

DIGITAL REVOLUTION AND WORLD AGRICULTURAL DEVELOPMENT:

Vision of a Global Investor and Entrepreneur

Howard Lee Morgan, Ph.D.

Chairman, B Capital Group



**TO FEED 10 BILLION PEOPLE
WE NEED TO USE ALL THE
TOOLS AVAILABLE**



Started with Ph.D. in Computer Science and Operations Research in 1968, then taught at Cornell University, at CalTech and the University of Pennsylvania's Moore School and Wharton School where I was a tenured full professor.

My research got us machine #50 on the Arpanet- the genesis of the internet.

Left in 1982 to start Renaissance Technologies, and have been encouraging young people in startups ever since.

Started First Round Capital in 2004, and B Capital Group in 2016. Joined John Deere Global Technology Innovation Advisory Council in 2008.

First Agtech investment was in 1983 when we invested in Farming Technology Corp, which used the new Apple II computers to help run center pivot irrigators on farms in Colorado. This used sensors and communications to decide when to water the fields. It saved large amounts of water.



Effective agricultural development requires



Planning

1. What to plant
2. When to plant
3. Where to plant
4. Economics
5. Agronomics



Running

1. Right equipment
2. Training
3. Actual farming
4. Field monitoring
5. Harvesting



Follow-up

1. Measuring output
2. Output quality by field and now by plant
3. Link back to next year planning

Digital Sensors and Big Data are changing all of the above
Not just for the growers, but also for the consumers



Innovation is coming from many areas

Start with the seed

New computer vision techniques to sort for genotype vs phenotype



Seed-X GeNee Breeder uses advanced image processing to look at a seed and determine the genetic traits, and likelihood of successful germination, thus reducing use of seeds that won't be successful and increasing yield



Data Collection

Location Sensors. - GPS and HiRes (2cm) GPS

Optical Sensors – visible and NIR

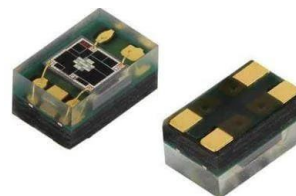
Electrochemical Sensors

Mechanical Sensors

Dielectric Soil Moisture Sensors

Airflow Sensors

Weather sensors



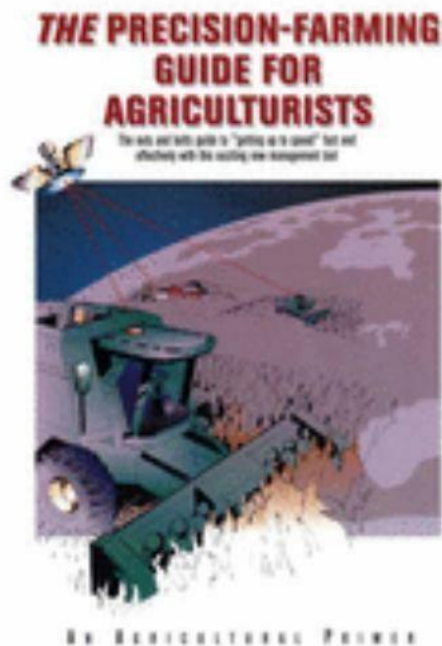
Plus, for small ag, the sensors available on your smartphone



