



Agtech Trends In 2020

How 6 trends are
transforming the future
of agriculture

Index

Indoor Vertical Farming 4

Farm Automation 6

Livestock Farming Technology 8

Modern Greenhouses 10

Blockchain 12

Artificial Intelligence 14



Innovation is more important in modern agriculture than ever before. The industry as a whole is facing huge challenges, from rising costs of supplies, a shortage of labor, and changes in consumer preferences for transparency and sustainability. There is increasing recognition from agriculture corporations that solutions are needed for these challenges.

In the last 10 years, agriculture technology has seen a huge growth in investment, with \$6.7 billion invested in the last 5 years and \$1.9 billion in the last year alone. Major technology innovations in the space have focused around areas such as indoor vertical farming, automation and robotics, livestock technology, modern greenhouse practices, precision agriculture and artificial intelligence, and blockchain.

PLUGANDPLAY

Indoor Vertical Farming

What is Indoor Vertical Farming?

Indoor vertical farming can be defined as the practice of growing produce stacked one above another in a closed and controlled environment. By using growing shelves mounted vertically, it significantly reduces the amount of land space needed to grow plants compared to traditional farming methods.

This type of growing is often associated with city and urban farming because of its ability to thrive in limited space. Vertical farms are unique in that some setups don't require soil for plants to grow.

Most are either hydroponic, where vegetables is grown in a nutrient-dense bowl of water, or aeroponic, where the plant roots are systematically sprayed with water and nutrients. In lieu of natural sunlight, artificial grow lights are used.



PLUGANDPLAY

Why is it important?

Reliable Harvests with Maximum Crop Yield:

Recent technological advances in the agriculture space allow vertical farms to control every aspect of growing crops. Variables such as light, humidity, and water can all be precisely measured year-round, resulting in reliable produce 24/7.

Reduced Labor Costs:

Labor has always been a pain point in agriculture -- it's one of the most expensive aspects of farming and the industry is currently experiencing a labor shortage. Vertical farming can significantly reduce labor needs, and therefore cost, by using robots to handle harvesting, planting, and logistics.

Optimized Energy Conservation:

Vertical farms are built to optimize energy conservation by significantly reducing water and energy usage. Studies show that vertical farms use up to 70% less water than traditional farms, which is key in drought-prone zones.

Sustainable, Environmentally Friendly Growth:

Indoor vertical farms take up significantly less land space than traditional methods, which makes it appealing in local urban farming centers. With a reduced supply distribution chain, food gets to the consumer's table faster and fresher while also reducing its carbon footprint on the planet.

No Pesticides or Herbicides:

Since indoor vertical farms are completely sealed off from the outside environment, there are virtually no pests. As a result, there is virtually no need for pesticides or herbicides. Food grown is healthier, safer, and certified organic, making it even more appealing to consumers.

Startups



Aerofarms

This New Jersey based startup has developed an aeroponic growing system that can grow without soil or sun, in any location. Aerofarms has proven to use 95% less water, 390 times more land efficient, 30 crops per season, and even the produce flavor is better. Each plant is monitored on more than 130,000 data points that is reviewed and tested using predictive analytics to improve their growing systems. With remote monitoring and controls in place, they have minimized the typical risks associated with traditional agriculture.



Iron Ox

Iron Ox is the first vertical farm to be run (almost) entirely by robots. The company has developed two robotic systems: one wheeled robot moves pallets of seeds around the warehouse and a robotic arm picks up individual plants and moves them from each pallet. Their hydroponic growing system uses 90% less water over traditional farming while growing 30 times the amount of crops per acre of land.

Farm Automation

What is Farm Automation?

Farm automation, often associated with “smart farming”, is technology that makes farms more efficient and automates the crop or livestock production cycle.

An increasing number of companies are working on robotics innovation to develop drones, autonomous tractors, robotic harvesters, automatic watering, and seeding robots.

Although these technologies are fairly new, the industry has seen an increasing number of traditional agriculture companies adopt farm automation into their processes.



PLUGANDPLAY

Why is it important?

