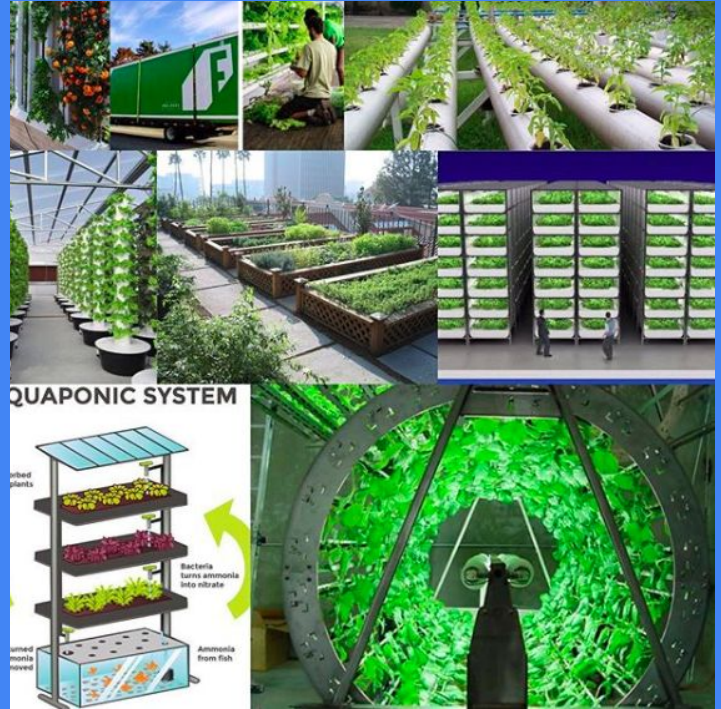


SkyFarms Agriculture Opportunities



*Finding Your
Place in Food
Solutions.*



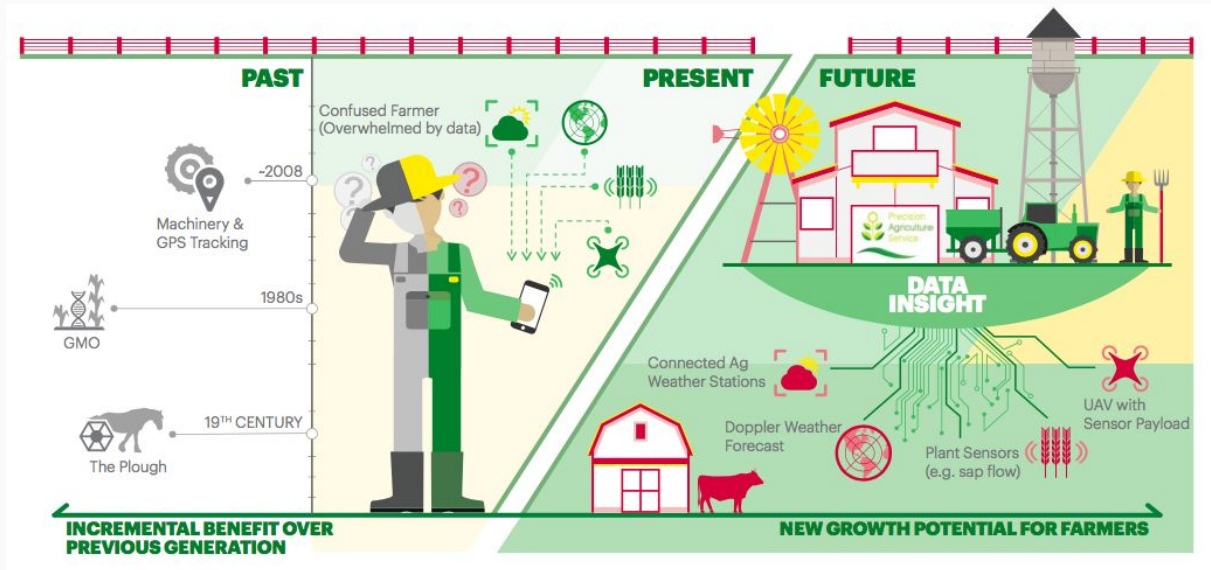
One: Agricultural Overview



Assessing Farmers Needs and Connecting YOU to the Food Value Chain

Evolution of Agriculture

Farming has evolved to new heights. Let us guide you through the flood of information and fragmentation of new innovation growing on to make it easy and convenient for you to find the right place to start!



What is Regenerative Agriculture?

Soil Stewardship, Proper land & resource management, Carbon Sequestering



The Regenerative Agriculture Toolbox: example practices*

Common principles

Limit soil disturbance
physical and chemical

Build diversity
In cropping systems and rotations,
with multiple species and yields

Armour the soil and living roots
no bare soil, keep it covered with living
roots as long as possible

Integrate animals
to drive nutrient cycling

Increase wildlife habitats
for pollination, pest-control and
building ecosystem health

Design for natural climate solutions
for water regulation, carbon
sequestration, flood control



No-till



Low external
chemical inputs



Crop rotations and
diversification



Precision
agriculture



Agroforestry



Multi-species
cover crops



Perennial crop
development



Holistic grazing
and mob grazing



Robotics and AI



Field margins
and hedgerow



Natural flood risk and
water management



Biochar



Compost teas

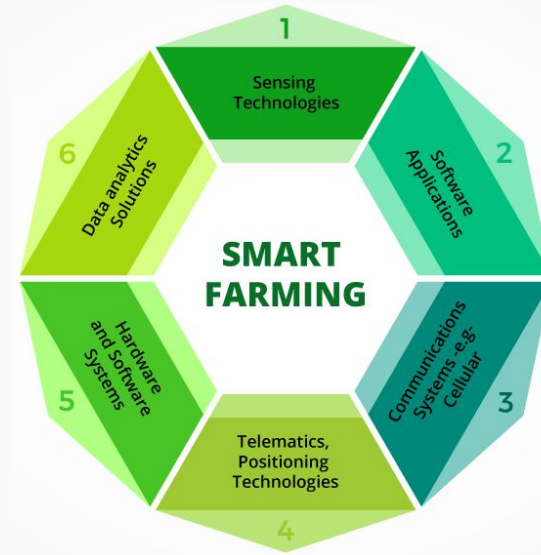
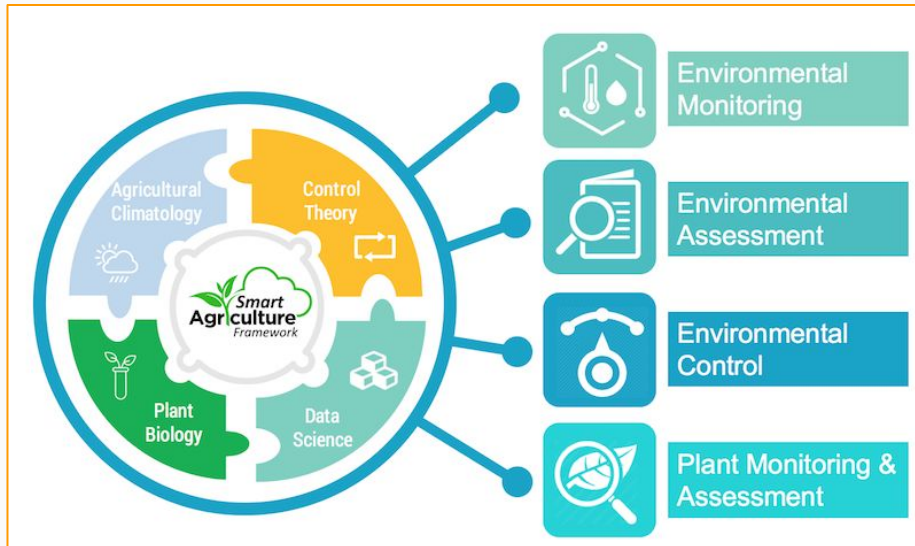


Rewilding and
afforestation

* These practices focus on environmental, rather than social regeneration. Regenerative agriculture is not about simply ticking some of the boxes above. Rather it's a process of understanding the specific farming system or landscape and working to continuously improve it. Covering outcomes such as soil health and carbon, biodiversity, nitrogen and water impacts.

