# Food and Agriculture is the Last Trillion Dollar Sector in US to go Digital

- Example - Kentucky Agriculture Facts:

  - Poultry: Graduates 300 million birds a year. Over 1 billion eggs laid. #1 agricultural commodity in KY.

  - Beef Cattle: 38,000 cattle farms with over one million beef cattle. Largest herd east of the Mississippi.

  - Swine: 410,000 head, concentrated in Western KY.

  - Dairy Cattle: 57,000 head.

  - Soybeans: Two million acres.

  - Corn: 1.3 million acres.

  - Wheat: 450,000 acres.

  - Tobacco: 68,000 acres.
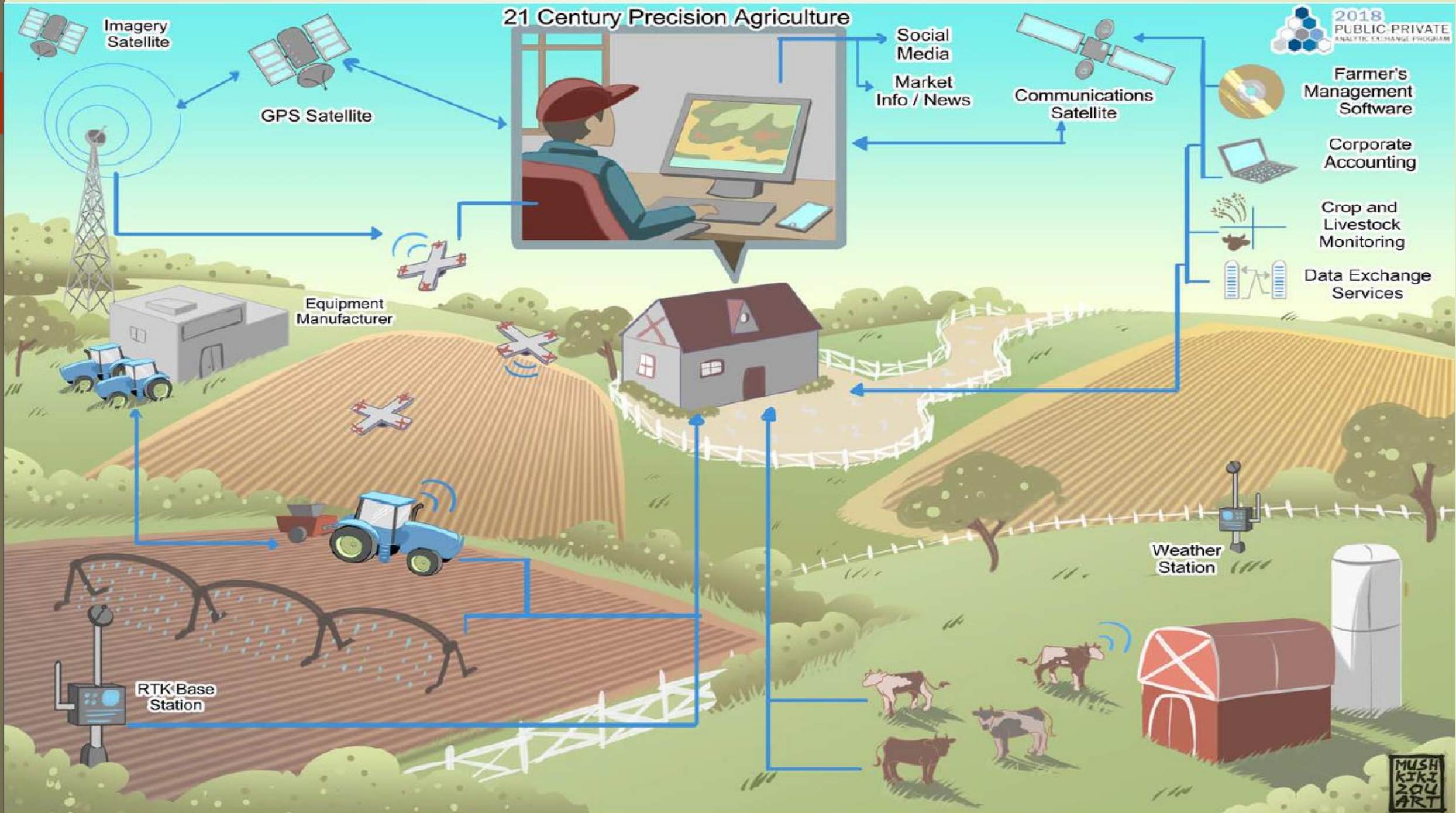
# What is Precision Agriculture?