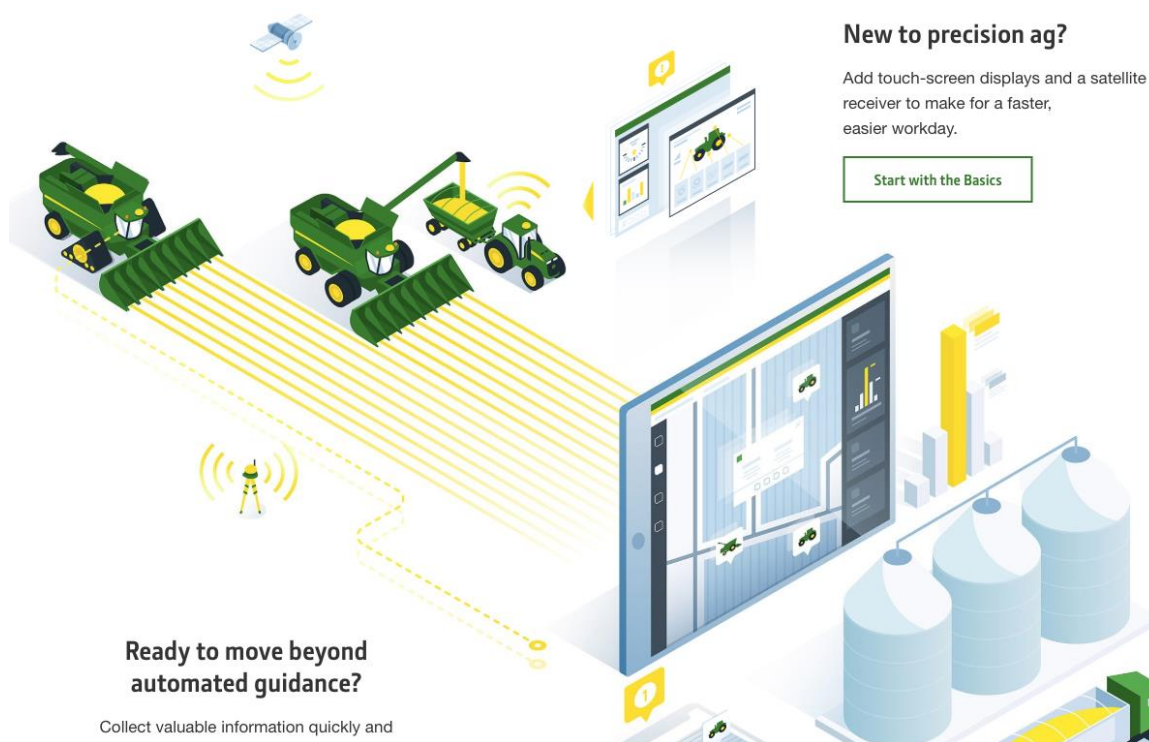


Precision Agriculture uses all this data

In 2003



In. 2019





Consumers are getting help too

Trellis uses AI to tell Frito Lay how many pounds of potatoes with acceptable moisture content they'll get from a specific field. Or tell Gallo what grapes will arrive from various growers

We've studied over 1.5M production seasons.
Ask us anything.



Our AI has studied decades of historical harvest data, and continues to examine the production of the world's largest food systems, as well as ongoing market and weather trends.

By fusing business, field, and operational records, Trellis is able to provide predictions and recommendations that are more comprehensive, timely, and accurate than any other estimation and supply chain optimization tool on the market.



People are coming in from different fields

Climate Corp started by Google alumni, sold for \$1B

Using the big data is also big business – Climate Corp Fieldview



SIDE-BY-SIDE MAPS

Use side-by-side maps to compare critical data layers in your field, including yield, soil maps, application rate, seed population rate and more.



FIELD HEALTH IMAGERY

Find out what's happening beyond the end rows with consistent, high-quality imagery that can help you identify issues early, prioritize scouting and take action to protect yield