What is Smart/Precision Agriculture?

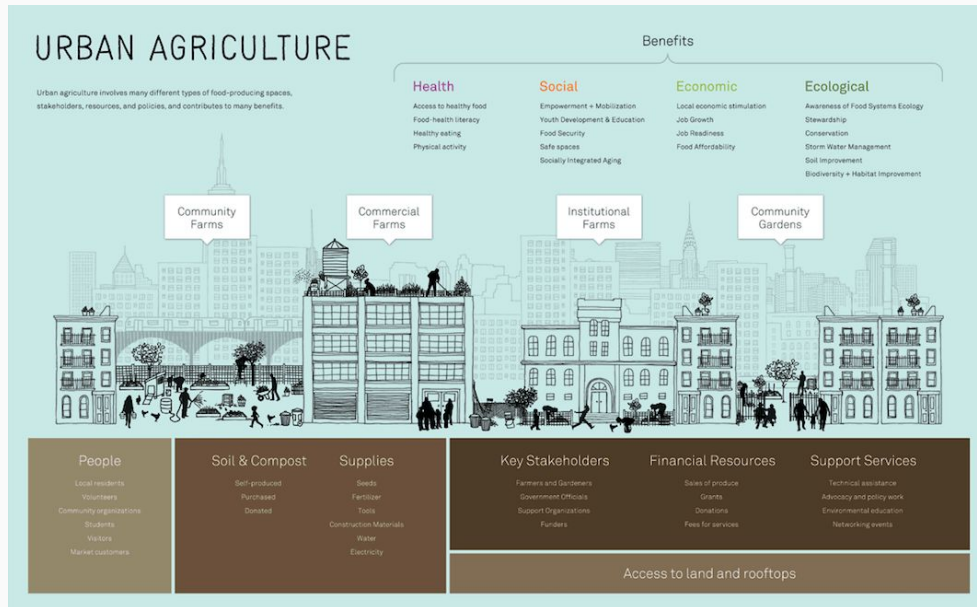
AgTech/Food Tech, Hardware, Software Upgrades & Enhancements, IoT, A.I., Robotics, Controlled Environment Agriculture



The Benefits of Smart Agriculture

- Increased Production
- Water-Time-Space-Energy Conservation
- Real-Time Data and Production Insight
- Lowered Operation Costs
- Increased Quality of Production
- Accurate Farm and Field Evaluation
- Improved Health of Product
- Reduced Environmental Footprint
- Remote Monitoring
- Equipment Monitoring

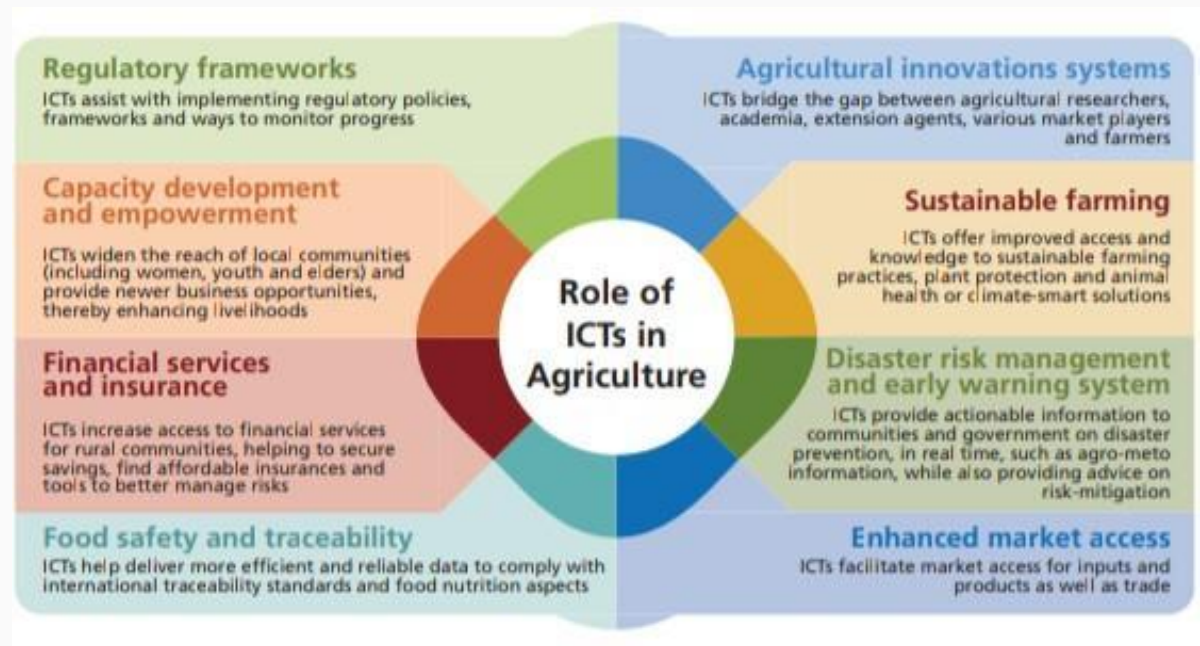
What is Urban Agriculture



Urban agriculture, urban farming, or urban gardening is the practice of cultivating, processing, and distributing food in or around urban areas. Urban agriculture can also involve animal husbandry, aquaculture, agroforestry, urban beekeeping, and horticulture.

What is Digital Agriculture?

- *Software*
- *Hardware*
- *ICTs*
- *Blockchain*
- *E-Learning*
- *Monitor-Manag*
- *Connect Plants-People*
- *Open-Source*
- *Data Science*



What is Sustainable Agriculture?

Regenerative, Local. Urban Farming, Upcycle, Sharing, Repurposing, Resource Management, CEA, CSA, Farm-to-Fork/Table

- Adaptable
- Resilient
- Resourceful
- Circular
- Renewable
- Repurposed
- Inclusive
- Holistic
- Emergent
- Closed-Loop
- Regenerative



Traditional Farming

We have many traditional soil farms in our network, some that are also enhanced with AgTech upgrades. While we do not specialize in the consulting and sales of technology, fertilizers, livestock, machinery and tools for traditional soil farms we do showcase and support farmers and land managers who embrace Sustainability, Biodiversity & Regenerative Agriculture Practices that you can connect with and learn from.