Harvest Automation:

Harvesting fruits and vegetables have always proven to be a difficult problem to automate. Harvest robots must be gentle with the produce to avoid bruising and damage. Companies like Agrobot have successfully developed the first robot for gently harvesting traditionally delicate produce while still meeting quality standards.

Autonomous Tractors:

Autonomous tractors can be controlled remotely or even pre-programmed to give full autonomy to a producer. Tractor automation kits are even being developed that makes automation more accessible for farmers by affordably retrofitting existing tractors with cutting edge driverless technology and implement control.

Seeding and Weeding:

Robotics developed for seeding and weeding can target specific crop areas. In seeding, this can easily reduce labor and mundane tasks on the farm. Weeding robotics can be incredibly accurate and reduce pesticide usage by 90% with computer vision.

Drones:

Drones can be used to monitor conditions remotely and even apply fertilizers, pesticides, and other treatments from above. They can also quickly and cost-effectively identify problem areas with imagery and infrared analysis to help farmers diagnose issues early on.

Startups



Abundant Robotics delivers robotic systems for the hardest jobs in agriculture. As robotics researchers, we've broken new ground in a variety of domains. For the past two years we've focused on hard problems in agriculture and are spinning-out of SRI International to build products based on our successful research. Our customers are grappling with urgent problems and are incredibly enthusiastic about the solution we've demonstrated.



Blue River Technology employs computer vision and robotics technologies to build intelligent solutions for the agricultural industries. Their See & Spray technology precisely sprays herbicides only where needed and with exactly what's needed, enabling a world in which every plant counts. This technology gives farmers a new way to control and prevent herbicide-resistant weeds, while also eliminating 90% of the herbicide volumes that growers spray today.

Livestock Farming Technology

What is Livestock Farming Technology?

Livestock technology can enhance or improve the productivity capacity, welfare, or management of animals and livestock.

New developments in the past 8-10 years have made huge improvements to the industry that make tracking and managing livestock much easier and data-driven.

This technology can come in the form of nutritional technologies, genetics, digital technology, and more.



PLUGANDPLAY

Why is it important?

Sensor and data technologies have huge benefits for the current livestock industry. It can improve the productivity and welfare of livestock by detecting sick animals and intelligently recognizing room for improvement. Computer vision allows us to have all sorts of unbiased data that will get summarized into meaningful, actionable insights. Data-driven decision making leads to better, more efficient, and timely decisions that will advance the productivity of livestock herds.

Sensors are being developed to monitor real-time milk quality, health, and pregnancy hormones. In addition, virtual fences exist that can move animals wearing a sensor to be moved remotely from one area of a pasture to another. Even robotics are advancing fast in this industry, where it's addressing the challenges of labor shortages on traditional livestock farms. 12% of dairy farms are currently using robots and is expected to grow to 20% in the next 5 years.



Startups



Cainthus

Cainthus is developing the world's most advanced technology for dairy farms today; technology that's transformational for animals, farmers, and the production of food. Using computer vision and artificial intelligence to identify health, reproduction, and environmental changes early on, Cainthus translates visual information into actionable data.



**Rex Animal
Health**

Rex Animal Health is on a mission to help livestock producers and farmers feed the world by increasing productivity and predicting, preventing, and precisely managing disease in the herd. They have built up the largest database of clinical, health, performance, and genetic data on these livestock. Also, agribusinesses can use this data in order to understand their supply chain to identify the source of potential food borne illness, find the most efficient producers, set prices in commodities trading, and to understand and assess risk to increase transparency in the food supply chain.

