



DIGITALIZATION AND ROBOTIZATION OF AGRICULTURE

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WHAT IS DIGITAL AGRICULTURE

- Digital agriculture, sometimes known as smart farming or e-agriculture is tools that digitally collect, store, analyze, and share electronic data and/or information in agriculture.
- FAO has described the digitalization process of agriculture as the digital agricultural revolution.



WHAT IS AN AGRICULTURAL ROBOT

- An agricultural robot is a robot deployed for agricultural purposes.
- An agricultural robot is defined as any robotic device that can improve agricultural processes, by taking over many of the farmer's duties that are slow or labour intensive.





FACTS ABOUT MODERN TECHNOLOGIES IN AGRICULTURE

Agriculture is a key high-tech industry of the future.

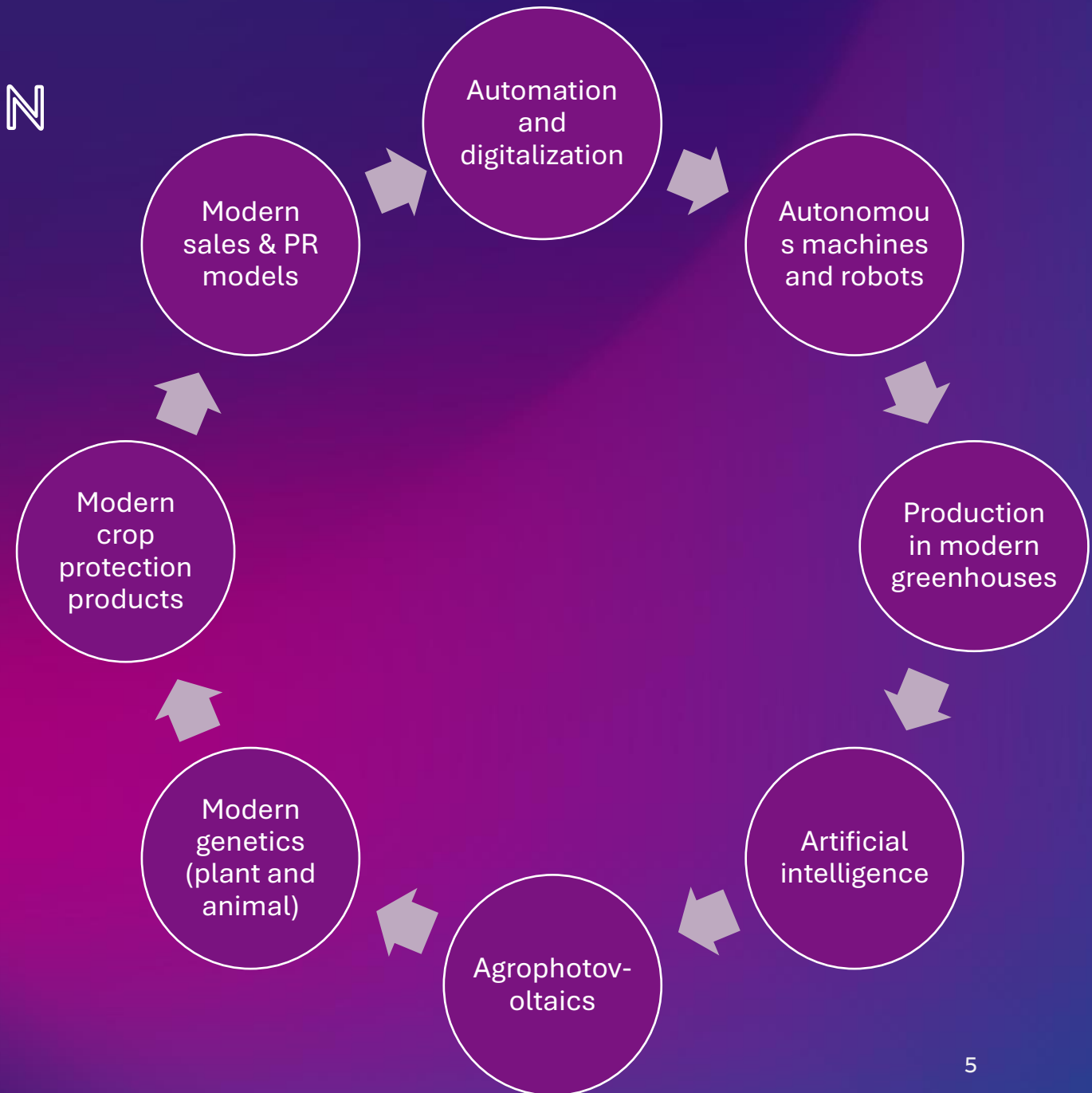
The modern tomato is as technologically sophisticated a scientific achievement as the latest version of the iPhone.

