, food aid is a temporary solution and by tackling the root of the problem and educating the nutrient-deprived population, these people can provide for themselves permanently.

## Possible Solutions

The global population in 2050 is estimated at around 9.8 billion, meaning that for agriculture to keep up, the crop calories produced will need to increase by 60%. With a decline in the amount of arable land available, the priority should become to increase agricultural productivity and yields. Small scale farmers in developing countries have proven to be the most environmentally conscious, as they develop cultivation skills that are necessary when farming input is low. These farmers are driven by their extreme poverty and often face pressures to overexploit their resources to benefit economically. Therefore, by educating impoverished people on how to remain environmentally friendly while efficiently producing food, they can tackle their food insecurity and contribute to sustainability in agriculture. Moreover, educating the public on the impact of various farming practices could lead them to make healthier choices.

### **Sustainable Development Goal (SDG)**

The issue at hand could potentially be categorized as various of the 17 sustainable development goals, however, it best falls into the second, which aims for zero hunger. The topic looks at how the concepts of food security and unsustainable farming practices are connected, and how one becomes the cause for the other. This is exemplified by the specific targets within the goal, one of which aims to ensure sustainable food production systems that increase productivity and help maintain ecosystems, and another which works towards ending all forms of malnutrition by 2030. The United Nations also expresses a desire, within their second goal, to encourage agriculture amongst women, support small-scale farmers, maintain genetic diversity crops, increase investment, eliminate trade barriers, and limit extreme food price volatility.

### **Bibliography**



"Agricultural Technology for Development." United Nations Digital Library, United Nations, [digitallibrary.un.org/record/765774#record-files-collapse-header](https://digitallibrary.un.org/record/765774#record-files-collapse-header).

"Agriculture and Food Security: Ethiopia." U.S. Agency for International Development, 8 Jan. 2021, [www.usaid.gov/ethiopia/agriculture-and-food-security](https://www.usaid.gov/ethiopia/agriculture-and-food-security).

Carter, Cavarrio. "Deforestation: A New Threat to Global Food Security." Borgen, 27 Nov. 2013, [www.borgenmagazine.com/deforestation-new-threat-global-food-security/](https://www.borgenmagazine.com/deforestation-new-threat-global-food-security/).

"Climate Change: Land Degradation and Desertification." World Health Organization, World Health Organization, [www.who.int/news-room/q-a-detail/climate-change-land-degradation-and-desertification](https://www.who.int/news-room/q-a-detail/climate-change-land-degradation-and-desertification).

"Consequences of GM Crop Contamination 'Set to Worsen'." The Guardian, Guardian News and Media, 18 Feb. 2008, [www.theguardian.com/science/2008/feb/18/gm.contamination](https://www.theguardian.com/science/2008/feb/18/gm.contamination).

"Contamination." CBAN, 2 Dec. 2019, [cban.ca/gmos/issues/contamination/](https://cban.ca/gmos/issues/contamination/).

"Crop Diversity: Why It Matters." Crop Trust, 28 Aug. 2020, [www.croptrust.org/our-mission/crop-diversity-why-it-matters/](https://www.croptrust.org/our-mission/crop-diversity-why-it-matters/).

“Deforestation and Food.” Food Sustainability Today, 19 Mar. 2018,  
[sites.psu.edu/foodsustainability/2018/03/19/deforestation-and-food/](https://sites.psu.edu/foodsustainability/2018/03/19/deforestation-and-food/).

“Document Card : Fao: Food and Agriculture Organization of the United Nations.” FAO, [www.fao.org/documents/card/en/c/ca9692en](http://www.fao.org/documents/card/en/c/ca9692en).

“Earth Science.” Lumen,  
[courses.lumenlearning.com/earthscience/chapter/desertification/](https://courses.lumenlearning.com/earthscience/chapter/desertification/).

Evans, Marni. “What Is Environmental Sustainability?” The Balance Small Business,  
[www.thebalancesmb.com/what-is-sustainability-3157876](http://www.thebalancesmb.com/what-is-sustainability-3157876).

“Extensive Agriculture.” Encyclopædia Britannica, Encyclopædia Britannica, Inc., [www.britannica.com/topic/extensive-agriculture](http://www.britannica.com/topic/extensive-agriculture).

