

# Emerging Risks and Opportunities in Agriculture

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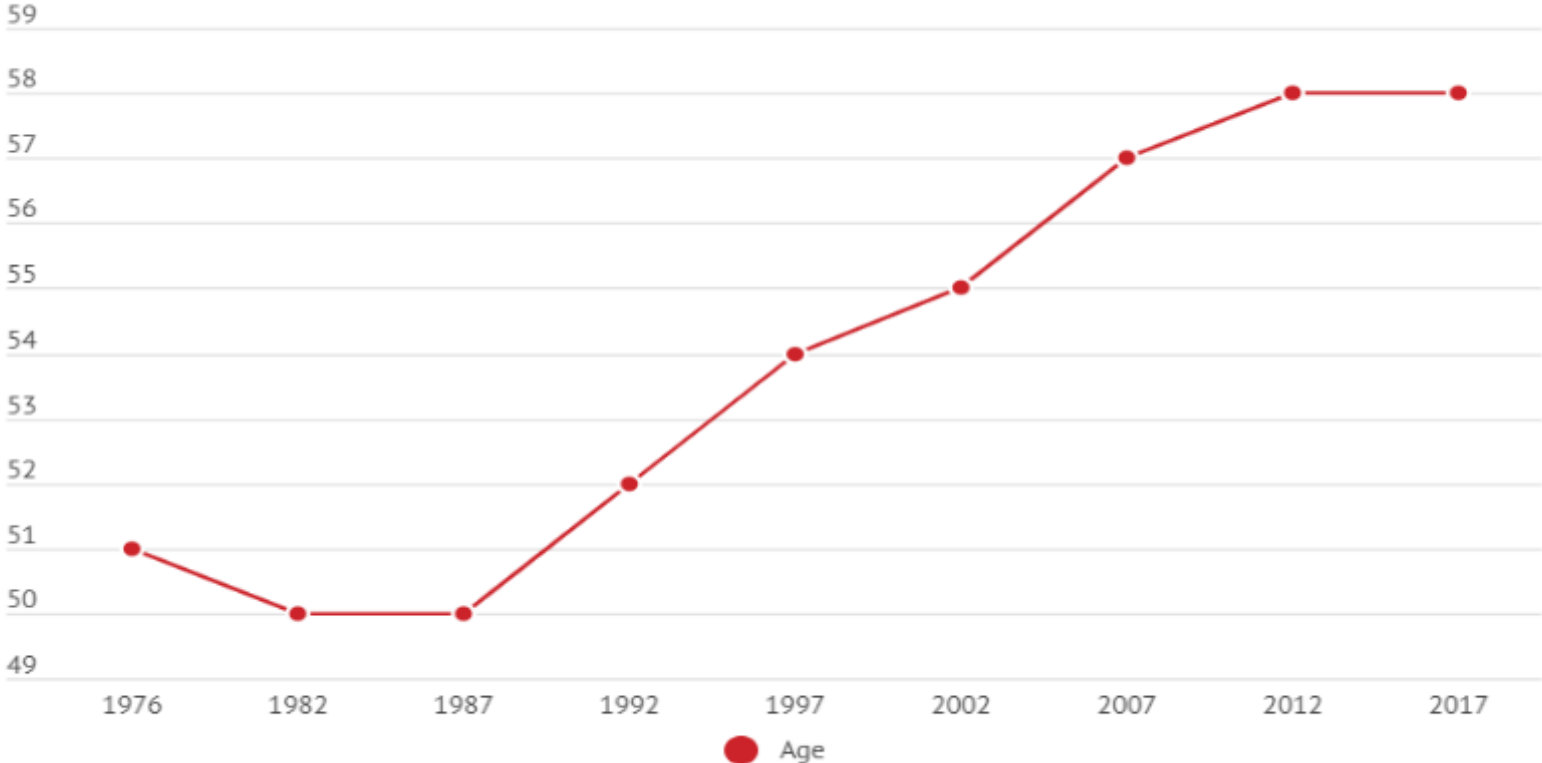
AUTONOMOUS FARM EQUIPMENT