Modern production techniques allow food to be produced regardless of weather conditions, location, or time of production.

Modern technologies in agriculture reduce costs and increase profits.

57% of agricultural production can already be robotized today.

WHAT ARE THE MODERN TECHNOLOGIES IN AGRICULTURE ?



DIGITALIZATION AND ROBOTIZATION

PRIORITY AREAS FOR DIGITAL SOLUTIONS IN AGRICULTURE

- Agricultural Extension and Technology Transfer.
- Risk Management.
- Crop Production Forecasting.
- Environmental Land Use Monitoring.

PRIORITY AREAS FOR ROBOTIZATION IN AGRICULTURE

- Robots can work non stop, humans need rest.
- Robots can detect presence of diseases, weeds, insect infestations and other stress.
- The lightweight of the robots do not compact the soil as larger machinery does.

WHY AGRICULTURAL ROBOTS ARE PREFERRED

- We can expect the robots to perform agricultural operations autonomously such as:
 - Spraying,
 - mechanical weed control,
 - fruit picking,
 - watching the farms day & night for an effective report,
 - allowing farmers to reduce the environmental impact,
 - increase precision and efficiency,
 - manage individual plants in novel ways.

FULLY AUTOMATIC HARVESTING AND RADISH BUNCHING MACHINE



Source: [Koppert Machines](#)

ECOROBOTIX SMART WEEDING ROBOT

An example weed control in the near future.

<https://ecorobotix.com/en/>



DEMETER- ROBOT FARMER

- Demeter is a robot that can cut crops it looks like a normal harvester, but can drive by itself without any human supervision.
- Demeter has cameras on it that can detect the difference between the crop that has been cut and crop that hasn't.
- This information tells it where to drive, where to put its cutter head, and when it has come to the end of a crop row so it can turn around.
- The Demeter robot can also be driven by remote control. Or, Demeter can be taught a path, and then follow that path using its on board sensors and computer control systems