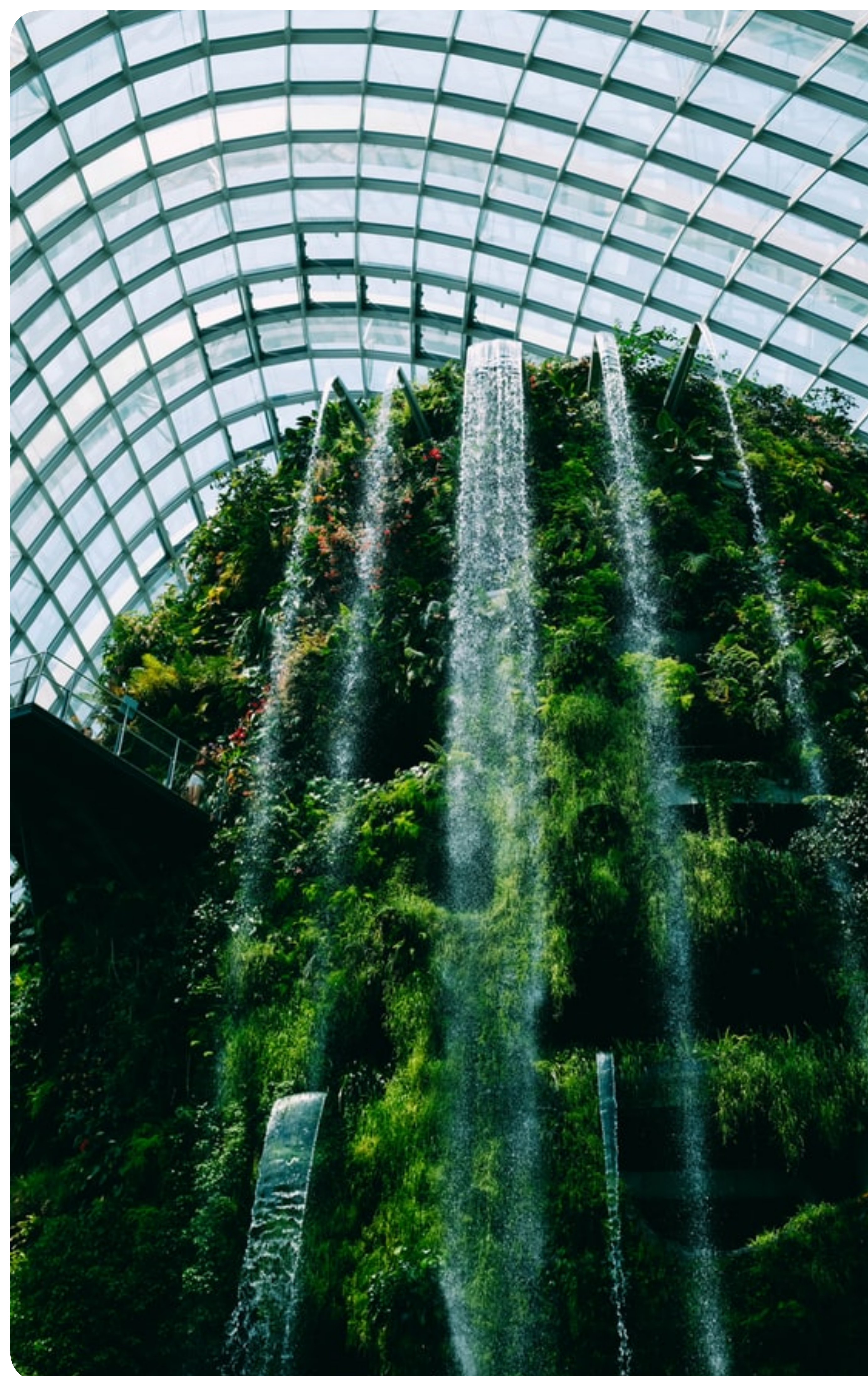
Modern Greenhouses

What is Modern Greenhouse?

Greenhouses today are increasingly emerging that are large-scale, capital-infused, and urban-centered. As the market has grown dramatically, it has also experienced clear trends in recent years. Modern greenhouses are becoming increasingly tech-heavy, using LED lights and automated control systems to perfectly tailor the growing environment.

Successful greenhouse companies are scaling significantly and located their growing facilities near urban hubs to capitalize on the ever-increasing demand for local food, no matter the season.

To accomplish these feats, the greenhouse industry is also becoming increasingly capital-infused, using venture funding and other sources to build out the infrastructure necessary to compete in the current market.



PLUGANDPLAY

Why is it important?