CHANGING DEMOGRAPHIC

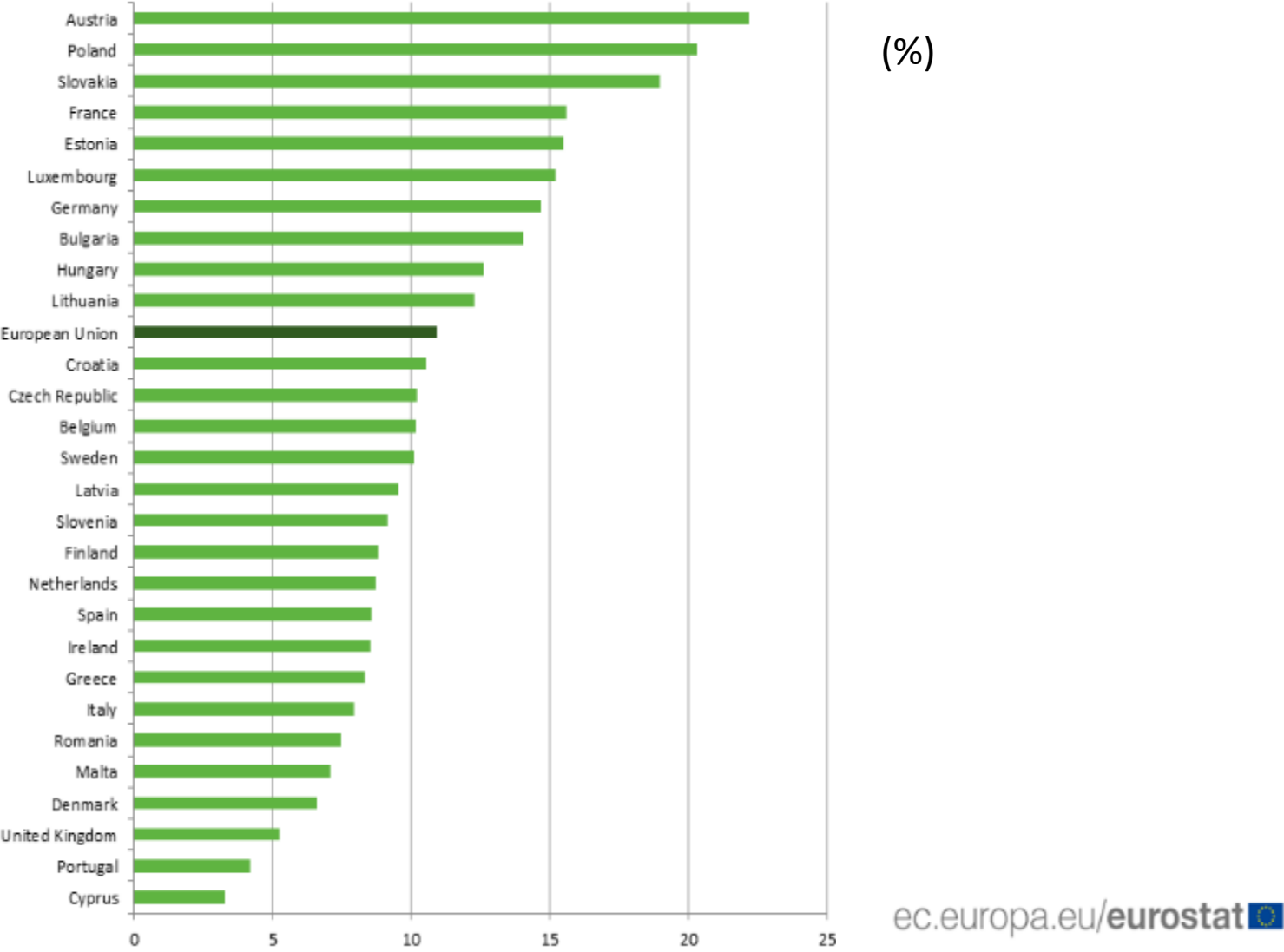
# U.S. AVERAGE AGE OF PRINCIPAL OPERATOR 1976-2017

The average age of U.S. farmers has been slowly rising since the 1980s.



This chart shows the average age of U.S. farmers since 1976. All data provided by the USDA Census of Agriculture.

# 2016 GLOBAL FARM MANAGERS AGED UNDER 40



# WHY HAS THE AGE OF FARMERS STEADILY INCREASED?





FARM TECHNOLOGY ADOPTION

# YOUNGER GENERATIONS ARE TECH SAVVY

- The average age of farmers is increasing – we will soon see transformation as farms are transferred to younger generations who are very tech savvy
- With fewer young people to take over family farms they will increasingly rely on technology to continue to produce enough food to feed a growing population



# SHE'S 15 AND SHE WANTS TO FARM

Technology is so versatile that no matter what you decide to do in life, it will be a part of it," she said. "I want to be a farmer. I can be a better farmer if I'm educated about technology."

~Kayla Visser



Source: CNN Tech

# MILLENNIALS LOOKING TO FARM

Seth Squires is a second-generation dairy farmer in upstate New York. At 18, he is part of a new trend in farming: Millennials who are choosing to continue a family tradition of farming.

Millennials rank their use of technology as the factor that makes their generation most unique.



Source: U.S. News & World Report

# DRIVING FACTORS FOR SUCCESS

- Grow as much per acre as possible
- Reduce the risk of failure
- Minimize operational costs
- Sell crops at the best price



# ADOPTION OF PRECISION AG IN THE UNITED STATES

## USDA Study

### Adoption rates vary significantly by technologies

Yield monitors that produce data for GPS based mapping are most widely used (About 50% on corn and soybean)

Guidance or auto steer is used on about 30% of farms

Soil mapping and use of variable rate technology (VRT) makes up 16-26% of farms

The largest corn farms (over 2,900 acres) have double the rate of adoption compared to all farms