AVL Motion Compact S9000

Autonomous harvesting of asparagus

Year of manufacture: 2018

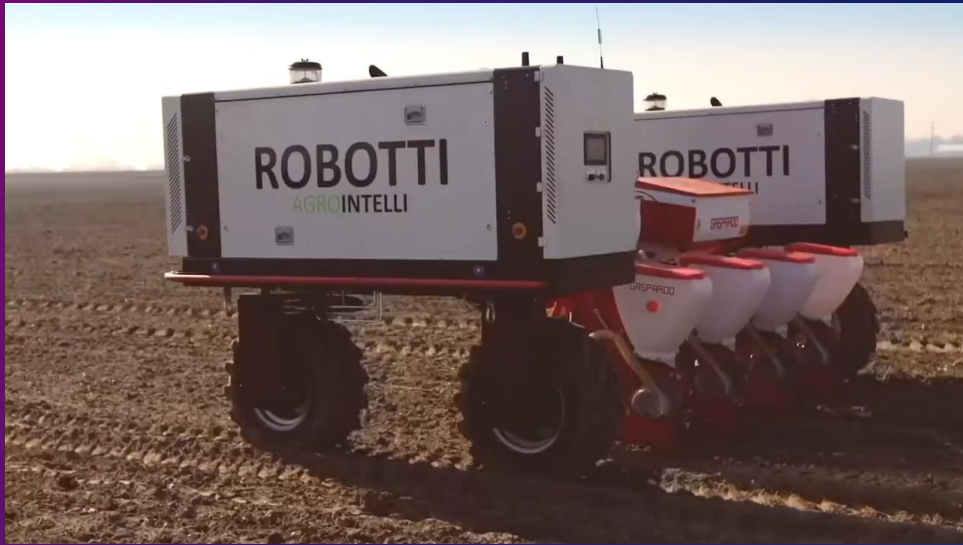
Manufacturer: AVL Motion

Price: 400,000 €

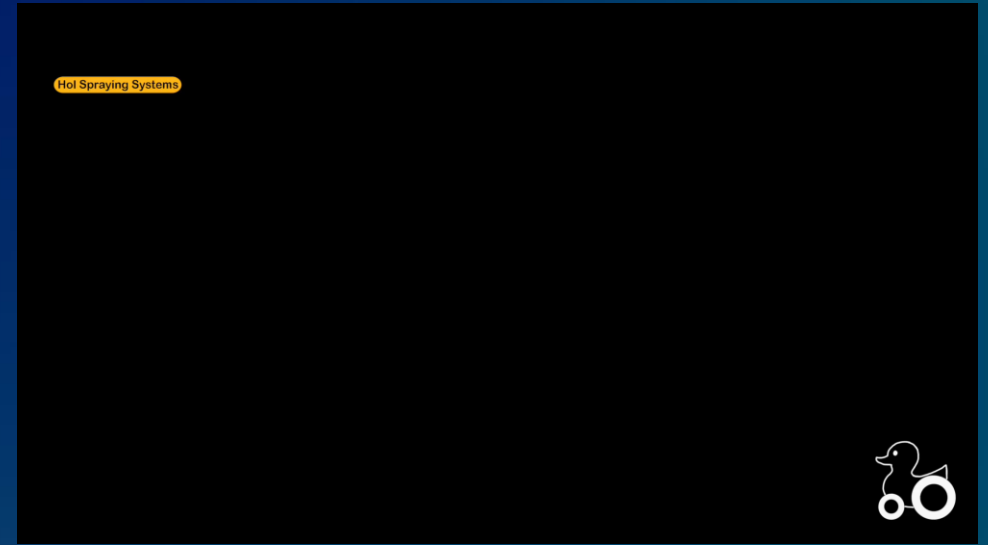


AN EXAMPLES OF DIFFERENT AGRICULTURAL ROBOTS

[AgroIntelli](#)



[AgXeed](#)

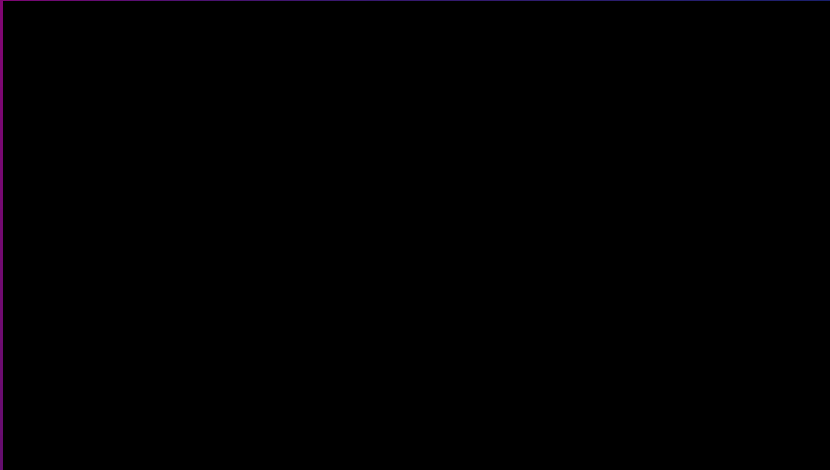


ADVANTAGES OF USING AGRICULTURAL ROBOTS

- Agricultural robots are capable of collecting crop and soil samples.
- They are small in size, which allows them to be able to accumulate data close to the crops.
- They are also capable of mowing, spraying pesticides, finding diseases or parasites, and performing mechanical weeding.
- Agricultural robots may have cameras and sensors which detect weeds and other forms of stress.
- Their sensors are used to spray only the area affected by the parasite instead of the entire crop. This has helped to protect our environment by reducing the amount of harmful chemicals released in the air.

