The TripleBottom

Agritech Playbook
February 2022

Current state of Global agriculture

Variable conditions ... The conditions in which food is produced vary tremendously across the world. In developed nations tech solutions are being adopted by farmers to improve productivity.

Land use... 71% of the world's land surface is habitable, and 50% of this land is dedicated to agriculture = global agriculture systems are incredibly diverse.

Efficiency... Food production per farmer has increased over the last few decades, while the share of the global population working in agriculture has fallen. In high-income countries agriculture accounts for 3% of total employment, but over 40% in some major emerging economies (like India), and even higher in less developed economics.

Smallholder Farms... with under two hectares of land represent 84% of farms globally but produce just one-third of global crop production. Many of these smaller farms produce food to meet their personal needs and trade any surplus.

Accessibility... Farms and fisheries operating on a small scale seldom have the resource or education to access the latest technology and hesitate to try new approaches perceived as being too risky to their own food security. Many also lack the connectivity required for advanced tech solutions.

Concentrated production... A small number of countries account for a large share of exports of Agricultural produce due to their comparative advantage in natural environmental and social conditions - five countries account for over two-thirds of the global wheat and beef exports.
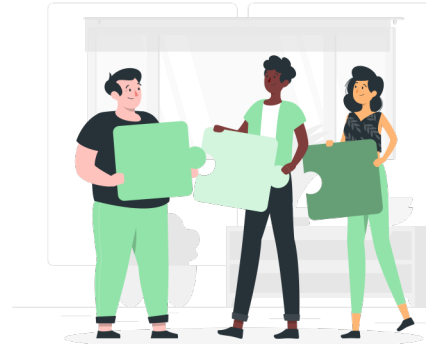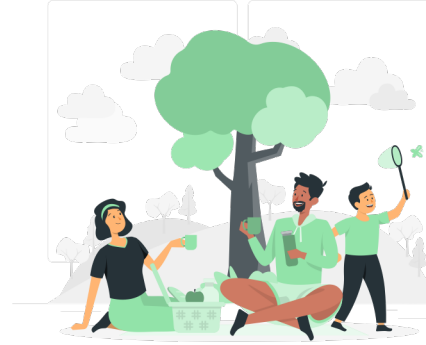
ENVIRONMENTAL

- Current unsustainable farming practices could lead to 95% of the world's land being degraded by 2050.

- Food production relies on predictable weathers, warm soils, fresh water and sufficient growing seasons all of which are jeopardised by Climate Change.

- Current farming practices influence climate change and directly impacting the environmental conditions agriculture relies on.

SOCIAL

- Almost 2 billion people don't have access to safe, nutritious and sufficient food, and

- There's expected to be another 2 billion mouths to feed by 2050 which will need a 60% increase food production.

- For farm workers, the growth in large-scale, corporate farms rely on hiring expendable and cheap labour resulting in poor working conditions.

GOVERNANCE

- Public policy has traditionally focused on maximised food production with little emphasis on environmental, climate or health outcomes.

- Policy is shifting in developed nations towards sustainable practices. Yet, developing nations will be reliant on continuing to maximise production.

The Evolving Agritech Landscape

INPUTS → **PLANNING / MANAGEMENT** → **PRODUCTION** → **END MARKETS**

AGRICULTURAL BIOTECH / GENOMICS

A range of tools, including traditional breeding, that alter living organisms, to make or modify products; improve plants or animals; or develop microorganisms for specific agricultural uses. Increasingly these processes rely on advanced analytics and artificial intelligence.

LOW GHG FERTILISERS AND PESTICIDES

Technologies that enable low-carbon fertiliser production and reduced anthropogenic emissions of methane (CH_4) and nitrous oxide (N_2O)

FARM MANAGEMENT

Includes software that allows farmers to more efficiently manage their machinery aimed at improving performance and extending useful life of farm equipment and other assets

SMART CROP AND LIVESTOCK MONITORING

Smart –Crop: Combining irrigation and nutrient-distribution equipment with sensor data and imagery analysis, to optimise resource usage and crop growth through real-time adjustments.