70-80% of large farms use mapping

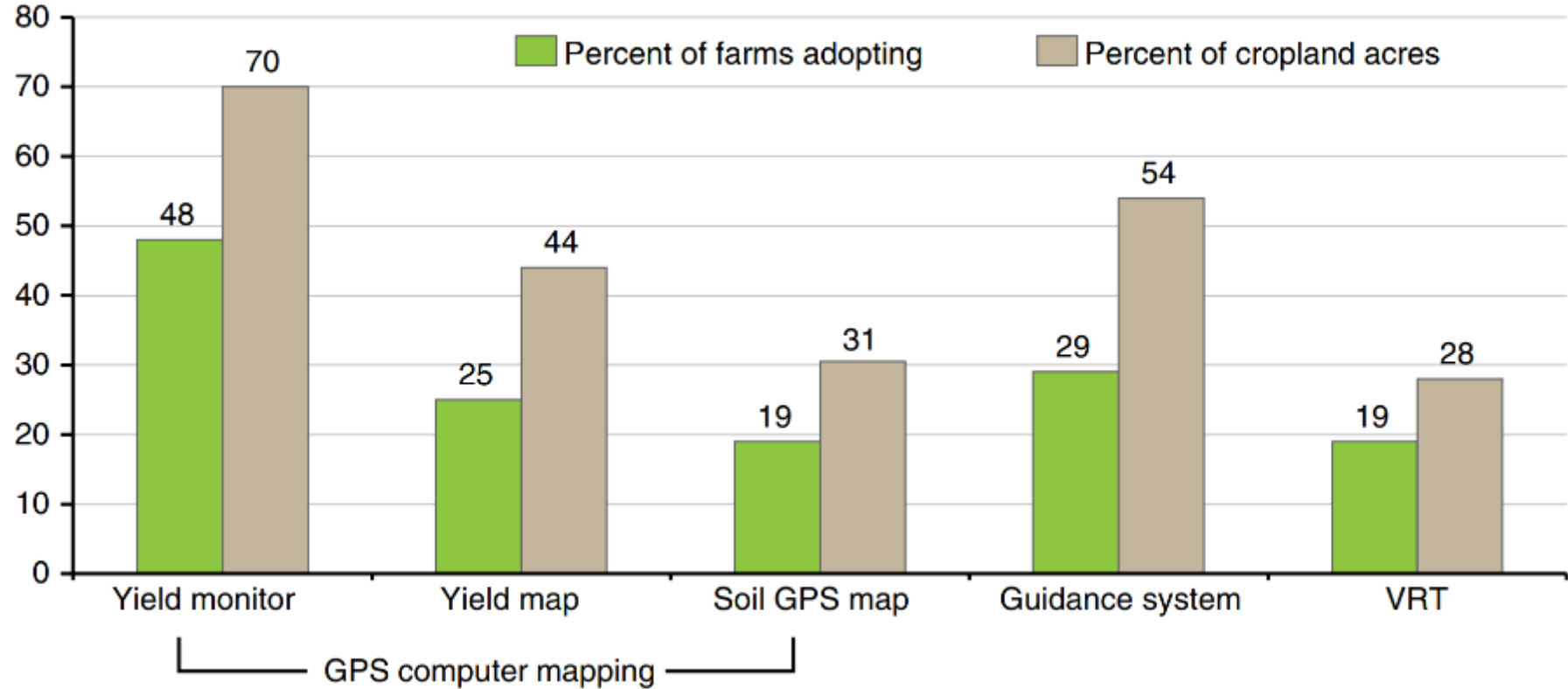
80% use guidance

30-40% use VRT

# ADOPTION OF PRECISION AG ON CORN FARMS

Percent of corn farms/cropland

2010

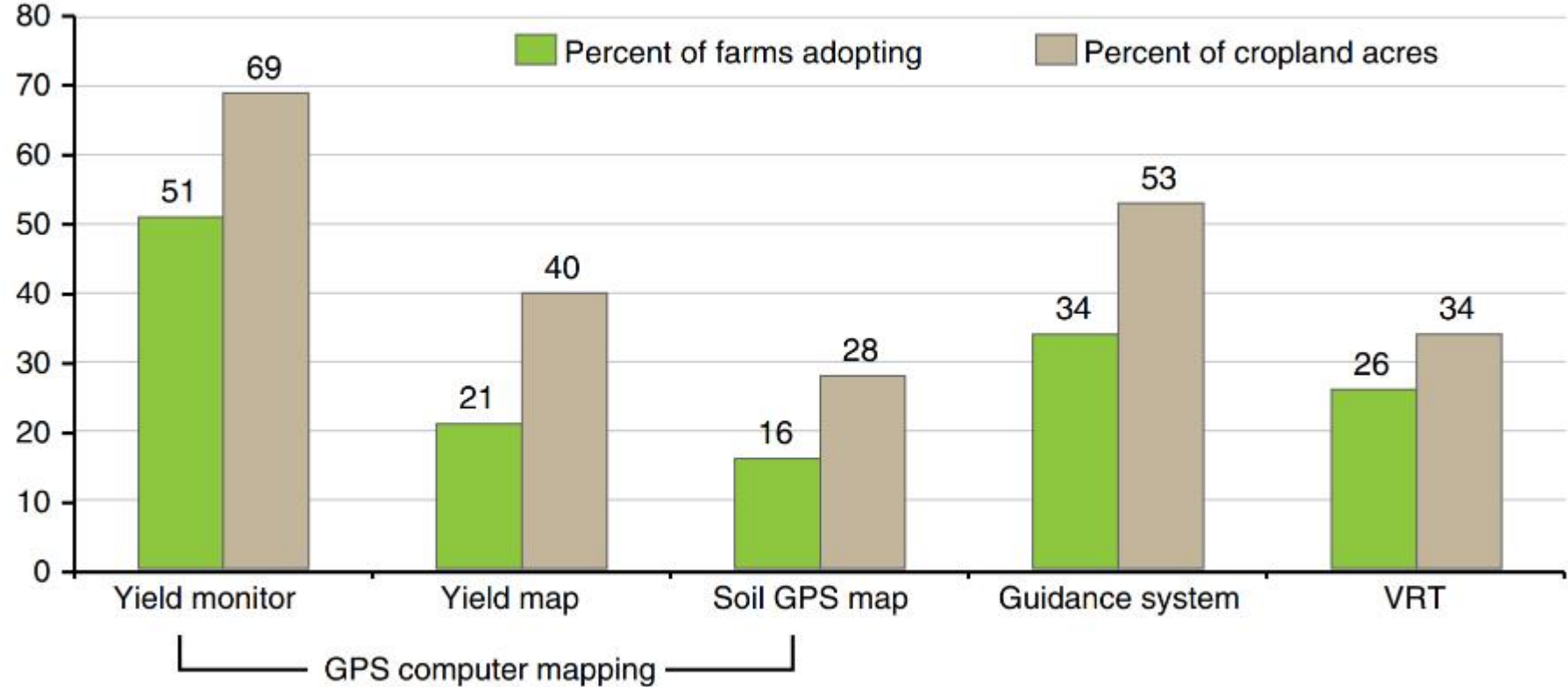


GPS = Global Positioning System.