Leaders in Soil/Land Management



“ We work to mitigate climate change
facilitating connections to create and accelerate
global scale activation and grassland restoration ”

HOW WE DO



Local
entrepreneur



Training provided
to become,



Locally owned
managed and led



The Hub connects
with a Land Owner



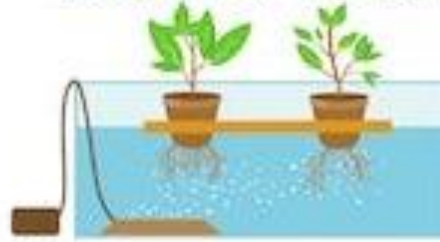
What To Know Before You Grow

Soilless Farming: PONICS..Hydro, Aero, Aqua

Aeroponics



Deep Water Culture



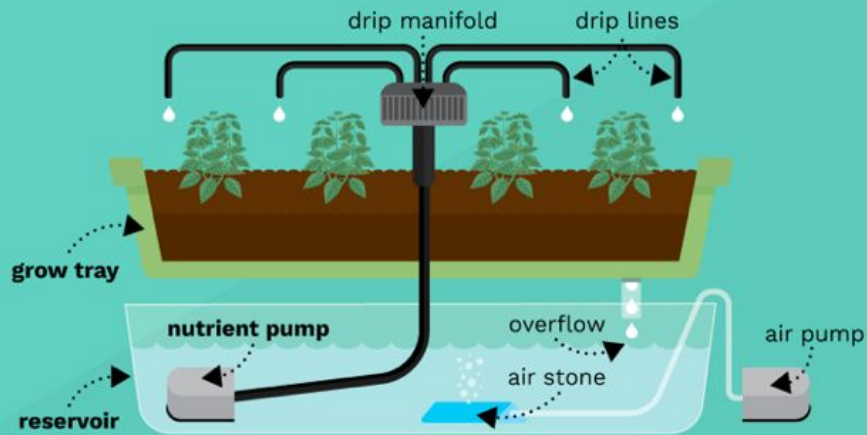
Drip System



Nutrient Film Technique

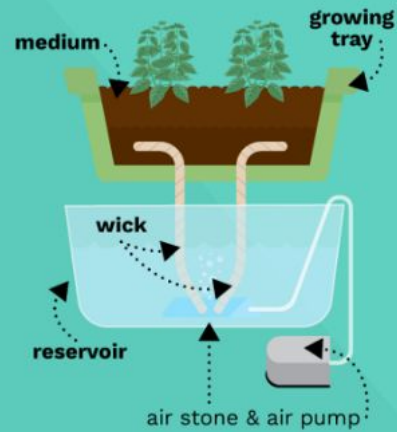


Drip (recovery or non-recovery)



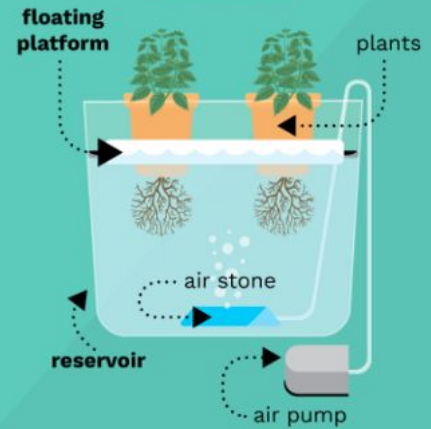
Recirculating drip systems recycle excess nutrient solution from reservoir. Timer controls submersed pump to drip nutrient solution onto base of each plant via drip line.

Wick



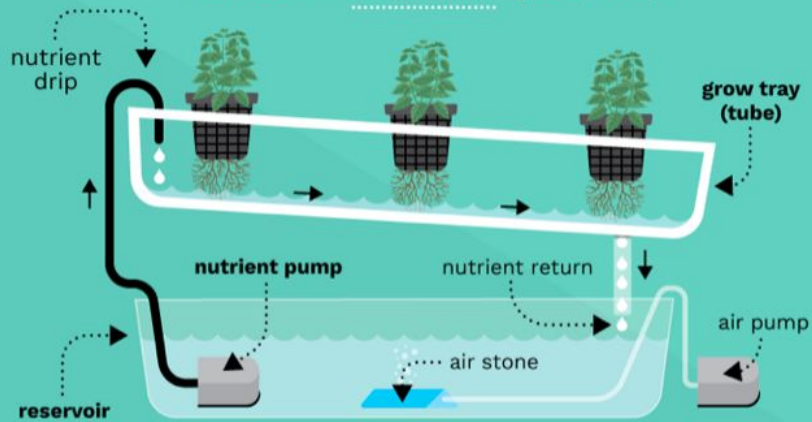
Involves no moving parts, can use variety of growing media. Nutrient solution is released onto growing tray and delivered to the roots through wick.

Water Culture or Aquaponic



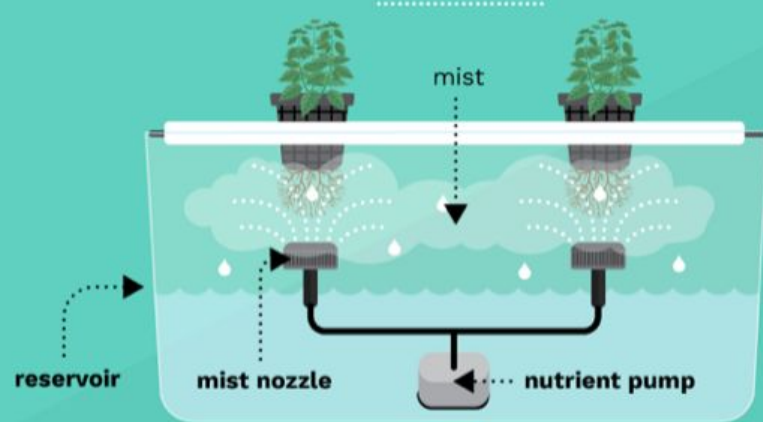
Containers hold plants inside floating Styrofoam platform - roots suspended directly into the nutrient water.

Nutrient Film Technique (NFT)



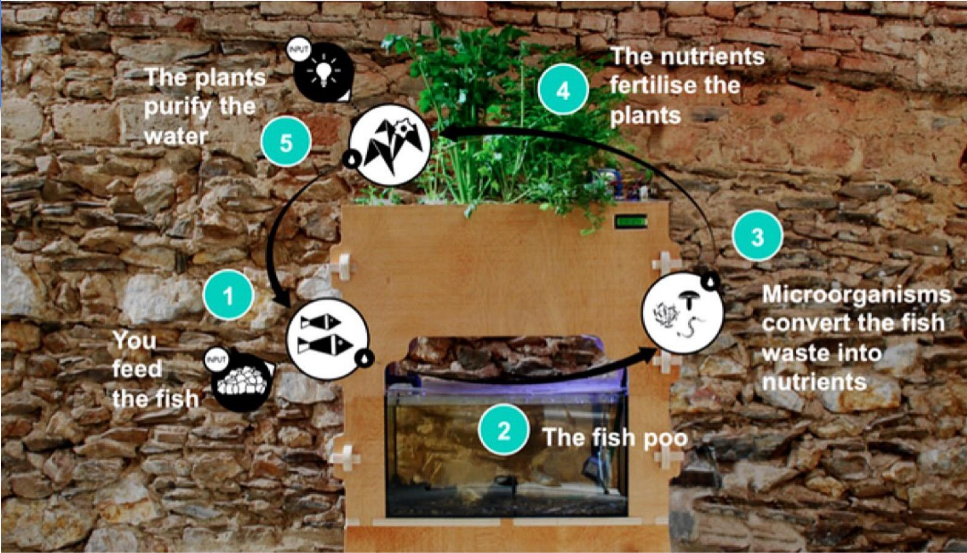
A continuous flow of nutrients eliminates need for timer. Pump forces nutrient solution over plant roots onto "grow tray," then overflow drains into reservoir.

Aerogenic



Also known as "fogponics," plant roots not suspended in water but hang in the air receiving nutrient-rich growing medium via misting.

AQUAPONICS



100 %
ORGANIC

No chemical fertilizer &
no pesticides

90 %
LESS WATER

Compared to a
traditional garden.

