



Issue Brief: New Technologies

Maricopa County Food System Coalition - November 2021

Introduction

Modern farming technology is **used to improve the wide types of production practices employed by farmers**. It makes use of hybrid seeds of selected variety of a single crop, technologically advanced equipment, and lots of energy subsidies in the form of irrigation water, fertilizers and pesticides.

New Disruptive Technology Innovations in Agriculture 2021

- GIS (geographic information system) and GPS (global positioning system) agricultural.
- Imagery from satellites.
- Aerial photography from drones and other sources.
- Farming software and data over the internet.
- Combining multiple datasets.

New-age technologies focus on **robotics, precision agriculture, artificial intelligence, block chain technology**, and more. Some technological advancements that have innovated agriculture: Improved productivity from mechanization of agriculture.

There are four major components of food security:

- **Food availability** – the “supply side” of food security, often determined by food production, stock levels, and net trade.
- **Food access** – whether one has adequate resources to obtain food for and is often related to income, physical access to food, and the cost of food.
- **Food utilization** – if food being consumed by individuals promotes health and well-being.
- **Food stability** – how consistent and adequate the other three components are.

Tried & True

Hydroponics - Hydroponic farms are growing crops with innovative technologies, including machine learning algorithms, data analytics, and proprietary software, in the absence of soil and growing seasons.

The cost and growing cycle for hydroponic crops can be forecast precisely, and indoor farms can be built wherever people require fresh produce. The farms are engineered to produce clean crops without pesticides in hygienic buildings monitored by computers to avoid bacterial contamination.

Aquaponics -

Aquaponics farming is a method of sustainable agriculture that forms a symbiotic relationship between fish and plants. It involves the use of a fish tank placed below a grow bed for plants, where the main input to the system is fish food.

When the fish produce waste, it is cycled out of the fish tank into the grow bed, where bacteria transform ammonia into nitrates that plants need to grow. The water is then filtered and returned to the fish tank, aiding in the highly optimized, zero-waste process of farming fish and plants together.

What's New

Digital Technologies - Integrated digital technologies that help with production, monitoring and planning are ushering in [the future of agriculture](#). Through these technological advancements, farmers are able to improve their yields while conserving resources, more quickly identify areas of their fields

that require attention, collect and categorize data, and more. Digital agriculture technologies — some of which were developed by CropLife International member companies — are already in use in many markets. We have showcased some of these technologies in our #CropTech innovations series highlighting the latest advancements in crop protection technology. In 2021, we will likely see even more widespread focus on these innovations as companies work to deliver these digital solutions to farmers all over the world.

Vertical Farms – Vertical farms operate without the need for favorable weather, fertile soil, lots of water and the usual high-running costs associated with the crop sector. Crops are produced closer to the consumer which will reduce logistical costs and environmental impact and maximize shelf-life.

Crops are grown without soil in a nutrient-rich solution using an ultrasonic semi-mist culture aeroponic and hydroponic growing system. Plant roots are suspended mid-air in high humidity, and intermittently misted with a nutrient solution that increases nutrient use efficiency and plant growth with a surplus of oxygen at the root surface.

The system is optimized to deliver specific combinations of lighting, environmental and nutrient mix profiles to suit the needs of specific crops.

Gene Editing - Scientists are deploying a new weapon in the fight against food waste: gene editing. They hope that the technology can help develop next-generation crops that are more resistant to pests and diseases, sustain less damage during transportation and storage, or have a longer shelf life – essentially quasi-imperishable produce.

Unlike in genetically modified crops – which typically involve the removal of a preferred gene from one species and introducing it into another – gene editing is a small, controlled tweak to the existing DNA of an organism. This can be carried out using several methods, including the CRISPR technique that enables scientists to remove, add, or alter sections of a DNA sequence to obtain desired traits.

Resources

This Innovative Company Helps Tackle Wildfires and Drought in California

https://www.treehugger.com/innovative-company-tackle-wildfires-drought-california-5208156?utm_campaign=treehugger&utm_medium=email&utm_source=cn_nl&utm_content=25644605&utm_term=

Vertical farms take root to sustain the food supply chain

<https://sustainabilitymag.com/supply-chain-sustainability/vertical-farms-take-root-sustain-food-supply-chain>

Advanced Technologies – Farming & Ranching, USDA

<https://nifa.usda.gov/topic/farming-and-ranching>

No Soil. No Growing Seasons. Just Add Water, Technology

<https://cacm.acm.org/news/254204-no-soil-no-growing-seasons-just-add-water-technology/fulltext>

How Can 'Aquaponics' Farming Help Create Sustainable Food Systems?

<https://www.globalcitizen.org/en/content/aquaponics-create-sustainable-food-systems/>

Digital Agriculture 2021: Bringing Innovative Technology to One of the Oldest Industries

<https://croplife.org/news/digital-agriculture-in-2021-bringing-innovative-technology-to-one-of-the-oldest-industries/>

Farmers need practical innovation, not moonshots, to stave off global food crisis

<https://www.weforum.org/agenda/2021/09/agriculture-farming-innovation-technology/>

How hydroponic farming is redefining the approach of adopting a healthy lifestyle?

<https://timesofindia.indiatimes.com/life-style/home-garden/how-hydroponic-farming-is-redefining-the-approach-of-adopting-a-healthy-lifestyle/articleshow/83951253.cms>

These super crops can save us from climate disaster

<https://www.wired.co.uk/article/farm-food-waste-genetics>

'It's not as carbon-hungry': UK's largest sunlit vertical farm begins harvest

<https://www.theguardian.com/environment/2021/oct/18/its-not-as-carbon-hungry-uks-largest-sunlit-vertical-farm-begins-harvest>