Livestock: software and hardware specifically aimed at better understanding livestock, from breeding patterns, to genomics, to detecting illness.

ROBOTICS & DRONES

Drones, robots or intelligent farm machines that perform various farm functions more efficiently and boost yield.

PRECISION AGRICULTURE

Using big data and predictive analytics to address farm-related issues and make better decisions to save energy, increase efficiency, optimise herbicide and pesticide application among other uses.

ALT-PROTEINS

An umbrella for three main processes that can replace animal protein production: Plant-based, Fermentation, and Cultivated meat

VERTICAL FARMING

Utilise technology to provide alternative farming methods to enable farming in locations and settings that cannot support traditional farming.

VALUE CHAIN TRANSPARENCY

Utilising tech including blockchain and open data platforms to provide end-to-end supply chain transparency and authenticate claims related to ethical and environmentally friendly sourcing to downstream stakeholders

MARKETPLACES

Marketplaces relevant to agriculture by connecting farmers directly to suppliers or consumers without any middlemen. While some are e-commerce platforms, others use tech to facilitate physical marketplaces

Agritech start-up landscape

FARM MANAGEMENT

conservis
CropIn — Innovating Fields
trecker.com
landmapp — unlocking land value
AEGRO — Colhendo Conhecimento

SMART-CROP AND LIVESTOCK MONITORING

Glaia
Phytoform
Noogata
EWETRACK
sourceful
Sencrop

PRECISION AGRICULTURE

Strider
adapt-N
GAMAYA
CropMetrics — YIELD OPTIMIZATION TECHNOLOGY
CropZilla
FARMERS BUSINESS NETWORK
agrilyst
bovcontrol
MyAgData.com

LOW GHG FERTILISERS / PESTICIDES

PIVOT BIO
monolith
N2 —— Applied

ALT-PROTEIN

THE PROTEIN BREWER
OCEAN HUGGER FOODS, INC™
BEYOND MEAT
Sunfed
SuperMeat
mosa meat
IMPOSSIBLE™
MEMPHIS MEATS

ROBOTICS AND DRONES

DroneAg — FARMERS WHO KNOW DRONES
Hummingbird Technologies
GAMAYA
EARTHSENSE AGRICULTURAL INTELLIGENCE
Dogtooth
Accelerated Dynamics
BioCarbon Engineering
Small Robo Company
odd.bot
MUDDYMACHINES
AAS Autonomous Agri Solutions

VALUE CHAIN TRANSPARENCY

sourcemap — where things come from
World Business Council for Sustainable Development
everledger
PROVENANCE
CIRCULARISE
BLOCKVERIFY

VERTICAL & URBAN FARMING

infarm
V-FARM
FREIGHT FARMS
plenty
LettUs GROW
BOWERY
BRIGHT FARMS
AeroFarms®

BIOTECH / GENOMICS

BN Bio Nebraska
BioPrime AGRISOLUTIONS PVT LTD
ART LAB SOLUTIONS — SOLUTIONS FOR CATTLE BREEDING
Microbe+