80 %
LESS WORK

Such as weeding and
digging

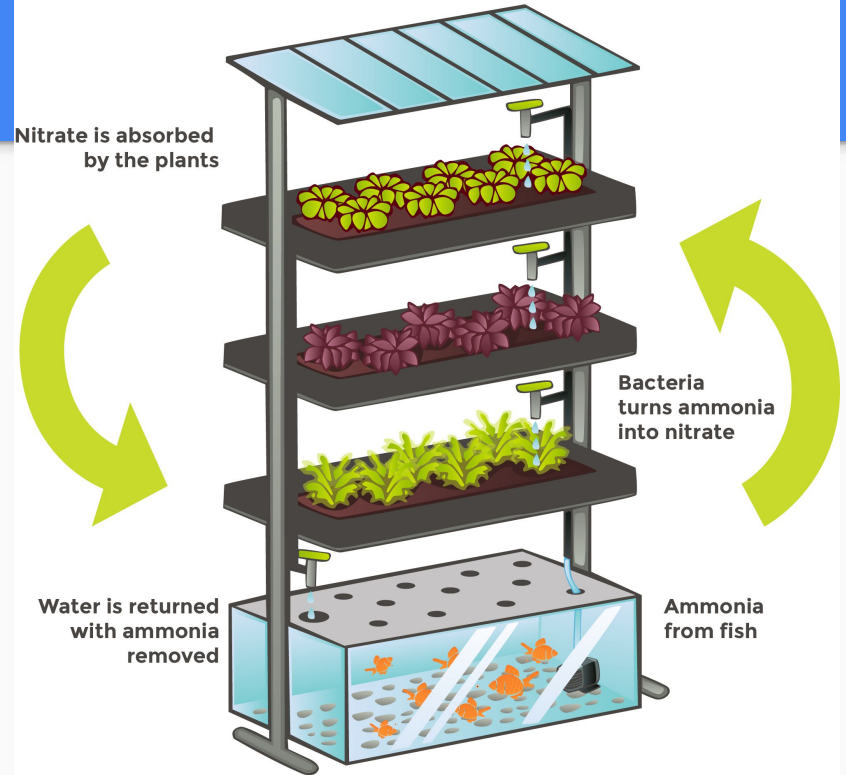
2 x
FASTER

Than in conventional
agriculture

DESIGNED
4 CITIES

Compact & All year
round

AQUAPONIC SYSTEM



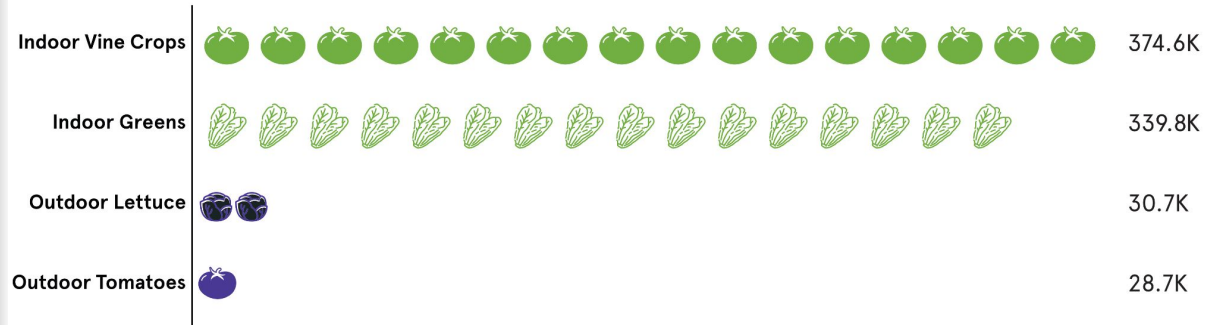
INDOOR
(CONTROLLED
ENVIRONMENT
AGRICULTURE)

VS.

TRADITIONAL
OUTDOOR

Annual production capacity of indoor crops vs. outdoor crops

Avg. lb/acre/year



Pre-Production Checklist

- Indoor/Outdoor
- Seeds, Temperature
- Electrical Conductivity, Nutrition, Ph, Water, Lighting, Temperature
- Harvesting (Self, CSA, Farmers Market, FoodBank, Restaurant, Product to Shelf)

LIGHTING

GROW LIGHTS ARE DESIGNED TO EMIT THE COLORS OF LIGHT THAT ARE USEFUL FOR PHOTOSYNTHESIS

PHOTOSYNTHETICALLY ACTIVATED RADIATION (PAR)
THESE ARE THE COLORS THAT PLANTS USE FOR PHOTOSYNTHESIS

BLUE LIGHT IS USED MORE FOR VEGETATIVE LEAFY GROWTH (400-500 nm)

RED LIGHT IS USED MORE FOR FLOWERING AND FRUITING GROWTH (600-700 nm)

FLUORESCENTS
LOW ENERGY EFFICIENT

LED
HIGHER ENERGY COST, LONGER LIFESPAN, REDUCES HEAT, GIVES YOU MORE CONTROL ON TUNING SPECTRAL COLORS

ELECTRICAL CONDUCTIVITY

WHAT IS IT?
THE ABILITY OF A MATERIAL TO CONDUCT AN ELECTRICAL CURRENT.

WHY REGULATE EC?
BY MEASURING EC, YOU CAN ESTIMATE THE NUTRIENT CONCENTRATION IN YOUR WATER.

THE HIGHER THE AMOUNT OF NUTRIENTS IN THE WATER, THE HIGHER EC IS.

THIS IS BECAUSE HAVING MORE DISSOLVED SOLIDS IN YOUR WATER IMPROVES THE WATER'S ABILITY TO CONDUCT AN ELECTRICAL CURRENT

YOU WANT EC TO BE WITHIN A SPECIFIC RANGE FOR EACH CROP.

PH

WHAT IS IT?
A NUMERICAL SCALE USED TO MEASURE THE ACIDITY OF WATER.

IDEAL RANGE FOR MOST PLANTS

ACIDIC NEUTRAL BASIC

WHY SHOULD I REGULATE IT?
IF THE PH OF YOUR NUTRIENT SOLUTION IS TOO HIGH (BASIC) OR TOO LOW (ACIDIC), IT CAN INHIBIT THE UPTAKE OF NUTRIENTS THROUGH THE ROOTS OF YOUR PLANTS.

AERATION

WHAT IS IT?
THE PROCESS BY WHICH OXYGEN GETS MIXED INTO A LIQUID OR SUBSTANCE.

HOW DOES IT WORK?

DEEP WATER CULTURE (DWC)
THE ROOTS ARE COMPLETELY SUBMERGED IN WATER

NUTRIENT FILM TECHNIQUE (NFT)
THE BOTTOM OF THE ROOTS TOUCH WATER

THE AIR STONE CREATES BUBBLES INCREASING DISSOLVED OXYGEN IN THE NUTRIENT SOLUTION

THE ROOTS GET OXYGEN FROM DIRECT EXPOSURE TO AIR

WHY DO PLANTS NEED IT?
PLANTS NEED OXYGEN TO CARRY OUT RESPIRATION (THE PROCESS BY WHICH PLANTS CREATE ENERGY). SUPPLEMENTAL AERATION IS MORE IMPORTANT FOR SYSTEMS WHERE THE ROOTS ARE NOT DIRECTLY EXPOSED TO AIR, SUCH AS DWC (DEEP WATER CULTURE).

NUTRIENTS

AVAILABLE IN THE AIR, SOIL & WATER

WHAT ARE THEY?
CHEMICAL ELEMENTS NEEDED FOR PLANT GROWTH.

BASIC + MACRO + MICRO NUTRIENTS

MACRO: NITROGEN, PHOSPHOROUS, POTASSIUM, CALCIUM, MAGNESIUM, SULPHUR

MICRO: IRON, MANGANESE, ZINC, COPPER, BORON, MOLYBDENUM, CHLORINE

PLANTS CONSUME LARGER QUANTITIES OF MACRO THAN MICRO NUTRIENTS

MINED FROM ROCK, THEY ARE MADE TO SIMULATE THE NATURAL MINERALS FOUND IN ORGANIC MATTER

SYNTHETIC VS. ORGANIC NUTRIENTS

ORGANIC NUTRIENTS ARE DERIVED FROM PLANTS AND/OR ANIMAL BY-PRODUCTS

TEMPERATURE

PLANTS TYPICALLY ENJOY THE AMBIENT TEMPERATURES THAT HUMANS ARE COMFORTABLE WITH.