- **Precision Agriculture 1.0**
  - **PA began late 1980s**
  - **Exploited GPS Technologies**
  - **Yield Monitoring / Maps**
  - **Variable Rate Technologies**

- **Precision Agriculture 2.0 "Smart Farming"**
  - **Advanced Exploitation of GPS Systems**
  - **Internet Connected**
  - **Multiple Communication Technologies**
  - **Sensor Intensive**
  - **Data Analytics**

# How Does Sustainability, Precision Agriculture, and Cybersecurity Intersect?

- **Sustainability involves agricultural best practices designed to maintain and improve the quality of the air, water, and land used in agriculture.**

- **PA records data for exploitation, analysis, and better decision making. It allows for robust record keeping, logging, tracking, and auditing.**

- **PA equipment allows for precise application of agricultural inputs to limit the impact to the environment and measure the health of the farm.**

- **Robust cybersecurity practices secures data and equipment, protecting farming operations from costly or damaging disruptions.**

# Lets Talk About CIA

**Confidentiality**

**Integrity**

**Availability**

| Sector | Impact: Data **Confidentiality** | Impact: Data **Integrity** | Impact: Equipment **Availability** |
|---|---|---|---|
| Row Crops | Yield Data / Cost Data | Soil Data / Yield Data | Farm Equipment |
| Vegetables | Yield Data / Cost Data | Soil Data / Yield Data | Farm Equipment |
| Rice / Cotton / Tobacco / Coffee | Yield Data / Cost Data | Soil Data / Yield Data | Farm Equipment |
| Fruits | Yield Data / Cost Data | Automatic Water Systems DSS Equipment | Robotic Picking Equipment Water Pivots |
| Nuts / Legumes | Yield Data / Cost Data | Automatic Water Systems DSS Equipment | Robotic Picking Equipment Water Pivots |
| Unique Value (Vineyards / Ginseng / Hemp) | Plant Genetics | Automatic Water Systems Remote Weather Stations | Cellar Climate Systems Water Pivots |
| Beef Cattle | Breeding Data | Animal Health Data | DSS Equipment |
| Dairy Cattle | Breeding Data / Yield Data | Animal Health Data | Robotic Milking Equipment Robotic Milking Barns |
| Swine | Breeding Data / Yield Data | Animal Health Data | Smart Barns |
| Poultry | Breeding Data / Yield Data | Animal Health Data | Barn Climate Systems |
| Unique Value (Horses) | Breeding Data | Animal Inputs | Barn Climate Systems |
| Aquaculture | Yield / Cost / Sales Data | Health Data / Water Quality | Containment Control |