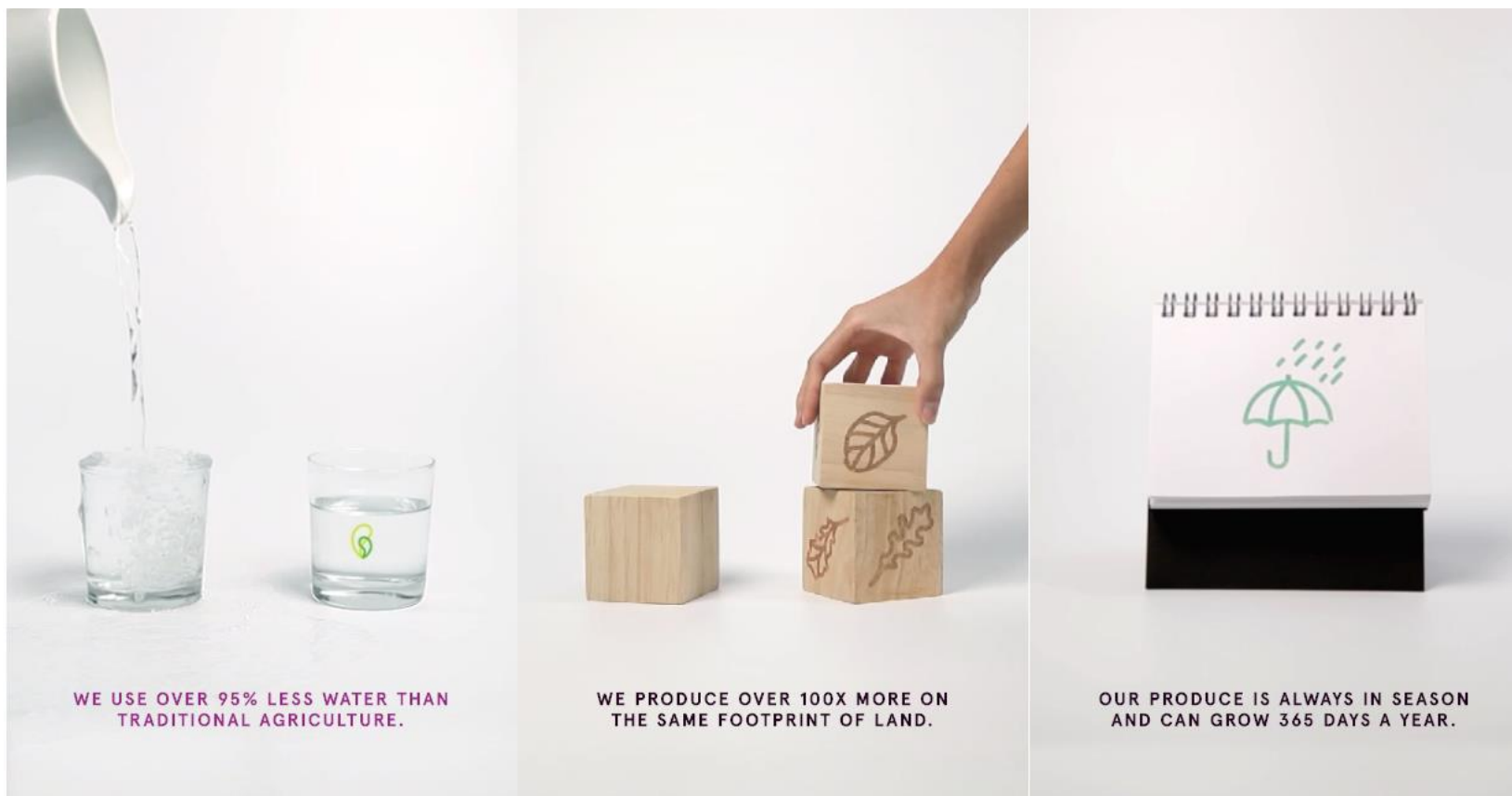
MANUAL SCRIPTING

Build a customized fertility plan to get the most out of your yield variability with easy-to-use prescription tools for nitrogen, phosphorus, potassium and lime.



Indoor Farming is also exploding

Transportation is a very large percent of the end consumer cost of produce. If you can grow it close to consumption, you can cut price.





How Do We Encourage Innovation

Regional Accelerators. (<https://www.postscapes.com/agtech-accelerators/>)

In the US there are now dozens of hundreds of companies



Better Food Ventures

LumiGrow LED lights
Farnhub ag sensing



Terra (SF)

Provenance – Block chain to monitor supply chain
ImpactVision – hyperspectral imaging for quality control



AgLaunch (Memphis).

Cowlar – dairy productivity
GroGuru – soil and irrigation monitoring
Skycision – drones for crop stress detection



Food-X (NYC)

FreshSurety – sensor for food/waste contamination
EIO Diagnostics – multispectral for udder abnormalities



What role can venture capital play

VC funding mostly going to specialty crops

it's easier to get pilots and farmers to test solutions from small companies

in the specialty crop area.

Corporate and government funding for large row crops (corn, wheat, soy, cotton, sugarcane). The channels to the farmers are dominated by large ag dealers and companies, who are innovating as fast as they can