Source: USDA Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

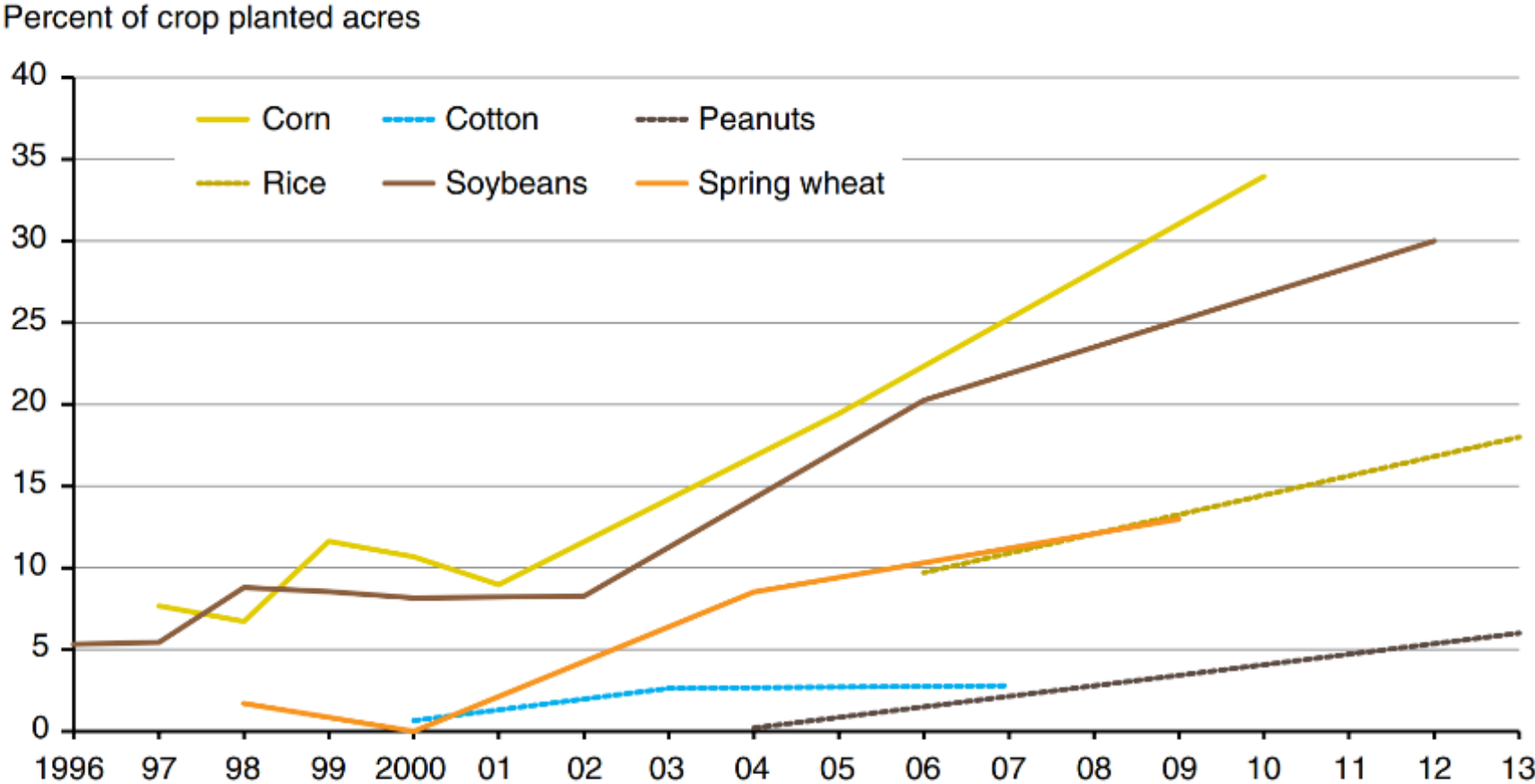
# ADOPTION OF PRECISION AG SOYBEAN FARMS

Percent of soybean farms/cropland 2012



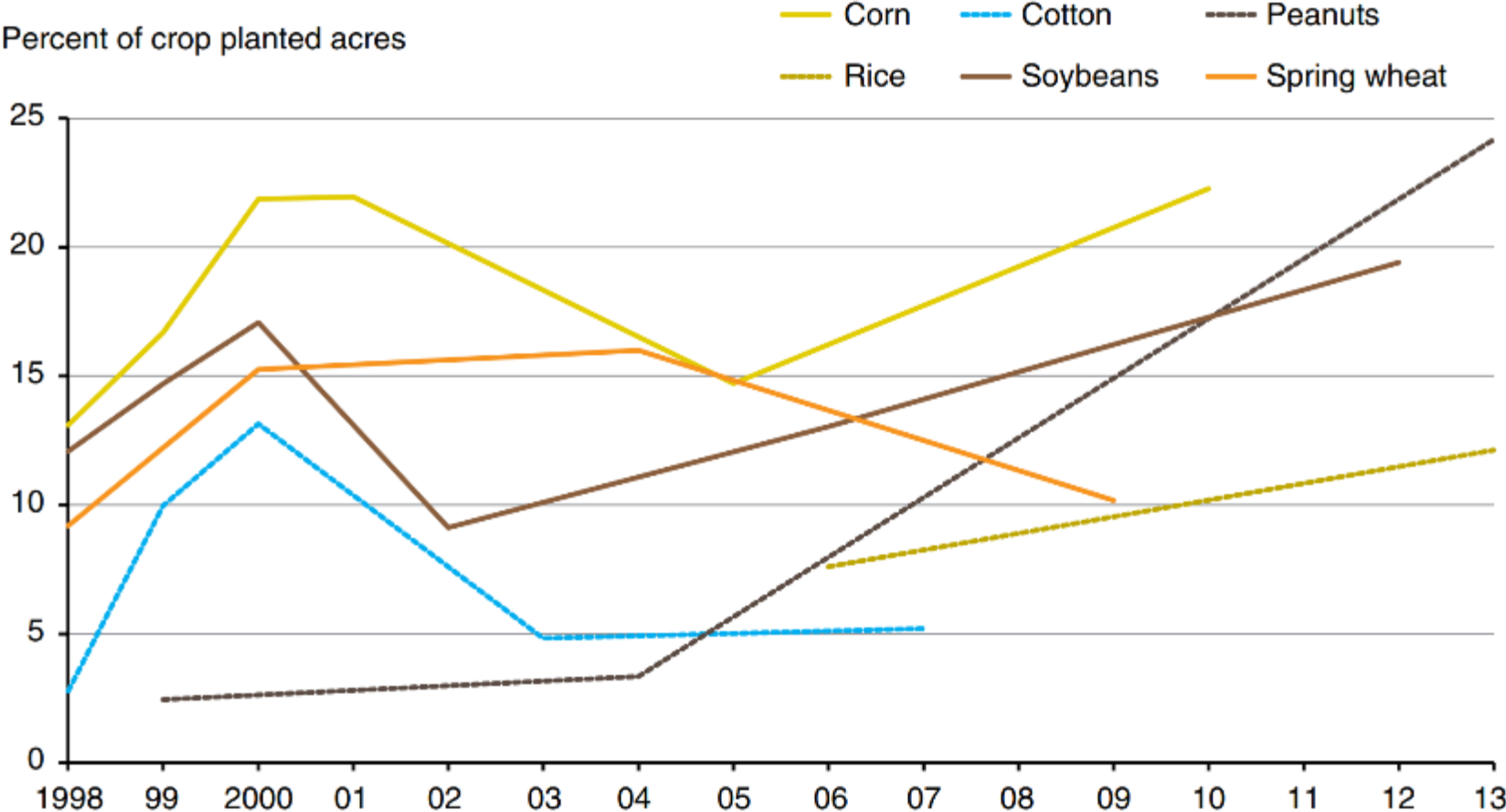
GPS = Global Positioning System.  
Source: USDA, Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

