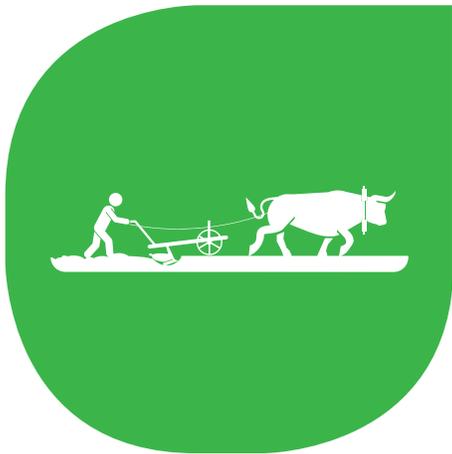




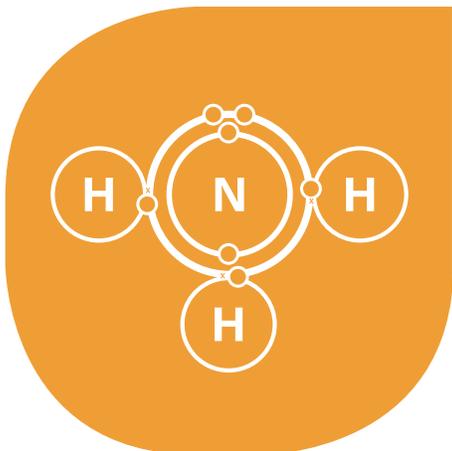
# 10 PIVOTAL AGTECH ADVANCEMENTS



## 1 CREATION OF THE PLOW

(1837)

John Deere created the first steel plow after trying to sow the fields in Grand Detour, Illinois, where the soil was different from the East Coast, resulting in broken wooden plows. The new plow could cut clean furrows through sticky Midwest prairie soil, paving the way for farmers in that area. Today, plows are used less, due in large part to the popularity of minimum tillage to reduce soil erosion and conserve moisture, however, the impact at that time was substantial to agricultural growth.



## 2 HABER-BOSCH PROCESS

(1909)

German chemist Fritz Haber developed this process, also known as The Haber Process, which creates ammonia from hydrogen and nitrogen. For agriculture, this made the manufacturing of ammonia for fertilizer economically feasible. In 1931, chemists Carl Bosch and Friedrich Bergius furthered the technology to allow for large-scale processing. Today, The Haber Process produces about 500 million tons of fertilizer every year.



# 3 **GREEN REVOLUTION**

(1930s-1960s)

This period is notable for the significant increase in agricultural productivity due to the introduction and adoption of new technologies, including high-yield varieties of grains, pesticides, and improved management and mechanization techniques. Many of these initiatives are credited to Norman Borlaug, the "Father of the Green Revolution".



# 4 **MECHANICALIZATION OF TRACTORS**

(BEGAN IN 1945)

During WWII, equipment manufacturers in the U.S. were told that making tractors was a patriotic duty, so when the war ended, the tractor began to take the place of draft animals on farms. The number of tractors in use on U.S. farms peaked at just under 5 million in the late 1960s and 70s, reaching their highest numbers in 1982. The result was a sharp rise in productivity per acre; though now farmers are managing crops, irrigation, pesticide use, and more with GPS receivers and advanced technologies.



# 5 **DRIP IRRIGATION**

(EARLY 1960s)

Though irrigation systems have been used throughout time, when Israeli engineer and inventor Simcha Blass and his son, Yeshayahu, created the first practical surface drip irrigation emitter in the late 1950s, it revolutionized how crops could be grown. As the name implies, drip irrigation allows water to drip slowly on the roots of the plants through larger and longer passageways at a decreased velocity, conserving water and fertilizer. The technology has allowed growth in desert climates and areas of the world susceptible to drought.



## 6 **LANDSAT MISSIONS BEGIN**

(1972)

On July 23, 1972, NASA and the U.S. Geological Survey launched the Earth Resources Technology Satellite (ERTS-1), later renamed Landsat 1. Stimulated by U.S. successes in planetary exploration using unmanned remote sensing satellites, the ERTS-1 would help gather facts about Earth's natural resources using sophisticated remote sensing observation instruments. In 1994, farmers began using this satellite technology to track and plan their farming practices. Launches of supplementary Landsat satellites followed over the next four decades, with the most recent launch of Landsat 8 in 2013.



## 7 **DEVELOPMENT OF PRECISION AG EQUIPMENT**

(EARLY 1980s)

The development and execution of precision agriculture was made possible by combining GPS and GIS. These two technologies pair accurate positioning with real-time data collection, leading to more precise farming techniques. At first, some techniques were doubted or considered unnecessary, such as the autosteer tractor. But once the benefits and operational efficiencies were realized, the improved tool became an integrated part of the industry. Today, precision technologies, such as aerial imagery, electromagnetic soil mapping and crop yield data collection continue to propel the farming business model forward toward increased productivity. A greater focus on precision agriculture has led to optimized returns on inputs and field efficiencies, while simultaneously preserving resources.



## 8 **COMMERCIAL LAUNCH OF GMO**

(1997)

Farmers have been selecting the most productive plants and seeds from their domesticated crops for up to 10,000 years. However, at the end of the 20th century, scientists gained the ability to select productive traits at the individual gene level, controlling the placement of genes in new crops, creating GMOs. In 1994, the first GMO food product, the Flavr Savr™ tomato, was approved by the U.S. Food and Drug Administration (FDA) and introduced to the market. Today, it is estimated that the vast majority of corn and soy grown in North America are genetically modified. It seems the ongoing question is not whether GMOs will be used, but how they'll be managed moving forward.



# 9 **AG TECHNOLOGY BOOM** (2013)

The purchase of Climate Corporation by Monsanto for \$930 million is believed to have triggered the agtech boom. Prior to this purchase, few investors gave much thought to the technological advancements in our agriculture system. A purchase of this size caught the attention of innovation centers like Silicon Valley and encouraged financial investments of tech advancements for agriculture, including from people outside of the industry. More and more agtech start-ups emerged, raising a total US\$4.6 billion in investments in 2016. Of course, there were well-established players and tools in the market before that time, such as the GEOSYS partnership with WinField. GEOSYS provided the satellite imagery for its R7 Tool for field monitoring, which was fully operational in 2012, but this “boom” brought agtech front and center for the masses.



# 10 **CRISPR** (2016)

The new genetic engineering tool known as CRISPR-Cas9 – Clustered Regularly Interspaced Short Palindromic Repeats aka CRISPR – can alter genetic material inside a plant or animal with advanced accuracy and speed. The tool was initially developed in 2012 by Jennifer Doudna and Emmanuelle Charpentier of the Innovative Genomics Institute with the goal of discovering new disease therapies. However, the technology is quickly expanding and is being used to research major crops and how to sustain a healthy microbial environment that can improve crop yields and nurture a balanced ecosystem.

## **ABOUT GEOSYS**



*GEOSYS supplies real-time, actionable insights to clients across the agriculture supply chain based on satellite and weather technology. As the first global digital agriculture company founded by agronomists, we bring 30 years of industry experience to businesses in more than 50 countries. GEOSYS provides clients with the data, analysis and insights needed to make more informed decisions by using the latest research in agronomics, information technologies and satellite imagery. Products range from worldwide risk*

*management and supply monitoring of agricultural commodities to input sales and precision farming support. GEOSYS also develops highly customized business solutions for large, multinational agricultural companies. With global headquarters in Minneapolis, Minnesota, GEOSYS has sales and marketing teams in North America, Europe, Australia and Brazil. [www.geosys.com](http://www.geosys.com)*