Combined, the entire global greenhouse market currently produces nearly US \$350 billion in vegetables annually, of which U.S. production comprises less than one percent. Combined, the entire global greenhouse market currently produces nearly US \$350 billion in vegetables annually, of which U.S. production comprises less than one percent.

Nowadays, in large part due to the tremendous recent improvements in growing technology, the industry is witnessing a blossoming like no time before. Greenhouses today are increasingly emerging that are large-scale, capital-infused, and urban-centered.

A major part of this recent transformation in the greenhouse industry has been the rise of a technology-infused Smart Greenhouse Market. Smart Greenhouses feature new levels of technology and control that allow for further optimization of growing conditions. These technologies include LED grow-lights that provide energy efficient supplemental lighting during cloudy conditions and at night, as well as an array of smart sensors that can detect issues with plants or the growing environment as they arise and trigger responses from different control systems.

Startups



BrightFarms

BrightFarms grows local produce nationwide by financing, building, and operating greenhouse farms in metropolitan areas. They partner with nearby grocery store chains, enabling the company to quickly and efficiently eliminate time, distance, and costs from the traditional food supply chain. BrightFarms' greenhouses consist of a hydroponic system utilizing a combination of natural and artificial light to grow its produce. It's distinct advantage is the short distance the produce has to travel to arrive in stores, resulting in sustainable energy savings and cost reductions. Its operations use 80% less water, 90% less land, and 95% less shipping fuel than traditional land farmers.



**Babylon
Micro-farms**

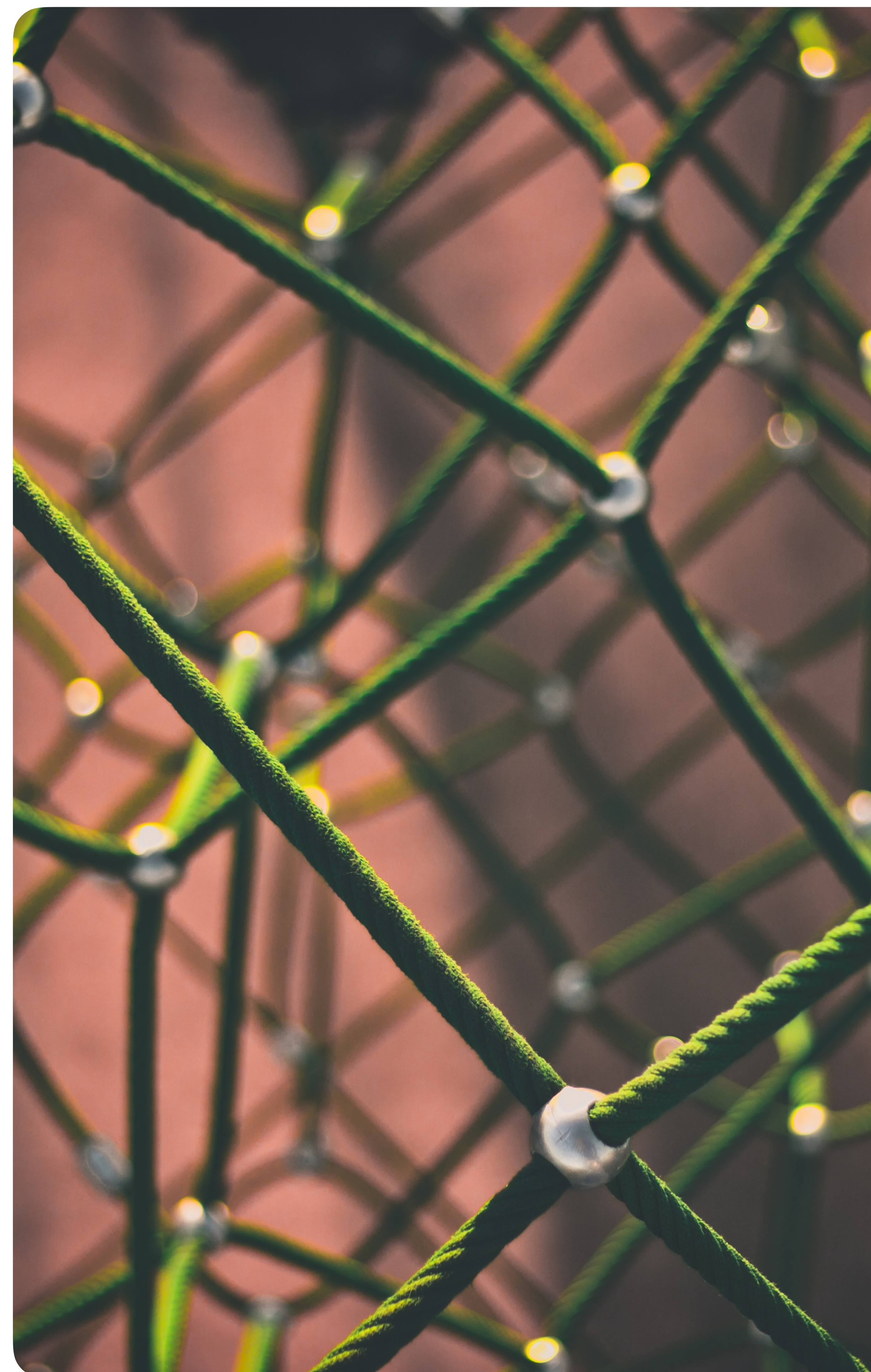
Babylon Micro-farms provides an on-demand indoor farming service to make sustainable indoor farming more accessible than ever before. Their farms grow fresh produce 2x faster using 90% less water than conventional agriculture, without the use of pesticides or harmful chemicals. Their business model drastically reduces the upfront costs and expertise associated with indoor agriculture, powered by a patented IoT platform that remotely operates the ecosystem of farms.