# ADOPTION OF YIELD MAPPING BY CROP



Source: USDA, Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

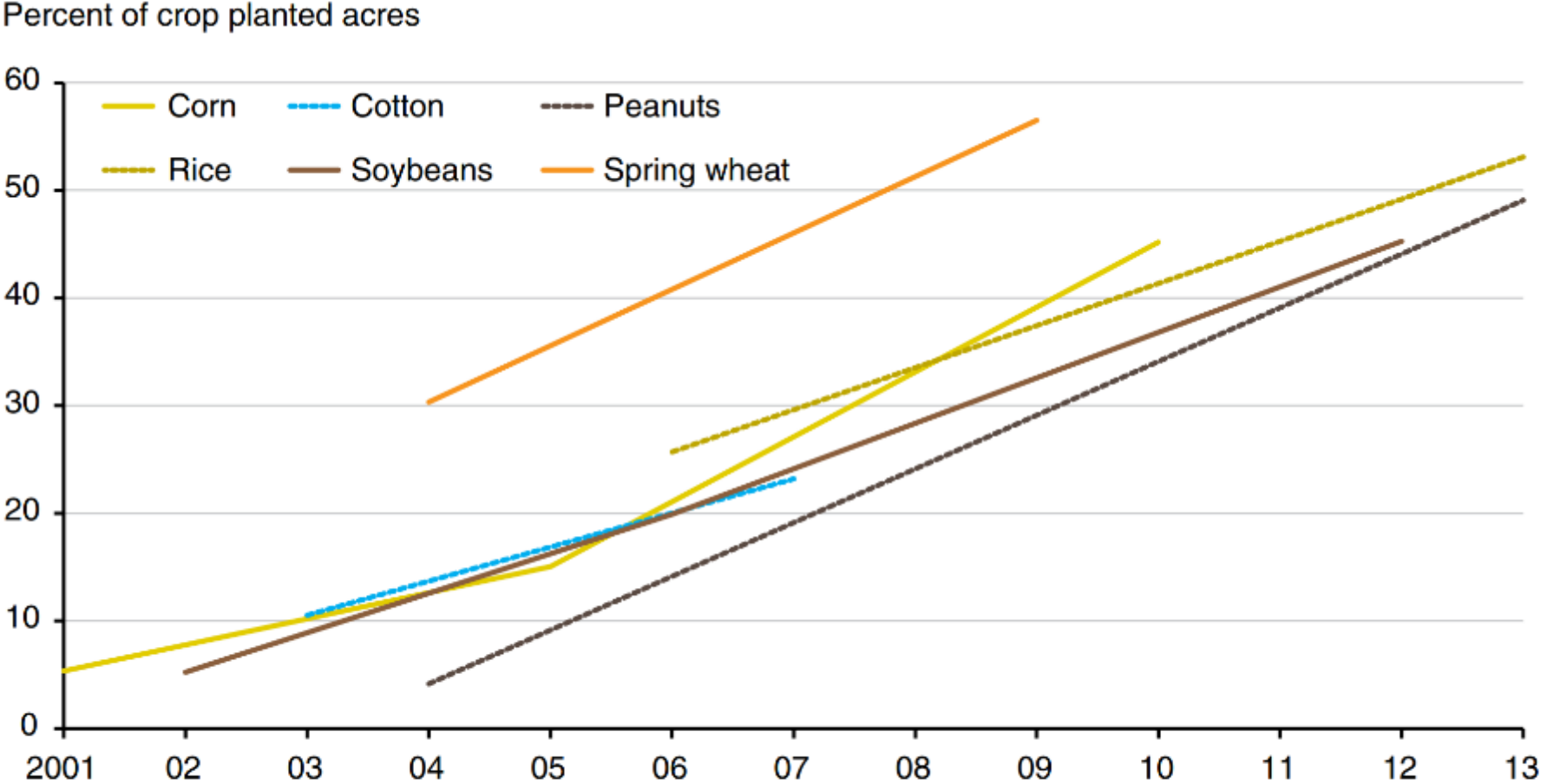
# ADOPTION OF GPS SOIL MAPPING BY CROP



Note: Global Positioning System (GPS).  
 Source: USDA, Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