MARKETPLACES

WAYCOOL
Kamatan
AgroStar
Gramophone
ninjacart
BigHaat.com
crofarm
S4S technologi
DeHaat Seeds To Market
Unnati
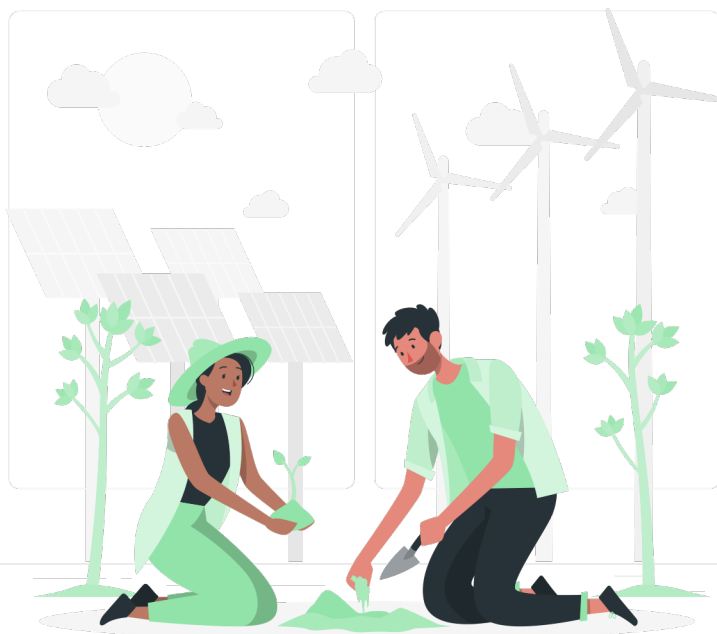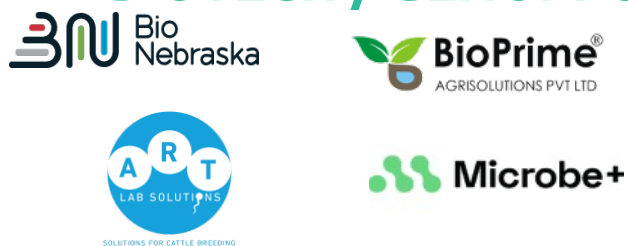
Agritech Investment Headlines

KEY TAKEAWAYS:

- **Growing financial investment** … in alternative foods and low GHG proteins, which has shown 121% YoY growth.

- **Driven by…** consumer demand for sustainable products and a maturing challenge area with greater levels of investor confidence.

- **Don't forget…** Agricultural biotech and genomics, natural solutions, value chain GHG reduction and vertical and urban farming have each raised in excess of US$1bn in 2021.

- **Unicorns galore:** Food, Agriculture and Land Use recorded 13 Unicorns (Start-ups reaching $1Bn valuation in 2021) from a total of 78.

- **Across Agric landscape:** Five of these unicorns are in alternative foods and low GHG proteins, three in value chain GHG reduction, two in precision agriculture and robotics, two in vertical and urban farming and one in Agricultural biotech and genomics.

Data source: Triple Bottom Analysis of Deal room and Crunchbase data

BIGGEST UNICORNS

1. **Pinduoduo** ($99.7bn)
2. 美菜 meicai.cn ($7bn)
3. FARMERS BUSINESS NETWORK ($4bn)

MOST ACTIVE INVESTORS

1. **SOSV** — 34 deals
2. **Temasek** — 25 deals
3. **New Crop Capital** — 20 deals

FASTEST GROWING: VERTICAL FARMING

Growth: $1.5bn to $3bn (2021)
Notable deals:
1) **BOWERY** - $300m
2) plenty - $400m

LARGEST SECTOR: ALT FOODS

Growth: $0.42bn to $1.2bn (2021)
Notable deals:
1) mosa meat - $90m
2) Protein Brewery - $26m

Number of deals for 2021
384
A **3.8%** YoY increase

Total investment level for 2021
$11.2Bn
A **152%** YoY increase

Fastest Growing - Vertical Farming

WHAT IS IT & WHY?

- Fully controlled environment indoors, in many stacked layers meaning it's suited to farming in urban areas.

- It focuses predominantly on producing leafy greens, using soil-free growing techniques by stacking plants in specially designed beds that make use of controlled lighting, irrigation, fertilisers and nutrients.

- It offers a system with reduced land requirements **(10-20x),** year-round crop production and up to **80% less water** use than conventional agriculture.

- As the global population grows, and ever-increasing number of people living in cities, vertical farming provides a solution to meet global food demands without putting extra stress on the environment. Issues with protein and produce imports, labour shortages, and climate disruption have all been tailwinds for the sector.

HURDLES TO OVERCOME

Limited Produce: Currently the focus is on producing leafy greens (like lettuce and herbs) as they're high in value and quick to grow. This will need to change if Vertical Farming is to be profitable.

The Learning Curve: We've only had one generation worth of optimising growing crops indoors

Goin' Public – hasn't been successful for vertical farming players. Aerofarms tried and failed in 2021. Appharvest was successful but saw record losses In its stock price in 2021.