IDEAL WATER TEMPERATURE FOR HYDROPONICS IS **65-80** DEGREES FAHRENHEIT.

IF TEMPERATURE GETS TOO **COLD**, THE PLANT'S METABOLISM SLOWS DOWN. AT EXTREMES, IT SHUTS DOWN.

IF TEMPERATURE GETS TOO **HOT**, OXYGEN LEVELS IN THE WATER DECREASE AND THE RISE OF PATHOGENS INCREASES.













LARGER SCALE SYSTEMS OPTIMIZE AIR TEMPERATURE THROUGH **HVAC** TECHNOLOGY.

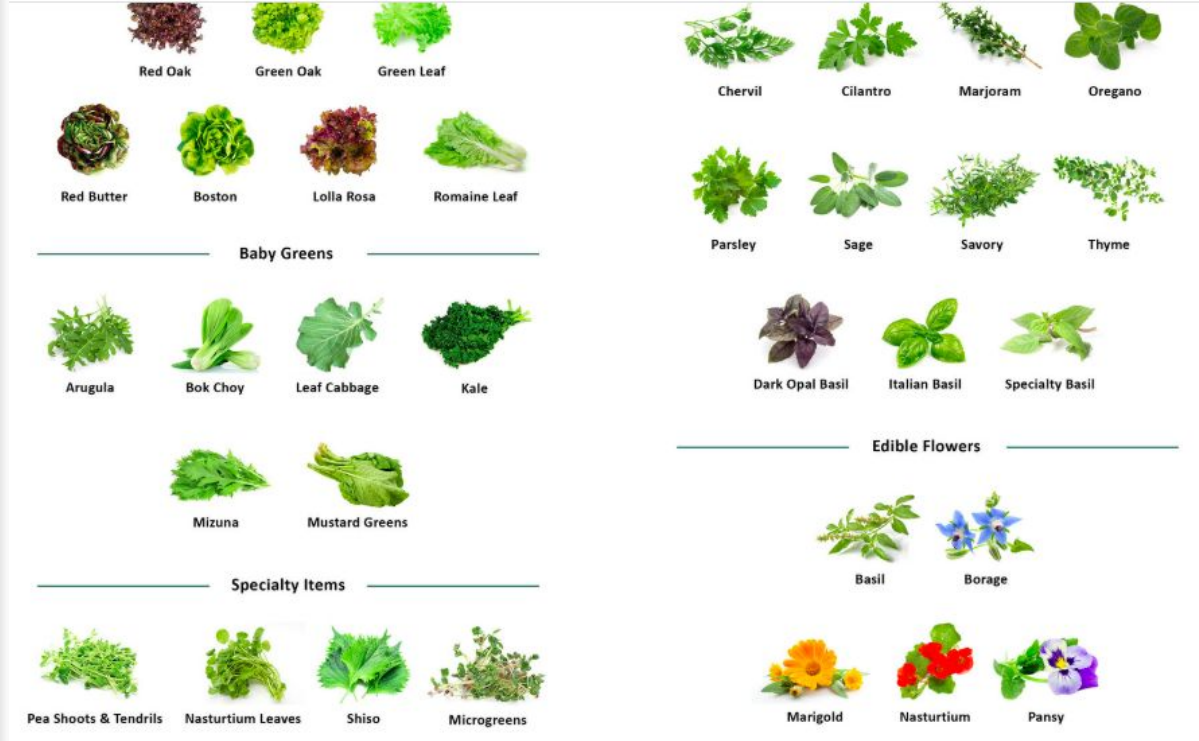
FOR A SMALL SCALE SYSTEM LIKE **-FARM-**, TEMPERATURE CONTROL IS NOT NECESSARY.

Crops Menu

A sample snapshot of the harvest selection for Farm-to-Fork Business

A selection of crops grown indoors

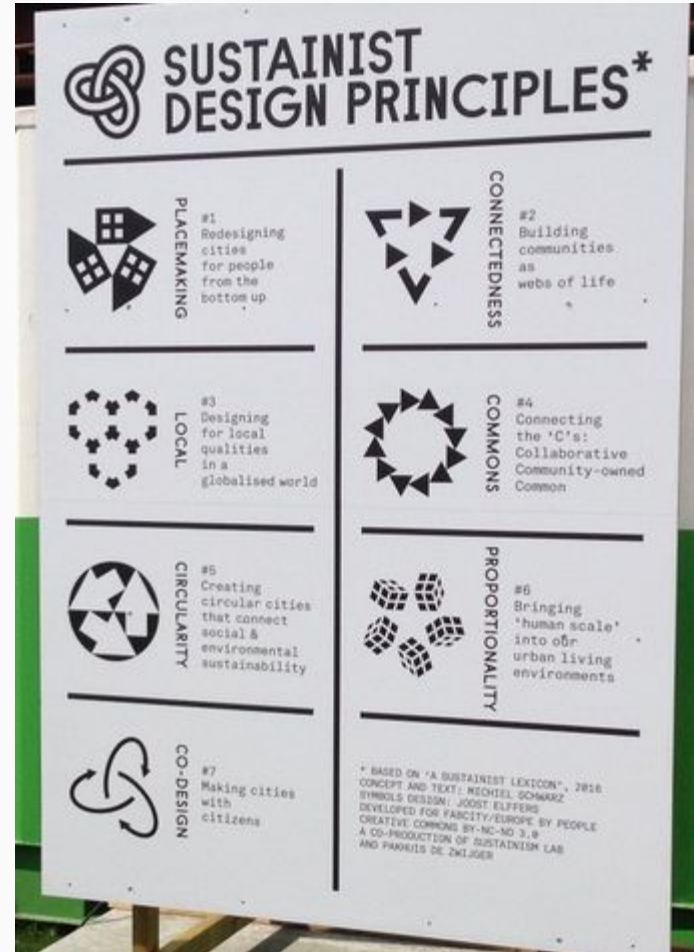
| | | | | | |
|---|---|---|--|---|--|
|  | Greens leafy greens, lettuce, spinach |  | Vine Crops tomatoes, peppers, cucumbers, eggplants |  | Cannabis |
|  | Hops |  | Flowers perennials, annuals, ornamentals |  | Commodities corn, wheat |
|  | Insects |  | Microgreens/ herbs |  | Other poultry, forestry seedlings, algae |
|  | Strawberries |  | Vegetable Transplants |  | Other Vegetables tubers, mushrooms |



Sustainable Design

Efficient and Responsible
Management and Conservation
of Resources through
considering proper design:

- Placemaking
- Local
- Circularity
- Co-Design
- Connectedness
- Commons
- Proportionality



THE HIVE of SMART FARMING OPTIONS



THINK S.M.A.R.T. About Agriculture



Our Methodology for educating about Smart Farming/Agriculture, Smart Cities, Smart Technologies

AgS.M.A.R.T.

ELEVATED AGRICULTURE

Types of Smart Farming (AgTech)

Growing Systems and Facility Types



Hydroponics

Plants are grown in water as opposed to soil.



Glass or poly Greenhouse

Transparent, enclosed structure made of glass or polycarbonate.



Aeroponics

Plant roots are suspended in the air and misted with a nutrient solution.