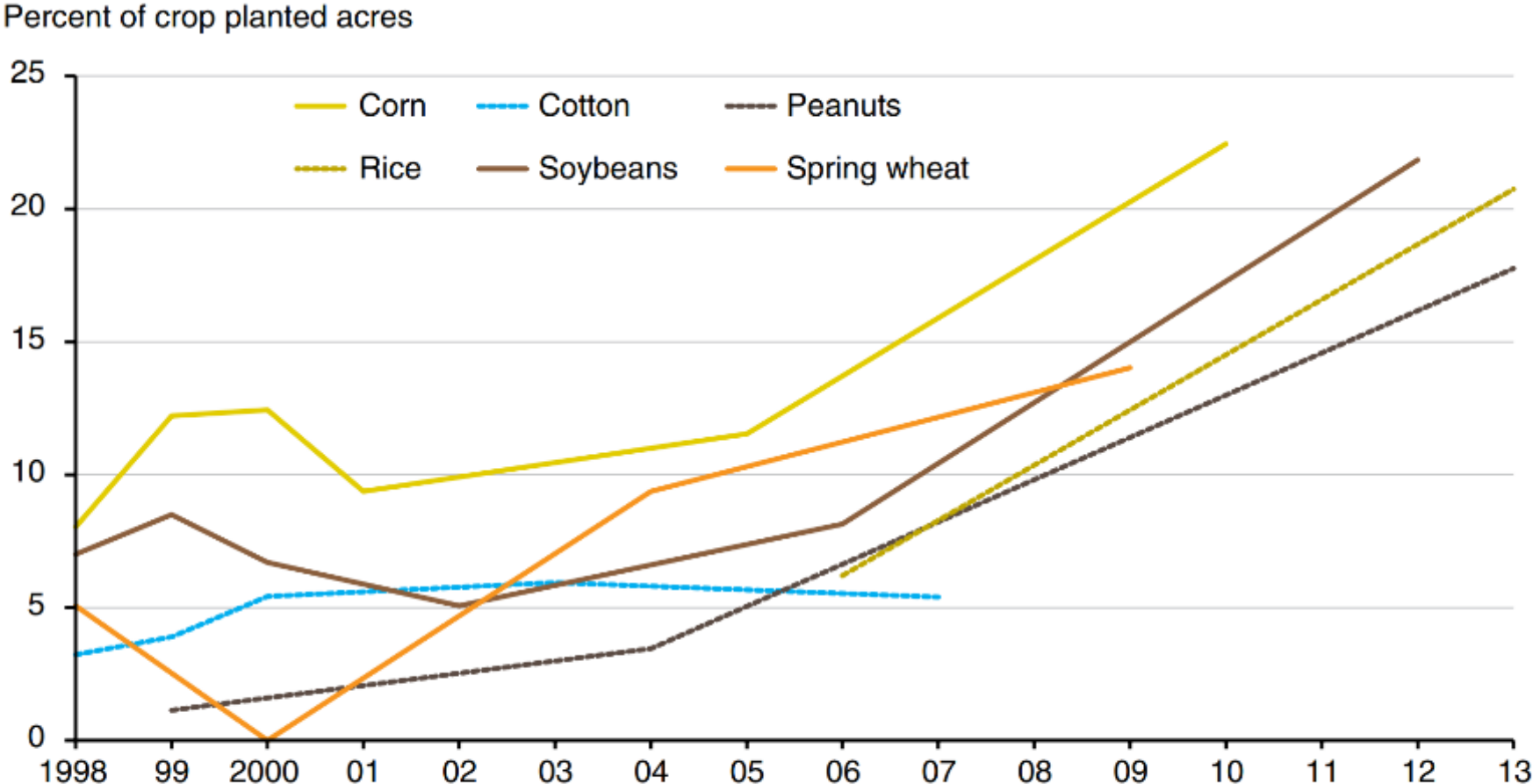


# ADOPTION OF GUIDANCE SYSTEMS BY CROP



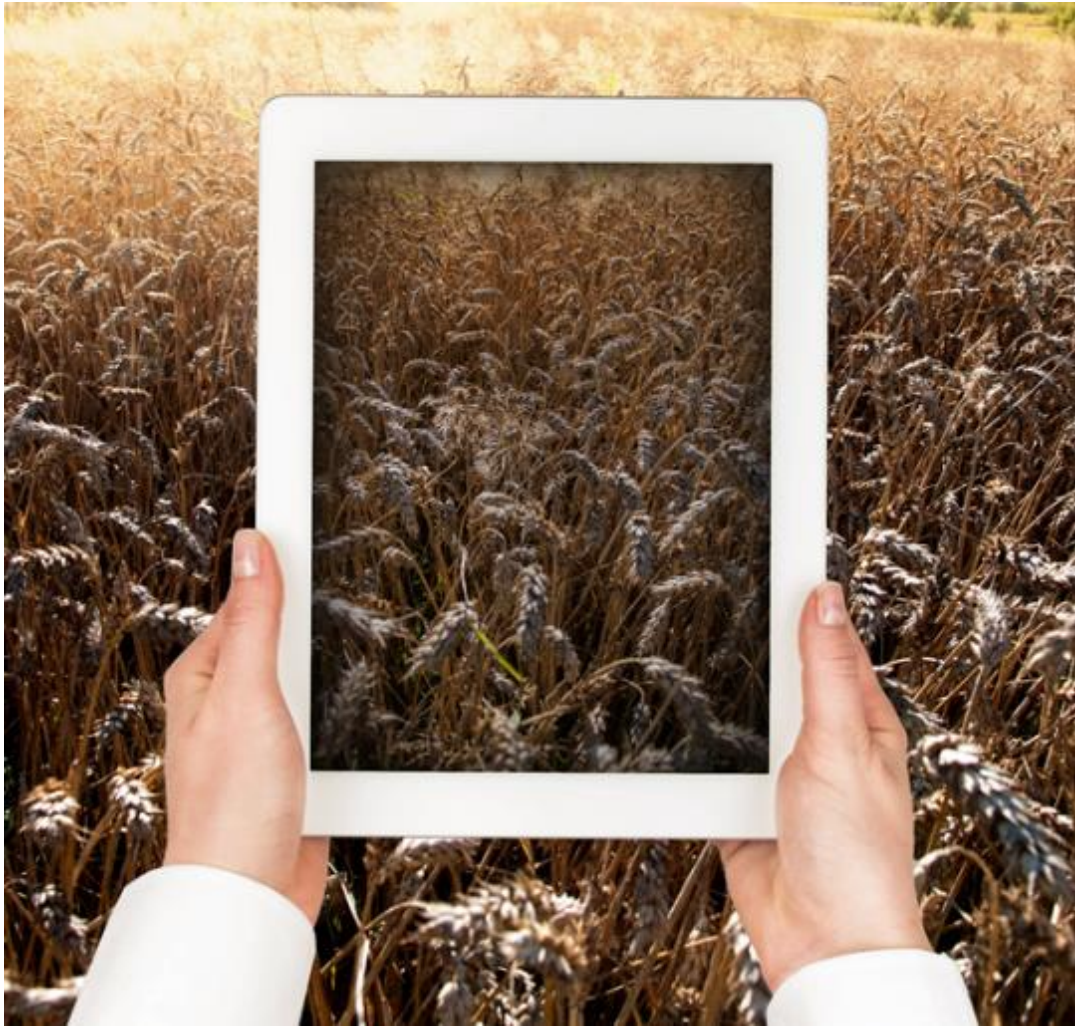
Source: USDA, Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