AN EXAMPLES OF DIFFERENT AGRICULTURAL ROBOTS IN ACTION

[Aigro](#)



[Vitibot](#)



[Naïo Technologies](#)



[PeK Automotive Slopehelper](#)



AGROPHOTOVOLTAICS

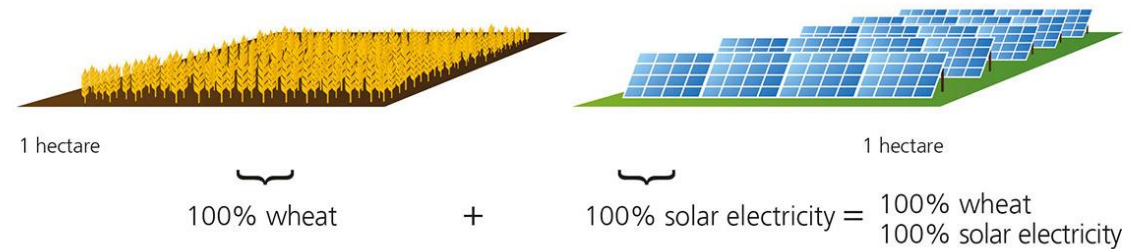


Source: [Engie, 2022](#)

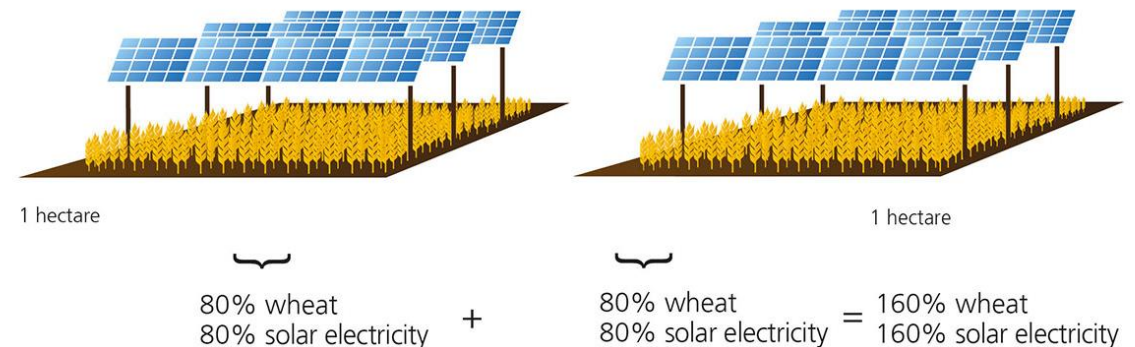
Agrivoltaics is the simultaneous use of areas of land for both solar photovoltaic power generation and agriculture.

The technique was originally conceived by [Adolf Goetzberger](#) and Armin Zastrow in 1981, and the word agrivoltaics was coined in 2011.

Separate Land Use on 2 Hectare Cropland



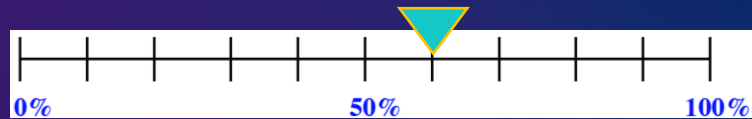
Combined Land Use on 2 Hectare Cropland: Efficiency increases over 60%



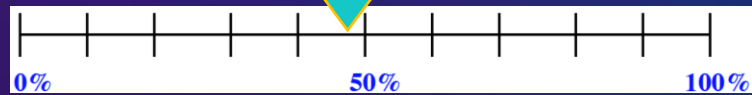
Source: [R. Brohm 2019](#)

WHERE ARE WE (SLOVENIAN FARMERS) ?