Indoor vertical farm

Fully enclosed and opaque room with a vertical growing system (hydroponic, aeroponic, and/or aquaponic). Artificial lights are used.



Aquaponics

Plants are grown in water that has been used to cultivate aquatic organisms (typically, fish)



Low-tech plastic hoop house

Semi-circular, tunnel-shaped structure made of steel and polythene.



Soil-based

Plants are grown in soil.



Container farm

Standardized, self-contained growing unit that employs vertical farming systems and artificial lighting.



Hybrid (Aquaponics, Hydroponics, Aeroponics)

Plants are grown in multiple systems in one facility.



Indoor DWC

Fully enclosed and opaque room with a non-vertical growing system where plants are grown in a deep-water culture system.

Snapshot 2019.

316 people responded to the survey. Of those 43 started their business this year, these are their numbers:



19% received funding (50% from corporate investors). 16% applied but were not successful. 65% did not pursue funding.



77% male founders 23% female founders.



21% of those companies based in the United States.



65% of companies are currently pre-revenue stage (the maximum revenue for this group is USD\$250-500K).



65% grow salad greens and microgreens.



16% are currently pre-profit. 19% are breaking even, 26% profitable, 39% declined to state.



61% in indoor vertical farms.
32% in greenhouses.



46% of the founders had no experience at all in agriculture. 44% of those founders were between 21-30 years of age.



90% plan to increase their production area.

Top Three Challenges Were:

1

Raising capital funds

2

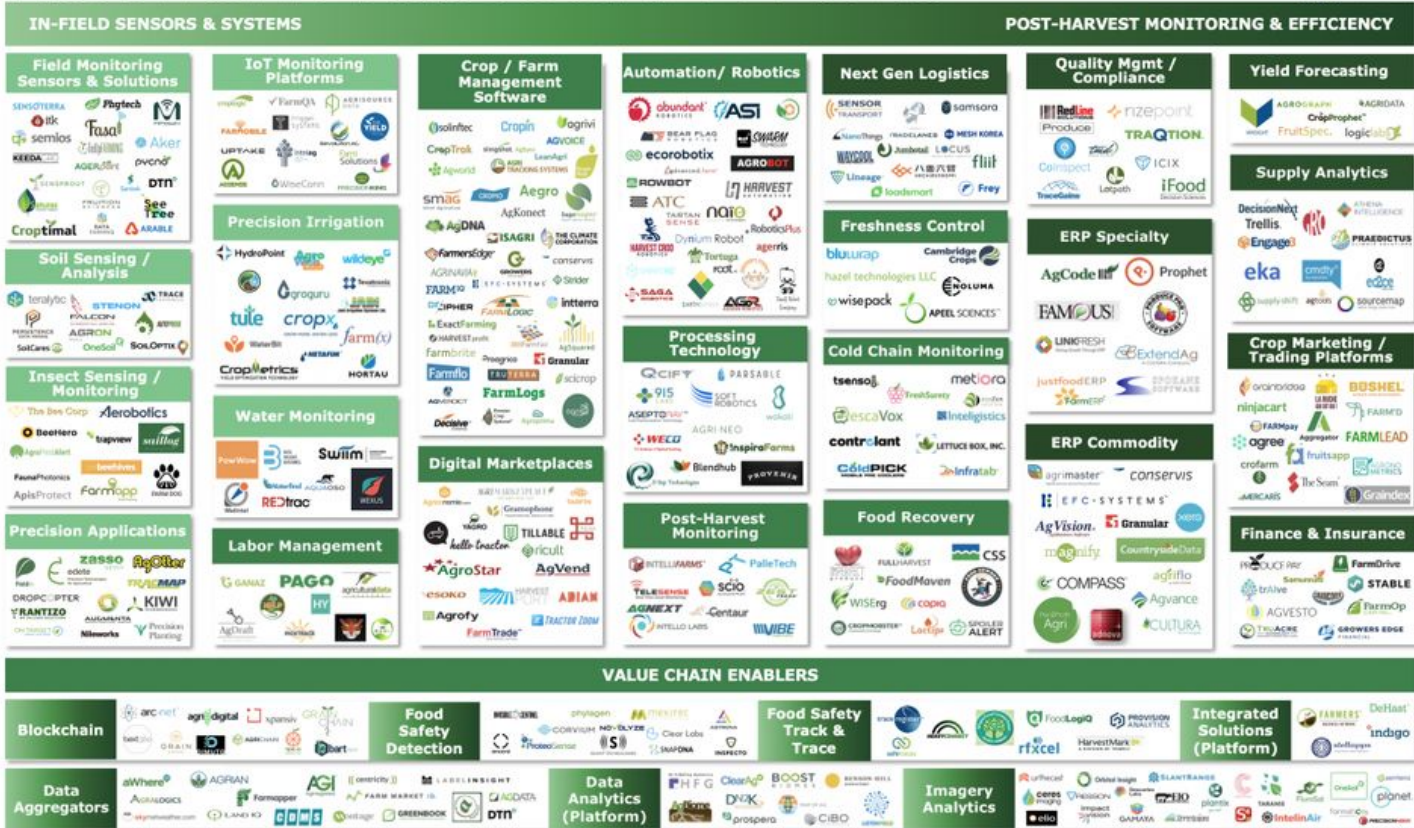
Maximising profit & sales

3

Automation to increase efficiency

Companies & Sectors











AGTECH LANDSCAPE 2019



AgTech Areas

Advancements in:

- **Hardware** (Equipment, Robots, Drones, Systems)
- **Software** (Sensors, Programs, Digital)
- **Integrated** (Data/Hardware/Software)
- **Input Enhancements** (biological/chemical)
- **Systems** (Soilless, Vertical, Container, Greenhouse)
- **Additional Drivers:** Education, Communities, NGOs, Consulting, Investment, Media, Impact

| | TYPE OF TECHNOLOGY | DESCRIPTION | EXAMPLES | DEVELOPING WORLD APPLICATIONS |
|-----------------|---|---|--|--|
| Hardware |  Machinery/equipment | Mechanical tools and equipment that improve farm effectiveness/efficiency | Tractors, plows, seed drills | Post-harvest loss, on-farm processing, irrigation, soil management |
| |  Robotics | Automated machinery | Driverless tractors, drones | |
| |  Irrigation | Water supply systems including pipes, sprinklers, valves and emitters | Sprinkler systems, drip irrigation | Irrigation |
| Software |  Mobile apps | Cell phone and smartphone apps that rely on mobile telephone technologies | Mobile money services, information dissemination apps, trading platforms | Irrigation (techniques), soil management, market access |
| |  Web apps | Programs stored on a remote server and delivered over the Internet through a browser interface | Farm management apps, accounting apps, safety/traceability apps | Irrigation (techniques), soil management, market access |
| |  Desktop apps | Programs installed on a computer (laptop or a desktop) that do not rely on internet connectivity | Farm management software, accounting software | |
| Integrated |  Precision agriculture and big data | A combination of sensors, satellite technology, and/or software that enables site-specific decision-making and/or remote operation of farming equipment | Digital imagery systems, data analytics platforms | Irrigation, soil management |
| Input enhancers |  Biotech | Technology that enhances crop productivity and/or resilience through biological processes | Transgenic seeds, biologicals | Post-harvest loss, irrigation, soil management |
| |  Chemical tech | Technology that enhances pesticides and fertilizers to increase farmer yields | Fertilizers, pesticides | Soil management |
| Systems |  Greenhouse systems | Building materials and control systems for heat, humidity and lighting | Climate-controlled greenhouses | |
| |  Soilless systems | Systems for growing crops in a controlled, soilless setting | Aquaponics, hydroponics, aeroponics | |

Vertical Farming

WHAT IS IT?