# ADOPTION OF VARIABLE RATE TECHNOLOGY BY CROP



Source: USDA, Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

# DIGITALIZATION OF AGRICULTURE - “SMART FARMING”



# DIGITAL AGRICULTURE TECHNOLOGY

Digital technology is transforming a very traditional agriculture sector

There are several innovations that make up the components of a digital agriculture system

- Big data
- Artificial intelligence
- Sensors
- Drones
- Autonomous equipment
- Weather tracking
- Livestock biometrics
- Satellite imagery
- RFID technology
- Artificial intelligence
- Pervasive automation
- Minichromosomal technology

# AVAILABILITY AND AFFORDABILITY OF DIGITAL SOLUTIONS

Start-up entrepreneurs offering digital services at a cost that farmers can afford

Increased availability of technology such as:

- Cloud computing systems

- Connectivity

- Open-source software



AUTONOMOUS EQUIPMENT

# AUTONOMOUS TRACTORS

Programmed to perform tasks while:

- Observing position

- Adjusting speed

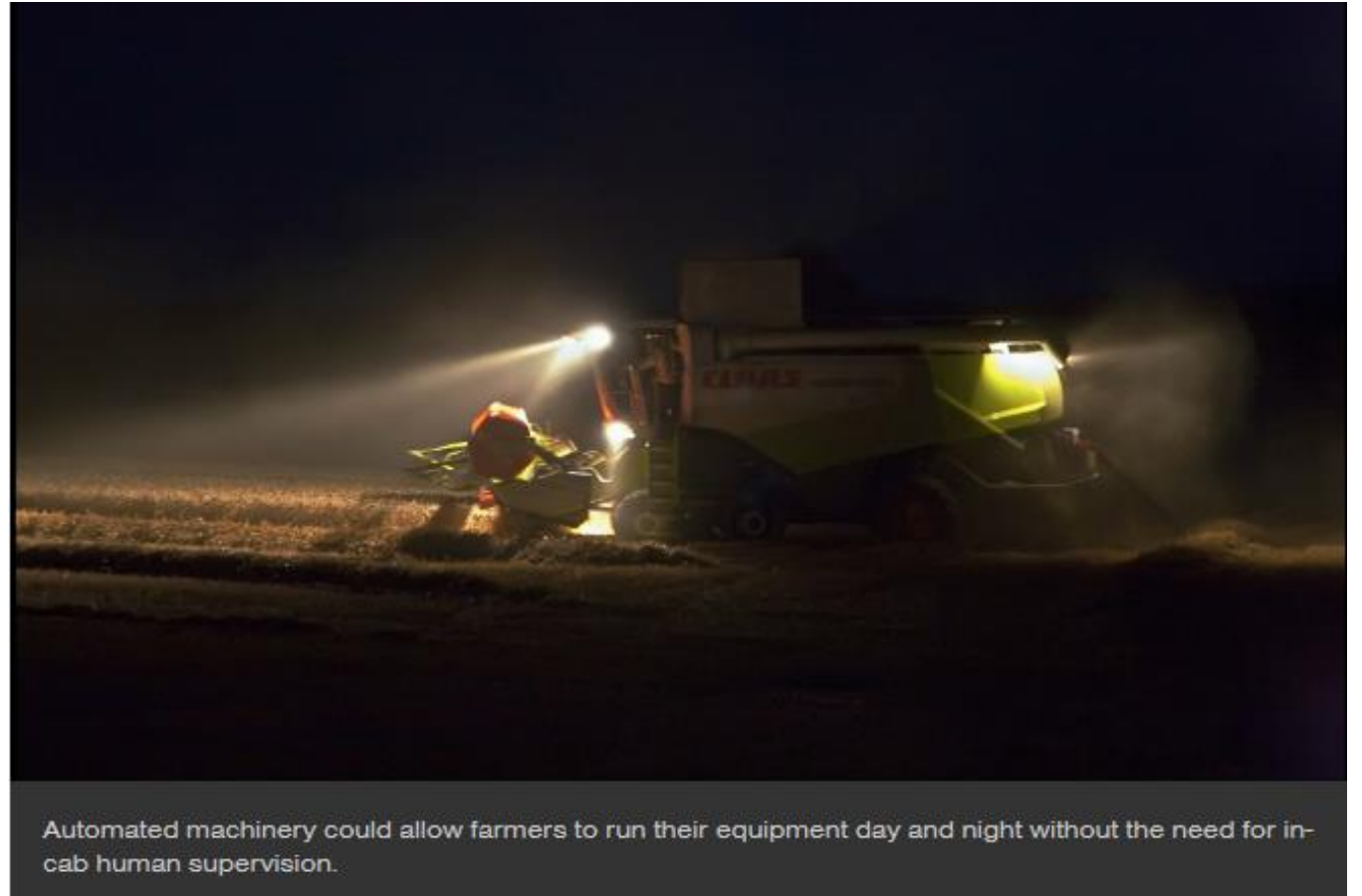
- Avoiding obstacles

How?