#1: Urban agriculture crucial to master planning
Consumers in urban areas will turn to vertical agriculture in their efforts to promote sustainability, nutrition and food security. NEOM is one such project driving the future of food production in urban environments. This $500-billion technological megacity in Saudi Arabia will strive to become the world's most food self-sufficient city. Not to be left out incumbent cities are acting. New York City announced that it would establish an urban Agriculture office and an urban agriculture advisory board.

#2: Super-sustainable vertical farms
Lots of electrical energy is required to power LED lights, as typically vertical farms can't access natural light. This is changing - as vertical farms are being combined with greenhouses or glass roofs so they can access natural sunlight when it's available - significantly reducing electricity requirements. Shockingly Fresh have created the UK's largest naturally lit vertical farm.

#3: More variety in vertical crops
More vertical farms growing a wider variety of different produce. Currently most vertical farm systems focus on leafy greens but this is rapidly changing. Eden Green Technology is working on developing hydroponic growing to increase the plants options so expect to see vertically farmed tomatoes, peppers and cucumbers grown en-masse indoors soon. A great example is Oishii who are growing strawberries indoors.

#4: Moving into communities
Vertical Farms can provide inner-city communities with easy access to fresh, nutritious food while also providing a sense of 'community' by bringing people together through the food-producing process. Vertical Harvest, is building affordable housing designed around vertical farms and employing 50 locals to grow a million pounds of food each year for underserved residents.

Largest – Alt Proteins

WHAT IS IT & WHY?

We can view alternative proteins as an umbrella for three main processes that can replace animal protein production

- **Plant-based** - includes products such as soy, pea, pulses, seitan, and tempeh

- **Fermentation** - uses the high-protein content and rapid growth of microorganisms to efficiently make large amounts of protein-rich food.

- **Cultivated meat** - by taking small samples of animal cells and growing them in a controlled environment to replicate taste, texture, smell and nutrition without harm to animals.

- Keeping global emissions below 1.5 degrees Celsius by 2050 is **scientifically impossible without a transformation in global meat production**. Plant-based and cultivated meat are long-term, durable solutions that are pro-climate, market-based, and well-positioned to help meet global climate goals.

HURDLES TO OVERCOME

- **Taste & Nutrition:** Fulfilling high consumer expectations for products that replicate the qualities of the meat alternatives

- **Cost:** Alt-proteins are sold at a premium across geographical areas – predictions for price parity with meat are as near as 2023.

- **Regulation:** As of Jan 2022, the only nation to approve the sale of cultivated meat is Singapore and some elements of fermentation remain heavily regulated.

#1: Precision Fermentation and Plant Molecular Farming

Precision fermentation uses microbial hosts as "cell factories" for producing specific functional ingredients. These ingredients (enzymes, flavourings, pigments, fats) improve sensory characteristics of plant-based products or cultivated meat. Plant Molecular Farming is similar but uses plants instead of bacteria or fungi as cell factories. Nobell Foods, mixes casein protein made through PMF with plant ingredients to create plant-derived cheese that match the stretchiness, meltiness, and taste of animal-derived cheese. 2022 is the year of PF and PMF.

#2: Expanding toolkit blurring lines

In 2022, the lines between plant-based, fermentation and cultivated meat production platforms will become blurrier: We may see cultivated meat products launched as blends with plant protein ingredients, both to lower costs and appeal to consumers who are looking for nutritional features like fiber. We will likely see plant-based meat products enhanced with cultivated fat to improve sensory properties. Machine learning advances will support the development of new hybrids that mimic the taste and texture of animal products. Climax Foods develops machine intelligence tools to support product development.