A METHOD OF PRODUCING FOOD IN VERTICALLY STACKED LAYERS OR OTHER STRUCTURES LIKE ROOFTOPS, CONTAINERS, WAREHOUSES, AND MORE.



HOW DOES IT WORK?

VERTICAL FARMING OFTEN USES CONTROLLED ENVIRONMENT AGRICULTURE (CEA) TECHNOLOGY WHICH ALLOWS YOU TO CONTROL VARIABLES LIKE pH, NUTRIENTS, LIGHT, TEMPERATURE, AND HUMIDITY.

HYDROPONICS



NUTRIENT WATER SOLUTION IS USED INSTEAD OF SOIL.

AEROPONICS



ROOTS ARE IN THE AIR AND SPRAYED WITH A NUTRIENT MIST.

AQUAPONICS



COMBINES HYDROPONICS & AQUACULTURE.

THE WASTE PRODUCED BY FISH SUPPLIES NUTRIENTS FOR PLANT GROWTH.

WHY FARM VERTICALLY?

SPACE-MAXIMIZING



KEEPS DOLLARS CIRCULATED IN THE LOCAL COMMUNITY

PRODUCE YEAR-ROUND AND LOCALLY, ANYWHERE



REDUCED TRANSPORTATION & REFRIGERATION



LESS FOOD MILES MEANS FRESHER PRODUCE



ADVANTAGES OF VERTICAL FARMING

RENEWABLE PRODUCTION

A 30-story vertical farm needs 26 million kWh of electricity, but it can generate 54 million kWh through solar energy and the use of biogas digesters.



EFFICIENT USE OF URBAN SPACE

Crops can be stacked as high as the building is built.



WATER CONSERVATION

Hydroponics uses 70% less water than traditional agricultural practices. Urban waste like black water can be recycled and used for indoor farming.



INCREASED YIELD

One acre in an indoor vertical farm can produce the same yield as 400 traditional acres, depending on the crop. And there's no running out of arable land.

YEAR-ROUND CROP PRODUCTION

There would be no more "seasonal crops" as vertical farming technology ensures continuous crop production even in non-tropical regions.



WEATHERPROOF

Crops are grown in a controlled environment and are therefore not exposed to extreme weather events like droughts and floods.

ENVIRONMENTALLY FRIENDLY

Indoor growing conditions in vertical farms reduce or eliminate the use of chemical pesticides.





68% cheaper
cost



38% reduced
food waste



97% reduced
food miles



95% less
water



30% faster
growing

90%

LESS WATER, SPACE, ENERGY, TIME THAN TRADITIONAL FARMING

The Market, Space & Yields

Global **Vertical Farming** Market

OPPORTUNITIES AND FORECASTS,
2019-2026

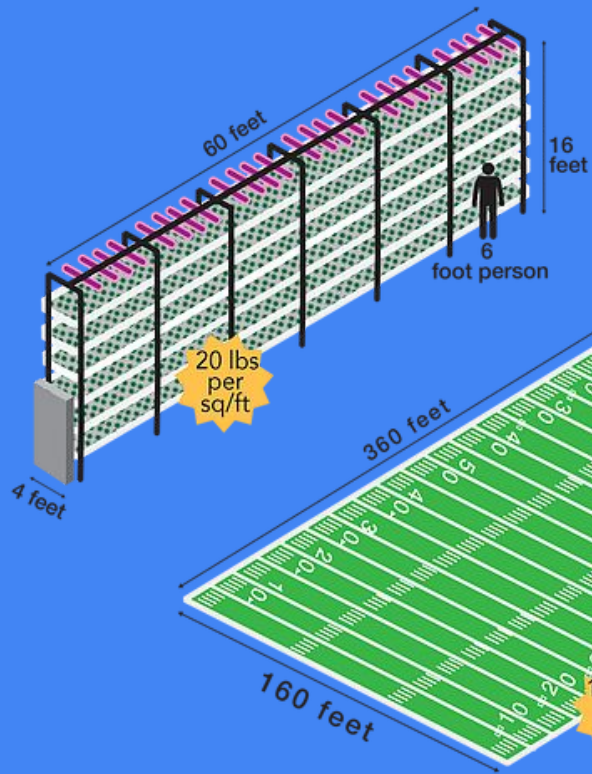
Global Vertical Farming
Market is expected to reach
\$12.77 billion by 2026.

Growing at a **CAGR of 24.6%**
(2019-2026)





| | TRADITIONAL | GREENHOUSE | URBAN CROP SOLUTION |
|------------------------------------|-------------|------------|---------------------|
| GROWTH PROCESS | 70 days | 40-50 days | 21 days |
| NUMBER OF CROPS PER M ² | 18 | 25 | 25-300 |
| CROP CYCLES | season | season | 365 days |
| WATER USAGE | 35 l | 15 l | 1.5 l |
| PESTICIDES/HERBICIDES | often | less often | never |
| LOCATION | open field | open field | everywhere |
| POST-HARVEST HANDLING | high | medium | low |



50 M²
GROWING SURFACE



**960 -
1.9K**
CROPS PER GROWING
CYCLE



**14K -
28K**
CROPS PER YEAR

Produces

150-200 heads of LETTUCE or LEAFY GREENS weekly

300-400 lbs. of FISH annually

450 lbs. of TOMATOES annually

270 MICROGREEN flats annually

Integrating Food in City Planning: Urban Farming Benefits & Methods

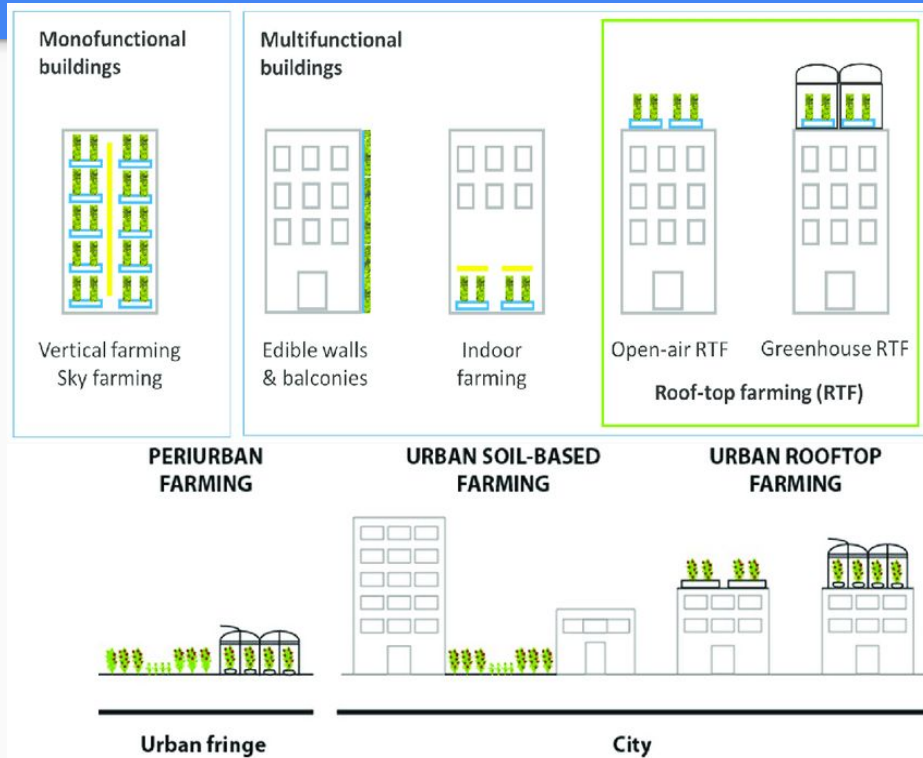


Economy

Health

Social

Environment



Shipping Container

Microfarm (inside house)