Blockchain

How is Blockchain transforming Agriculture?

Blockchain's capability of tracking ownership records and tamper-resistance can be used to solve urgent issues such as food fraud, safety recalls, supply chain inefficiency and food traceability in the current food system.

Blockchain's unique decentralized structure ensures verified products and practices to create a market for premium products with transparency. Thus, commanding a premium price would provide a monetary incentive.



PLUGANDPLAY

Why is it important?

Food traceability has been at the center of recent food safety discussions, particularly with new advancements in blockchain applications. Due to the nature of perishable food, the food industry at whole is extremely vulnerable to making mistakes that would ultimately affect human lives. When foodborne diseases threaten public health, the first step to root-cause analysis is to track down the source of contamination and there is no tolerance for uncertainty.

Consequently, traceability is critical for the food supply chain. The current communication framework within the food ecosystem makes traceability a time-consuming task since some involved parties are still tracking information on paper. The structure of blockchain ensures that each player along the food value chain would generate and securely share data points to create an accountable and traceable system.

Vast data points with labels that clarify ownership can be recorded promptly without any alteration. As a result, the record of a food item's journey, from farm to table, is available to monitor in real-time.

The use cases of blockchain in food go beyond ensuring food safety. It also adds value to the current market by establishing a ledger in the network and balancing market pricing. The traditional price mechanism for buying and selling relies on judgments of the involved players, rather than the information provided by the entire value chain. Giving access to data would create a holistic picture of the supply and demand. The blockchain application for trades might revolutionize traditional commodity trading and hedging as well. Blockchain enables verified transactions to be securely shared with every player in the food supply chain, creating a marketplace with immense transparency.

Startups



OriginTrail

OriginTrail is the first purpose-built protocol for supply chains based on blockchain technology. Blockchain technology has huge potential to decentralize trust in supply chains and bring enormous benefits. To unlock this potential, OriginTrail protocol was designed to tackle the prime challenges limiting the exchange and integrity of data in product supply chains. OriginTrail delivers IT providers in the supply chain industry quick implementation of blockchain-supported data sharing in multi-organizational environments.



Provenance

Powered by blockchain and open data, Provenance's platform gathers and shares key product information and journeys in a way that's secure, trustworthy and accessible.

Artificial Intelligence

How is AI transforming Agriculture?