- GPS positioning

- Radio feedback

- Automation software



Automated machinery could allow farmers to run their equipment day and night without the need for in-cab human supervision.

Source: pbs.org

# AUTONOMOUS TRACTORS







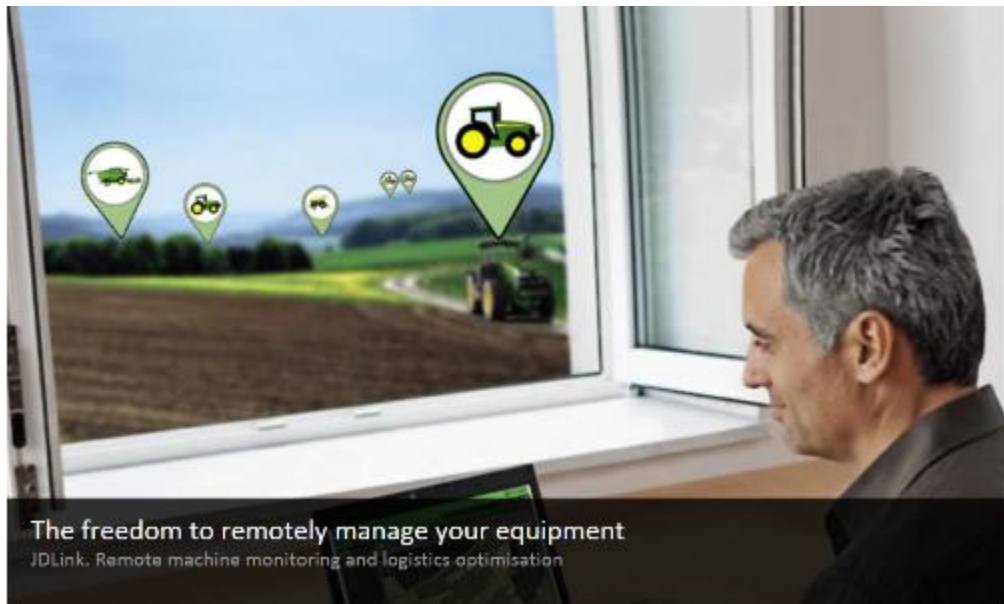
# TELEMATICS

# AGRICULTURAL TELEMATICS

Mechanical warnings

Intra-tractor communication

Farm swarm platform



Source: deere.com



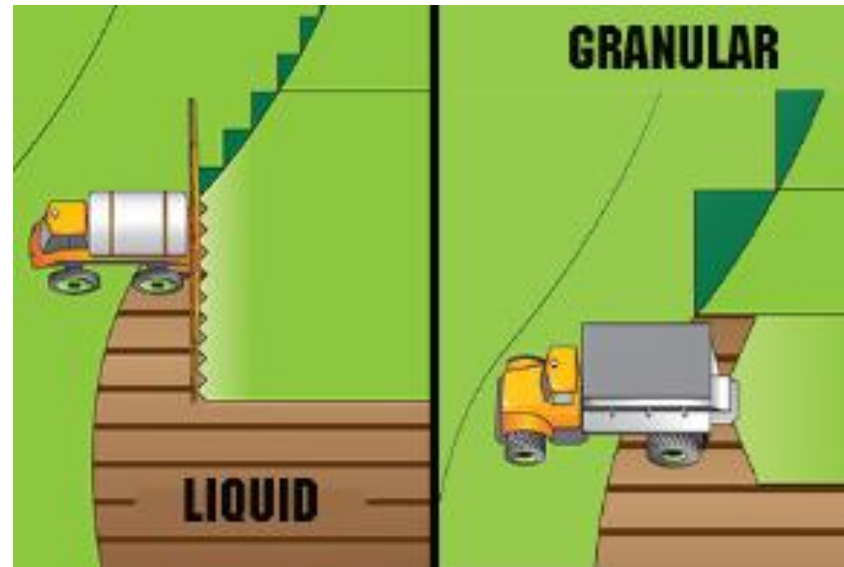
# VARIABLE RATE APPLICATION

# VARIABLE RATE SWATH CONTROL

Pre-computes demographics

Procedurally apply inputs at variable rates

Reduces over-application and product waste



Source: Agleader.com



Source: University of Sydney

# ROBOTICS

# UNIVERSITY OF SYDNEY – LADYBIRD



Source: University of Sydney

# SWARMFARM ROBOTICS



Source: Swarmfarm

# AND SO MUCH MORE ...

Harvesting and picking

Monitor water, pH and health of plants

Weed control

Autonomous mowing, pruning, seeding, spraying and thinning

Phenotyping

Sorting, packing moving



Source: Growing Georgia



Source: Robohub



Source: BBC



Source: Growing Produce





# THE INSURANCE INDUSTRY

# NEW AND UNCERTAIN RISKS

- System malfunction
  - Equipment
  - Connectivity
- Cyber crime
- New liability theories
- Long-term unknown impacts
- Competitors
  - Bundled products from manufacturers
  - Customer experience – tech savvy farmer

# NEW PRODUCTS / SERVICES

- Precision ag data
  - Customer centric pricing
  - Crop insurance (smart contracts)
  - Discounts
  - Automatic coverage for new equipment
- Specialized coverages / services
  - New perils and coverage terms
  - Customer centric platforms
- Farm cyber
- Loss control opportunities
- New strategic partners

# Questions?

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THANK YOU!