Greenhouses

Rooftop

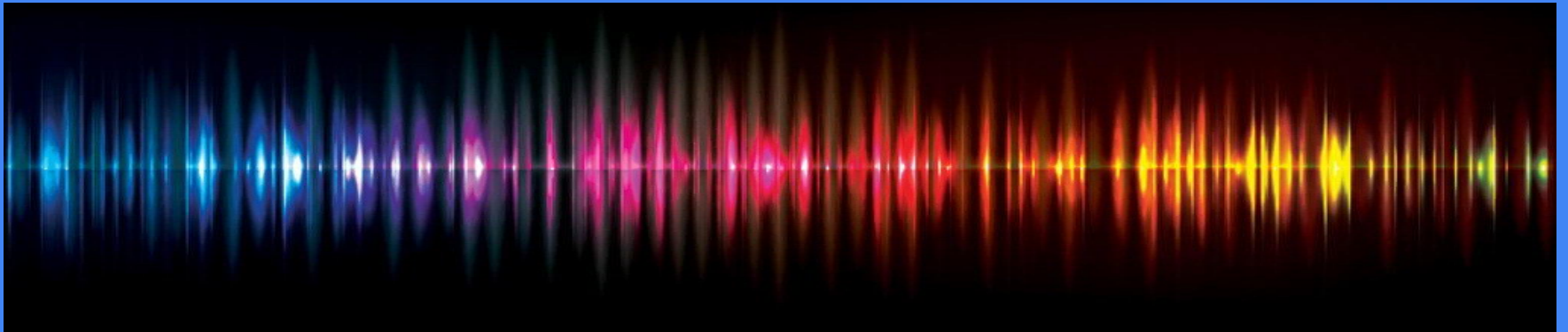
Underground

Protected Soil

On-Ground Soil

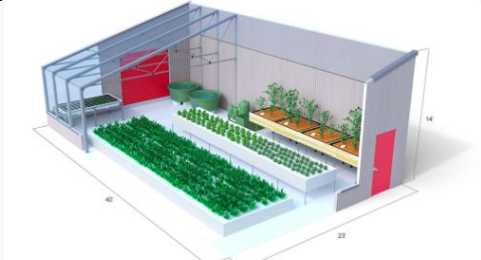
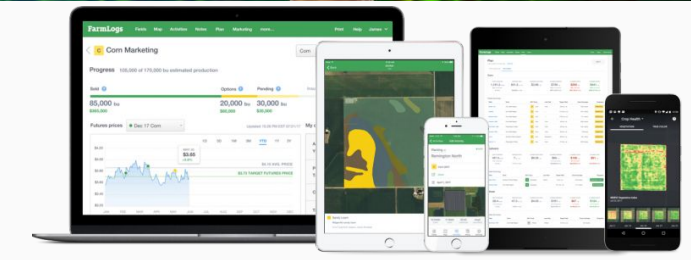
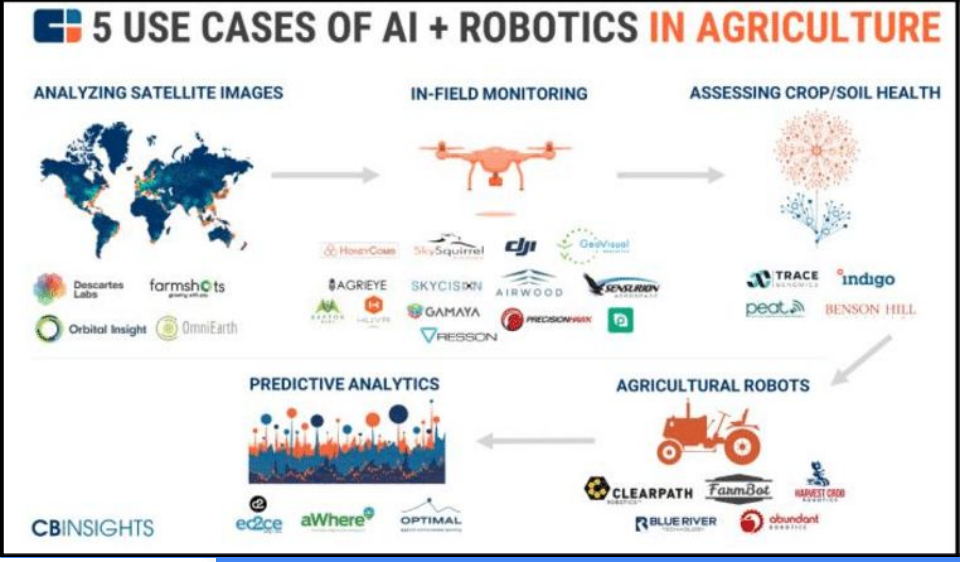
The Spectrum of AgTech

Finding The Right Place For You To Grow





Five Places To Grow



1. Hardware
2. Software
3. Integrated
4. Input Enhancements
5. Systems

HARDWARE & SYSTEMS



1. CONTAINERS & POPUPS
2. GREENHOUSES & AGLABS (above and below ground)



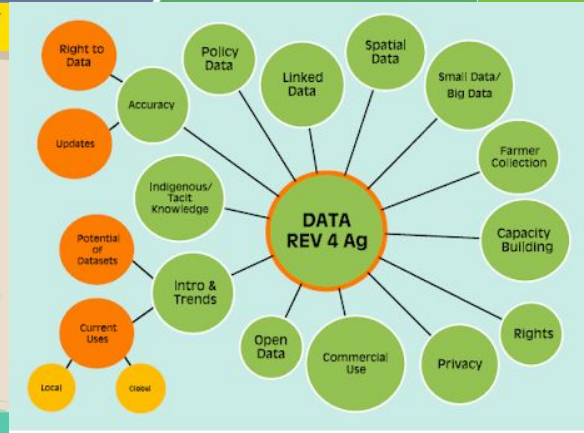
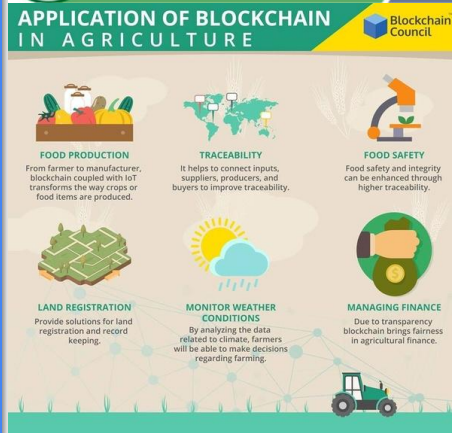


- 3. VERTICAL UNITS (advantages + yield + energy/water use + types of crops + productivity):
- 4. HORIZONTAL UNITS: (dryponics)
- 5. CIRCULAR SYSTEMS
- 6. ROBOTICS & DRONES



SOFTWARE & INTEGRATED

1. Sensors & Monitoring
2. Farm Management & Data Collection
3. Blockchain
4. Artificial Intelligence
5. IoT (Internet of Things)
6. Augmented/Virtual Reality
7. Open-Source Sharing



INPUTS

1. Agronomy and Crop Science
2. Biotechnology
3. Food Science
4. Biochemistry



“Strong communities are build around local, real food, that we trust will nourish our bodies, farmers and planet. We don’t just need to produce food, we need to **GROW** it.”

- Kimbal Musk (BigGreen)

Become A Member!

Now you know all the places you can reconnect to your food. Lettuce get you growing based off the things you were interested in.

By becoming a member, you will receive a personalized consultation and access to agriculture community, ideas, tips, designs, research, and impacts that fit with you and your local area.

SkyFarms.io/membership