#3: Upcycle and repurpose

The sustainability benefits of alt-proteins over animal-based products is already clear, but there is further opportunity to lower environmental impact (and cost) by upcycling ingredients and repurposing side stream materials. Grounded Foods uses rescued cauliflower in plant-based cheese. Some precision fermentation companies such as Air Protein and Solar Foods are using greenhouse gases as inputs in their fermentation processes

#4: Regulatory support for cultivated meat

In 2022, more consumers may get their first taste of cultivated meat. The U.S. Department of Agriculture (USDA) and U.S. Food and Drug Administration (FDA) have been actively working on a joint regulatory framework for cultivated meat since 2018, and several companies including UPSIDE Foods, Wild Type, and BlueNalu have indicated readiness to launch in U.S. when given the green light. Governments around the world, including the EU, Israel, and Canada, have granted over $66 million USD-equivalent to alternative protein research projects

Agritech Trends for 2022

Trend 1: Agritech growth continues
Our food security outlook is bleak. Fertiliser shortages and a changing climate are putting a lot of pressures on how we grow food, which means any innovation in agriculture will make a huge impact. We've seen 130% more funding in 2021 than we did in 2020, and we expect that trend to continue.

Trend 2: Valuations soar
We've seen valuations across the Agritech sector reach all-time highs, with companies raising on average at 40-90x revenue (or with no revenue at all) and the valuation boom reaching the pre-seed and seed stages where $7M - $28M pre-money valuations are more frequent than not. We believe increasing food security pressures and a conscious consumer boom means this trend is here to stay.

Trend 3: African innovation cashes in
Over the past five years, funding in African Agritech has risen consistently, 2021 saw 22 deals totalling $95M largely made up of a few bumper deals in Kenya and Nigeria (Twiga Foods, Apollo Agriculture, Aerorobotics). In 2022 we're on the lookout for a diversification to other African innovation hubs to help farmers access markets, insurance, financing and knowledge.
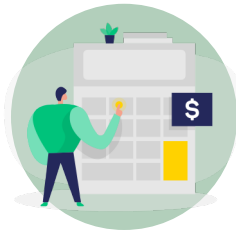
Trend 4: Inflation & Rising Food Prices
With record-breaking food price jumps in 2021, returns on AgriTech investment are facing headwinds in 2022. This will change the financial pressures and priorities for growth start-ups who will look to drive efficiency throughout their operations.
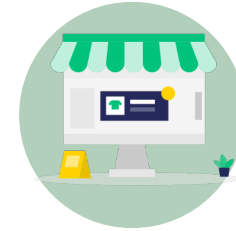
Trend 5: Disrupting India's Agri-landscape
Recent regulatory and technological changes means there's a **$35B** opportunity to disrupt India's agricultural landscape before 2025. A perfect example is start-up, **DeHaat**, which is addressing 3 of the biggest challenges faced by Indian farmers through their online platform: obtaining working capital, securing Agri-inputs (like seeds) and finding buyers for produce.

Trend 6: Agri finance explosion
Farmers adopting sustainable tech will be pricey as government-based lending processes can be clunky. We expect an uptick in investment in Agri finance solutions in 2022 . Agrograph, uses AI to analyse data on potential crop yield and farmer creditworthiness through satellite imagery and historical farm data. This streamlines loan applications and supports risk-based pricing – meaning better transparency for lenders and cheaper rates for farmers.

Trend 7: European Regenerative AgriTech
Regenerative farming places a **premium** on building up soil health, conserving water, and contributing to biodiversity. 2022 will see increasing government support for these practices but It can still be a daunting shift in practices for farmers. Expect an explosion of 'Decision support software' such as **Soil Capital** which analyses farm data and give a projection of future profit/losses if certain regenerative practices are adopted (Spoiler alert: Regenerative Agric is good for long term profit margins).
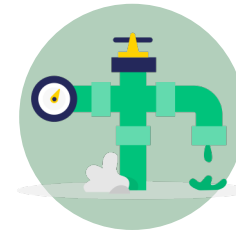
Trend 8: Alternative Tractor Fuel
Farming machinery manufacturers are advancing their efforts to develop alternative, sustainable fuels. JCB have invested **£100M** to develop a hydrogen fuelled machine which will be available to customers by the end of 2022. Similarly, New Holland has created a methane fuel tractor (essentially a tractor powered by cow farts!) which will be **available to the mass market in July.**

The Takeaways

- 2021 was a bumpy ride but throughout the year AgriTech funding has stayed strong. Though with rising inflation rates, diminishing margins and a reduction in supply chain disruption, 2022 could see tailwinds dampen.