“Farm Machinery Timeline: From the Late 1700's to the Late 1900's.” Medium,  
Medium, 6 Dec. 2018,  
[medium.com/@SeeTree/farm-machinery-timeline-from-the-late-1700s-to-t  
he-late-1900s-895bdd3fc7d8](https://medium.com/@SeeTree/farm-machinery-timeline-from-the-late-1700s-to-the-late-1900s-895bdd3fc7d8).

“Food Security and Nutrition Around the World in 2020.” THE State of Food Security and Nutrition in the WORLD 2020,  
[www.fao.org/3/ca9692en/online/ca9692en.html#chapter-1\\_1](http://www.fao.org/3/ca9692en/online/ca9692en.html#chapter-1_1).

Grant, Mitchell. “Sustainability.” Investopedia, Investopedia, 8 Aug. 2021,  
[www.investopedia.com/terms/s/sustainability.asp](http://www.investopedia.com/terms/s/sustainability.asp).

Hertel, Thomas. "Growing Food and Protecting Nature Don't Have to Conflict – Here's How They Can Work Together." *The Conversation*, 28 Apr. 2021, [theconversation.com/growing-food-and-protecting-nature-dont-have-to-conflict-heres-how-they-can-work-together-146069](https://theconversation.com/growing-food-and-protecting-nature-dont-have-to-conflict-heres-how-they-can-work-together-146069).

"High Level Task Force on Global Food and Nutrition ." United Nations, United Nations, [www.un.org/en/issues/food/taskforce/](http://www.un.org/en/issues/food/taskforce/).

"Impact of Sustainable Agriculture and Farming Practices." WWF, World Wildlife Fund, [www.worldwildlife.org/industries/sustainable-agriculture](http://www.worldwildlife.org/industries/sustainable-agriculture).

"Impact of Sustainable Agriculture and Farming Practices." WWF, World Wildlife Fund, [www.worldwildlife.org/industries/sustainable-agriculture](http://www.worldwildlife.org/industries/sustainable-agriculture).

"Improving Food Security & Nutrition around the World." *Feed the Future*, 5 Oct. 2020, [www.feedthefuture.gov/](http://www.feedthefuture.gov/).

"Land in Economics: Notes, Characteristics, Functions, Importance and Productivity." *Economics Discussion*, 1 Aug. 2018, [www.economicdiscussion.net/land/land-in-economics-notes-characteristics-functions-importance-and-productivity/31125](http://www.economicdiscussion.net/land/land-in-economics-notes-characteristics-functions-importance-and-productivity/31125).

"The Main Consequences of Non-Sustainable Farming." *Challenge Advisory*, [www.challenge.org/knowledgeitems/the-main-consequences-of-non-sustainable-farming/](http://www.challenge.org/knowledgeitems/the-main-consequences-of-non-sustainable-farming/).

“Management and Natural Processes Affecting the Biological and Chemical Aspects of Soils.” FAO,

[www.fao.org/soils-portal/soil-degradation-restoration/global-soil-health-indicators-and-assessment/soil-health-biological-and-chemical/en/](http://www.fao.org/soils-portal/soil-degradation-restoration/global-soil-health-indicators-and-assessment/soil-health-biological-and-chemical/en/).

McCracken, Mark. “Farm Inputs.” Teach Me Finance,

[www.teachmefinance.com/Scientific\\_Terms/Farm%20inputs%20.html](http://www.teachmefinance.com/Scientific_Terms/Farm%20inputs%20.html).

Mehl, Jackson, and Neuendorf. “Soil Erosion.” Biodiversity a-z, 17 Dec. 2019,

[www.biodiversitya-z.org/content/soil-erosion](http://www.biodiversitya-z.org/content/soil-erosion).

“Monoculture Farming Explained: What Are the Pros and Cons? .” Earth

Observing System, 20 Oct. 2020, [eos.com/blog/monoculture-farming/](https://eos.com/blog/monoculture-farming/).

Norse, D., and Xiaotang Ju. “Environmental Costs of China’s Food Security.”

Research Gate, May 2015,

[www.researchgate.net/publication/277972744\\_Environmental\\_costs\\_of\\_China%27s\\_food\\_security](https://www.researchgate.net/publication/277972744_Environmental_costs_of_China%27s_food_security).

“Pastoral Farming.” Beef2Live, 8 Aug. 2021,

[beef2live.com/story-pastoral-farming-0-106915](https://beef2live.com/story-pastoral-farming-0-106915).