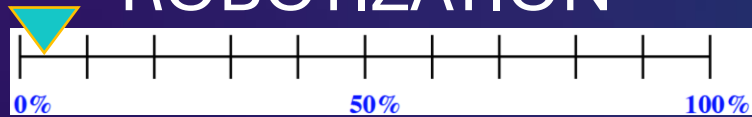
GPS (RTK) navigation



DIGITALIZATION



ROBOTIZATION



THE WILL OF YOUNG FARMERS FOR NEW TECHNOLOGIES



MODERN TECHNOLOGIES IN AGRICULTURE HELP TO

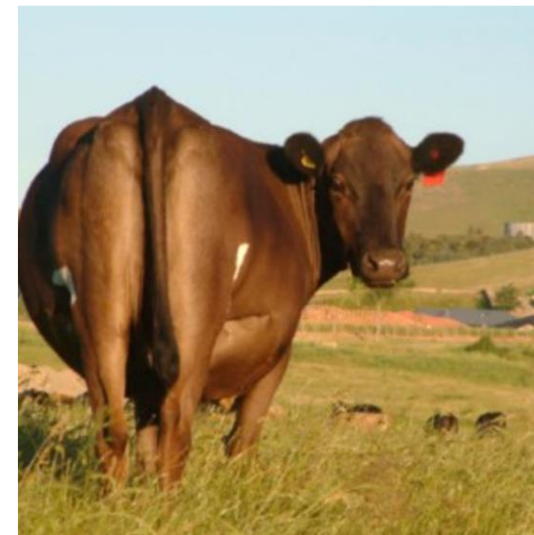


PRESERVATION OF EXISTING ECOSYSTEMS

- Forests, swamps, permanent meadows.
- Reduction of pollution of rivers, soils, groundwater.

REDUCED METHANE EMISSIONS

- Reduced impact of agriculture on global warming.
- Reuse for the production of heat and electricity.



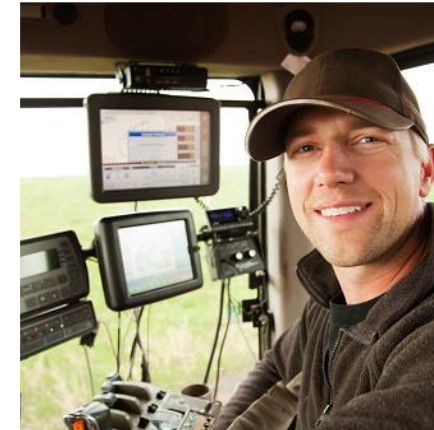


WE WILL PRODUCE WITH LESS

- Higher yields (ha/person/€).
- Healthier.
- Closer to the consumer.

NEW EMPLOYMENT OPPORTUNITIES

- Modern workplaces.
- Easier physical work.
- A more popular industry for young people.



INCREASED SELF SUPPLY

- Production 24/7.
- less weather impact on production.



Pictures from DLG-Feldtage in 2022

The next DLG Feldtage will take place from 11 to 13 June 2024 at Gut Brockhof in Erwitte/Lippstadt (NRW)

Picture source: Sergej Kranjc, Termodron d.o.o.



2022 CROP ROBOTICS LANDSCAPE

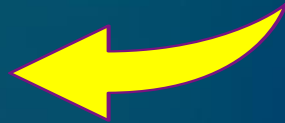


INDUSTRIAL TRANSFORMATIONS HAVE ALWAYS EXISTED, AND TODAY IT IS NO DIFFERENT, ONLY THAT EVERYTHING HAS BECOME MORE DIGITAL/ROBOTIC

ONCE UPON A TIME



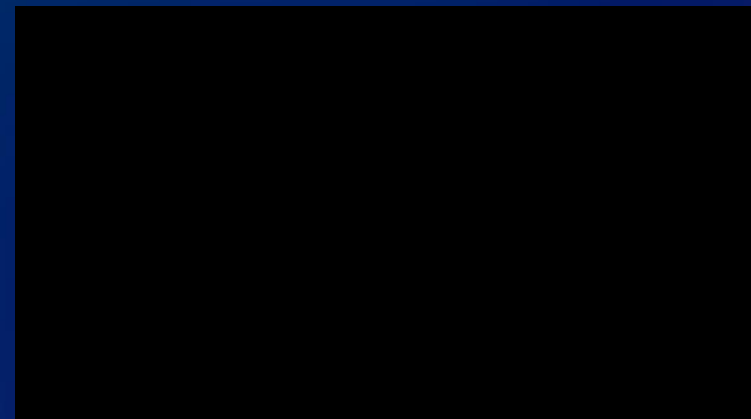
THE EXAMPLE OF THE **AUTOMOBILE** INDUSTRY



THE EXAMPLE OF THE **AGRICULTURAL** INDUSTRY



TODAY OR
TOMMORROW



WHAT'S NEXT ?