- Innovation is aplenty but funding remains focussed on several pockets of the Agritech landscape – there is significant opportunity for Venture Capital in pursuing emerging segments of the Agritech landscape.

- **Empty supermarket shelves** due to pandemic-induced disruption to supply chains demonstrated the fragility of the global food system. Governments **across the world** are determined to strike a balance between food supply while limiting agriculture's impact on the environment. Technology and innovation provide a solution to striking this balance. So, support from public bodies for actors creating the new technology, and for farmers integrating innovation into their practices, is set to continue and intensify.

- Keeping global emissions below 1.5 degrees Celsius by 2050 **is scientifically impossible** without a transformation in global Agriculture and meat production. Amongst the innovation highlighted here are long-term, durable solutions that are pro-climate, market-based, and well-positioned to help meet global climate goals.

- Inaction is not an option…

For Everyone: Agritech directory – Our ever-evolving directory of the Sustainable Agritech landscape including current funding, teams, and product summaries If you wish to be added fill out this form…

For UK Investors: UKRI intends to help inform broader discussions on the topic of Agritech finance acting as a knowledge repository and matchmaker. Also for aspirational angel investors check out FoodHacks

For Start-ups: **Agritech Accelerators Guide–** if you're an early-stage start-up looking for mentorship, networking and upskilling see this list of global accelerators

Ollie Potter
Co-Founder @ The Triple Bottom
in_ Potterollie

Colin Markham
Co-Founder @ The Triple Bottom
in_ ColinMarkham

Nikita Ermolenko
Trend Analyst @ The Triple Bottom
in_ NikitaErmolenko

The TripleBottom

Share the report:

About The Triple Bottom

The Triple Bottom is a free weekly newsletter and insights platform providing snappy updates on the latest sustainable business and technology trends. By connecting technology, talent and trends, the mission of The Triple Bottom is to accelerate innovation and growth of sustainable business.

To join our community, and keep in touch with the latest from The Triple Bottom, visit or follow us on:

Website & Newsletter

Linkedin

Sources & Methodology

Data Sources & Curation

Our knowledge base has grown to over 2,000 companies, with new start-ups and historical data being added each day. The raw data for our reports comes from Crunchbase and Dealroom, which gathers publicly-available information such as press releases and US Securities and Exchange Commission filings, as well as crowdsourcing directly from the industry. The Triple Bottom contributes data from its own collection methods, including private communications with investors and companies. We also collect data from partners across the globe to ensure we have the most comprehensive, accurate and curated dataset and knowledge base of agrifoodtech companies and investments. The raw data are painstakingly curated by The Triple Bottom team to ensure they are relevant, accurate, up-to-date, and categorized according to our proprietary tagging system. We will update and improve our dataset continuously throughout the year, meaning total figures from previous years' reports will shift as our dataset becomes more complete. To provide numbers that can be fairly compared to the previous year, estimates for total deal volumes and amounts for this year are adjusted using a model of how they will appear 12 months in the future. The adjustments (roughly +17% for overall dollar volumes and +45% for deal counts, with more granular adjustments by stage where appropriate) are modelled based on trends in historical data dating back to 2017. While we are happy to share our findings, we reserve all rights with respect to The Triple Bottom research and this report and we require it to be fully and accurately cited when any of the data, charts, or commentary are used.

Categorisation

The Triple Bottom's categorisation system is designed to capture broad themes across the complex agrifoodtech value chain (see page 3 for a list of categories). The agrifood sector has a wide supply chain spanning inputs and industrials, farming, logistics, wholesale distribution, processing, retail distribution, and the consumer. In many cases, technologies such as marketplaces connect different links in the supply chain and so in this report we've chosen to focus on high-level themes. To assist with the categorisation and to avoid subjectivity, The Triple Bottom first employs machine learning and artificial intelligence models to suggest category placement and to help tag the company according to the technology and its place in the supply chain. Finally, The Triple Bottom team manually reviews the suggestions for each company, often with significant research and debate among our team.