“Popular Unsustainable Techniques Used in Modern Agriculture.” Farm

Management, 21 May 2018,

[www.farmmanagement.pro/popular-unsustainable-techniques-used-in-m](http://www.farmmanagement.pro/popular-unsustainable-techniques-used-in-m)

modern-agriculture/#:~:text=According%20to%20studies%2C%20one%20of,fertilizers%2C%20and%20overexploitation%20of%20land.

“Runoff.” Merriam-Webster, Merriam-Webster,

[www.merriam-webster.com/dictionary/runoff](http://www.merriam-webster.com/dictionary/runoff).

“Slash and Burn Agriculture.” EcoLogic Development Fund, 11 Mar. 2015,

[ecologic.org/actions-issues/challenges/slash-burn-agriculture/](http://ecologic.org/actions-issues/challenges/slash-burn-agriculture/).

“Soil Compaction.” What Causes It, and How Do You Avoid It?,

[www.vaderstad.com/en/know-how/basic-agronomy/soil-analysis-and-protection/soil-compaction/](http://www.vaderstad.com/en/know-how/basic-agronomy/soil-analysis-and-protection/soil-compaction/).

“Solutions to Food Insecurity.” Tread Softly, Mar. 2021,

[treadsoftly.net/food-security/solutions-to-food-insecurity/](http://treadsoftly.net/food-security/solutions-to-food-insecurity/).

“The Sources and Solutions: Agriculture.” EPA, Environmental Protection Agency,

[www.epa.gov/nutrientpollution/sources-and-solutions-agriculture](http://www.epa.gov/nutrientpollution/sources-and-solutions-agriculture).

“Timeline.” Innovature, [innovature.com/timeline](http://innovature.com/timeline).

“UN Milestones - Food Security and Nutrition .” United Nations Dag Hammarskjöld

Library , United Nations, [research.un.org/en/foodsecurity/un-milestones](http://research.un.org/en/foodsecurity/un-milestones).

“Unsustainable Agriculture.” Citizens of Earth,

[www.thecitizensofearth.org/unearthing-our-roots](http://www.thecitizensofearth.org/unearthing-our-roots).

Veeck, Gregory, et al. "Challenges of Agriculture and Food Systems Issues in China and the United States." *Geography and Sustainability*, Elsevier, 16 May 2020,  
[www.sciencedirect.com/science/article/pii/S2666683920300225](http://www.sciencedirect.com/science/article/pii/S2666683920300225).

"Water in Agriculture." World Bank,  
[www.worldbank.org/en/topic/water-in-agriculture](http://www.worldbank.org/en/topic/water-in-agriculture).

"What Are Arable Crops?" FutureLearn,  
[www.futurelearn.com/info/courses/explore-how-farmers-produce-food-sustainably/0/steps/60777](http://www.futurelearn.com/info/courses/explore-how-farmers-produce-food-sustainably/0/steps/60777).

"What Causes a Drought?" NOAA SciJinks – All About Weather,  
[scijinks.gov/what-causes-a-drought/](http://scijinks.gov/what-causes-a-drought/).

"What Is Crop Diversity and Why It's so Important." FruitStand.com,  
[fruitstand.com/blogs/articles/what-is-crop-diversity-and-why-its-so-important](http://fruitstand.com/blogs/articles/what-is-crop-diversity-and-why-its-so-important).

"What Is Sustainable Agriculture?" SARE Western, 7 Aug. 2020,  
[western.sare.org/about/what-is-sustainable-agriculture/](http://western.sare.org/about/what-is-sustainable-agriculture/).

## Appendix

- I. Detailed study on food waste and its relationship with nutrition and environmental sustainability.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0195405>

- II. Report examining the similarities between the challenges China and the US face with regards to agriculture.

<https://www.sciencedirect.com/science/article/pii/S2666683920300225>

- III. The United Nations Conference on Trade and Development's (UNCTAD) policy brief on food security and sustainable agriculture in the least-developed countries (LDCs).

[https://unctad.org/system/files/official-document/presspb20116\\_en.pdf](https://unctad.org/system/files/official-document/presspb20116_en.pdf)

- IV. Article which compares the United States' approach to agricultural practices with the European.

<https://theconversation.com/growing-food-and-protecting-nature-dont-have-to-conflict-heres-how-they-can-work-together-146069>

- V. Video providing a clear explanation for eutrophication

<https://youtu.be/92TFJTtug6k>

- VI. Overview, targets, and progress with regards to the second United Nations Sustainable Development Goal2

<https://sdgs.un.org/es/goals/goal2>