Key Technologies

Robots -



**A Rowbot applying nitrogen in field last year
small form factor allow mid season applications**

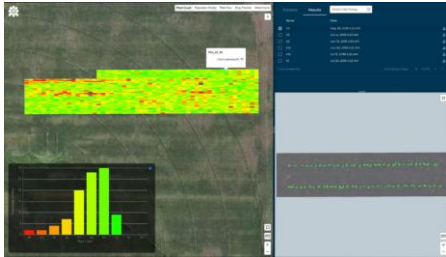
CROO



**Strawberry harvesting
spans 6 beds and picks**

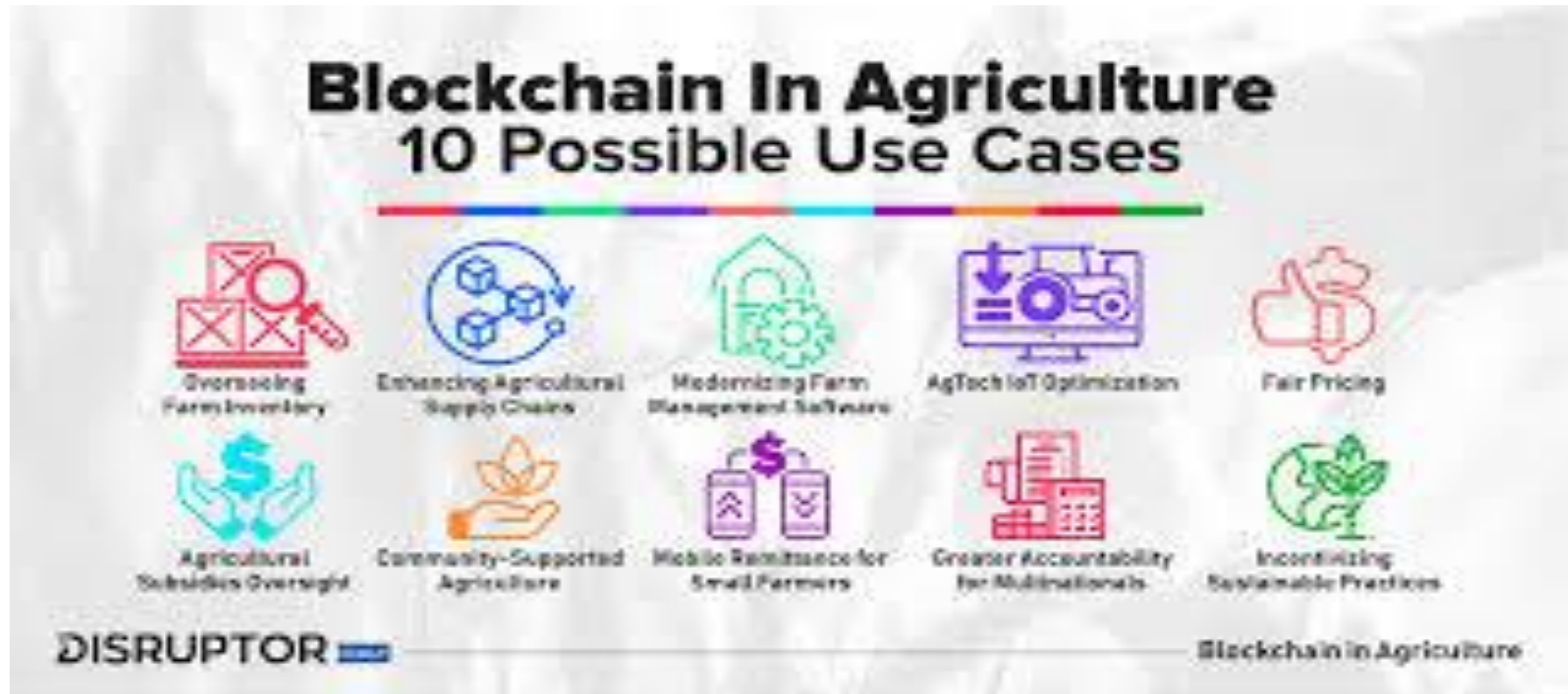


5G



**AgReliant and SlantRange to use 5G for
realtime collection and aerial phenotyping**

Blockchain





Key Technologies

AI/Machine Learning

Detecting diseases

Target weeds, pick herbicides

Blue River See and Spray

Seasonal forecasting models

Weather long range forecasts

Computer vision AI

AI for autonomous vehicle

AI chatbots to help use equipment



Some Key Lessons

BEST PRACTICES

- ❑ Make sure the team understands both the technology and the market. Too often the technology is searching for a problem, but practical application in a real growing situation is impossible
- ❑ Moving from demonstration to production is much harder than the small agile tech teams realize. Environmental issues such as temperature ranges, vibration when running on real tractors, moisture protection, and communication failures all need to be taken into account
- ❑ Regulation may make certain solutions difficult – especially as more countries are putting in appropriate data privacy rules
- ❑ The venture model will work in Agriculture – it is one of the key next sectors ready for real disruption. And it is a giant market, albeit with big players who are not unaware of what's coming.



Thank You

Questions?