Cognitive Robotics in agriculture

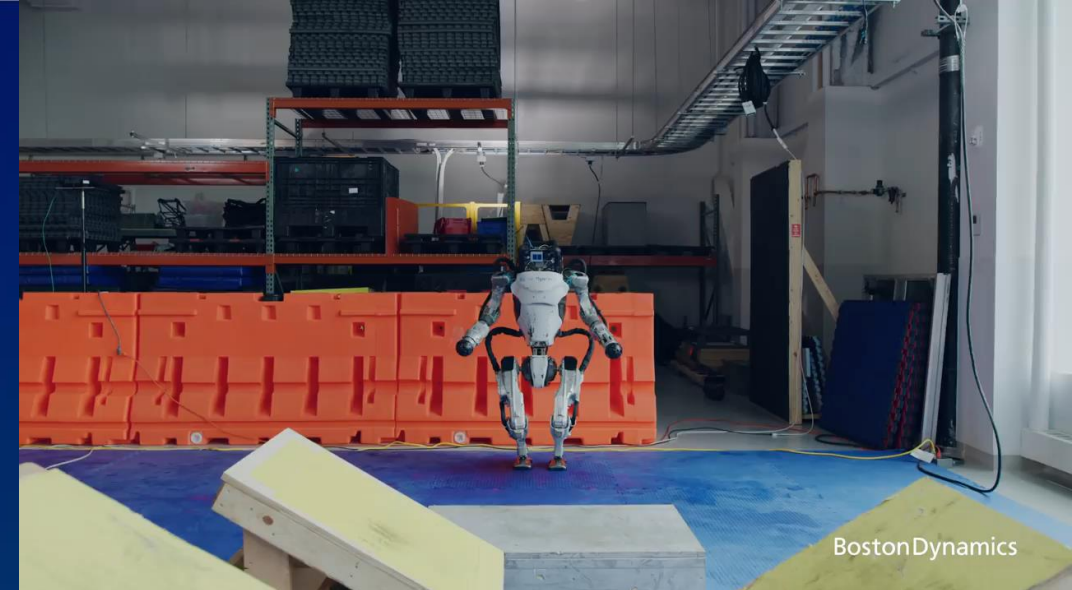
- Boston Dynamics
- Mineral (Alphabet)

Technology combination

- IoT, Cloud , 5G, Cybersecurity , Big Data Analytics , Mobile technologies , AR/VR ...

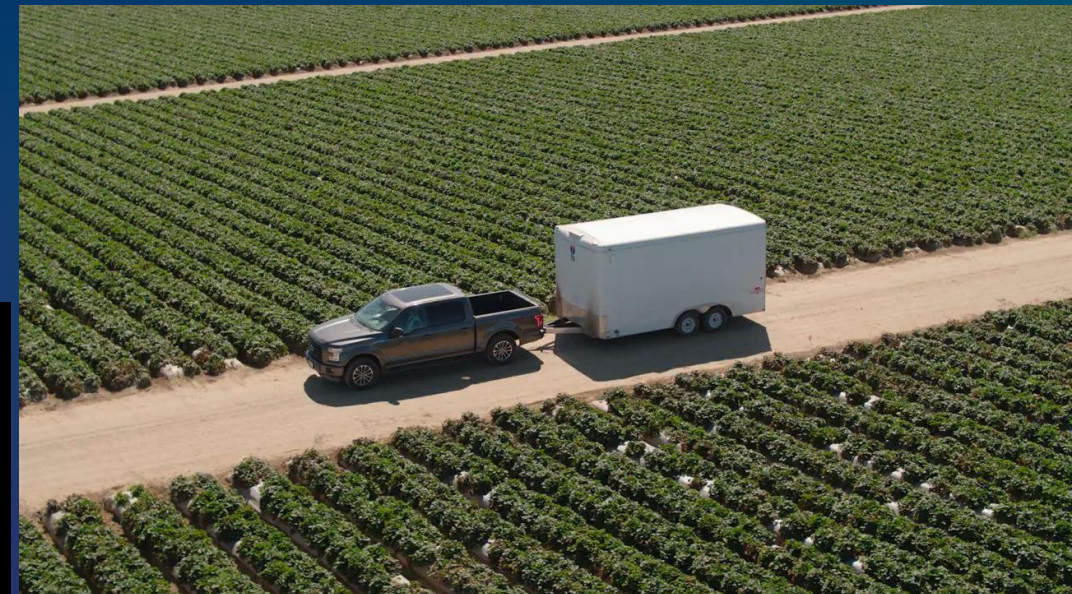
Under and upper water agriculture?

CRISPR and other biotech technology.



BostonDynamics

[Boston Dynamics](#)



[mineral](#)

Source: [nemosgarden](#)

With agriculture we created civilization, but without agriculture, we will lose it, so invest, work and be part of agriculture!



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