The rise of digital agriculture and its related technologies has opened a wealth of new data opportunities. Remote sensors, satellites, and UAVs can gather information 24 hours per day over an entire field. These can monitor plant health, soil condition, temperature, humidity, etc. The amount of data these sensors can generate is overwhelming, and the significance of the numbers is hidden in the avalanche of that data.

The idea is to allow farmers to gain a better understanding of the situation on the ground through advanced technology (such as remote sensing) that can tell them more about their situation than they can see with the naked eye. And not just more accurately but also more quickly than seeing it walking or driving through the fields.

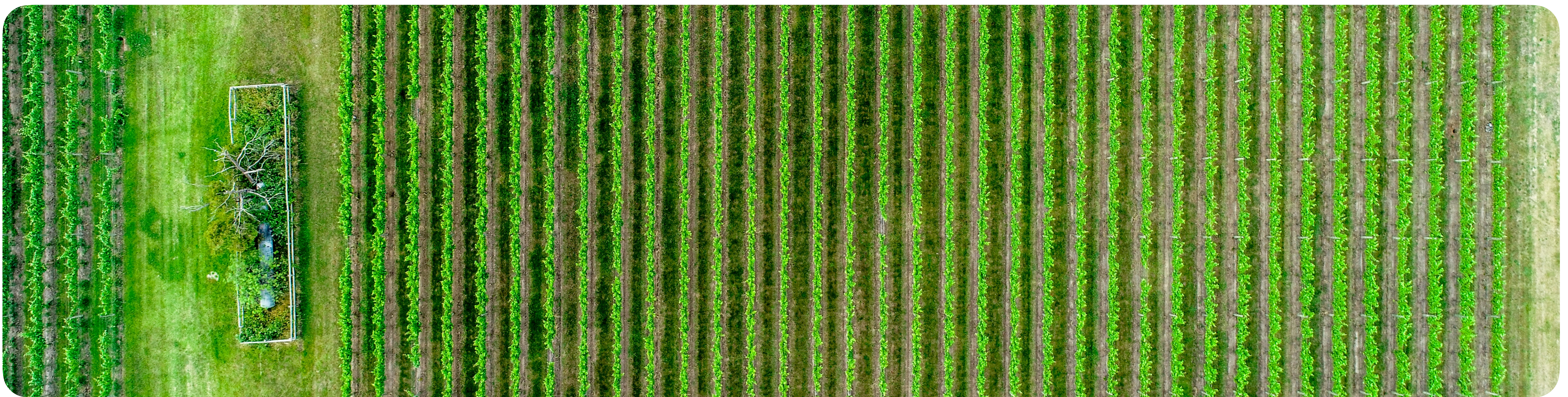


PLUGANDPLAY

Why is it important?

There is huge potential for artificial intelligence and machine learning to revolutionize agriculture by integrating these technologies into critical markets on a global scale. Remote sensors enable algorithms to interpret a field's environment as statistical data that can be understood and useful to farmers for decision-making. Algorithms process the data, adapting and learning based on the data received.

The more inputs and statistical information collected, the better the algorithm will be at predicting a range of outcomes. And the aim is that farmers can use this artificial intelligence to achieve their goal of a better harvest through making better decisions in the field.



Startups



**Aker
Technologies**

Aker Technologies Inc, develops smart in-season crop management tools to accelerate the adoption of precision farming practices across the industry. Aker has developed patented computer vision and biometric sensors, along with software and service solution to detect, classify and measure pests pressure, airborne pathogens, crop diseases and fertility issues inside the canopy of crop fields.



Agrowatcher

Agrowatcher uses computer vision technology and multispectral imaging to discern differences in crops for crop identification and detection of water stress, pests, infestation, and diseases. Plant leaf color and morphology changes are our indicators. The system uses a special digital camera that can record reflected light energy imagery in multiple bands across the visible and near-infrared spectrum with significant resolution.

To stay up to date on the latest agriculture technology startups, join the Plug and Play Platform. Our Agtech accelerator program runs twice a year boosting our startups through corporate business development, networking and pitch events, world-class mentorship, and the potential for investment.

[PNPTC.COM](https://pnptc.com)