# Information Flow on the Farm
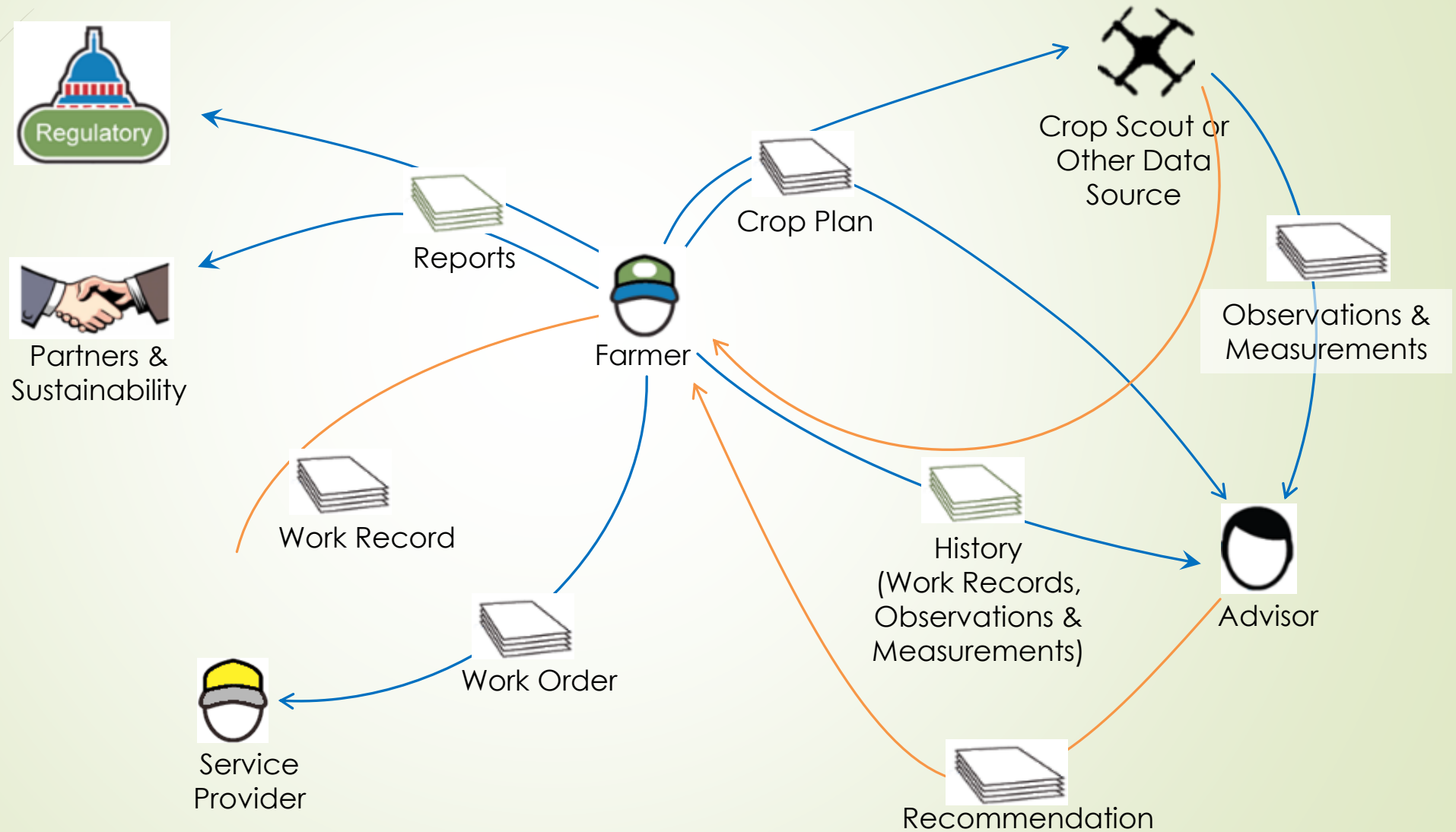
# Attack Scenario – The $500,000 Brick

- Modern farm equipment is a high tech system of systems.

- Farmers jailbreak their systems with bootleg diagnostic software.

- Hundreds or thousands of pieces of equipment with bootleg software may have vulnerabilities or malicious code installed.

# Best Practices

- **Baseline security necessary to mitigate threats are consistent with other industries.**

- **Recommended best practices are derived from the Center for Internet Security's critical security controls (http://www.cisecurity.org/controls/). Examples:**



- **Implement Email and Web Browser Protections**

- **Limit and Control Network Ports, Protocols, and Services**

- **Inventory and Control Hardware and Software Assets**

- **Account Monitoring and Control**

- **Separate Operational Technologies and Business Operations**

- **Data Recovery Capabilities**

- **Incident Response and Management**

- **Implement Physical Controls**

# CIS Controls™

# V7

## Basic

**1** Inventory and Control of Hardware Assets

**2** Inventory and Control of Software Assets

**3** Continuous Vulnerability Management

**4** Controlled Use of Administrative Privileges

**5** Secure Configuration for Hardware and Software on Mobile Devices, Laptops, Workstations and Servers

**6** Maintenance, Monitoring and Analysis of Audit Logs

## Foundational

**7** Email and Web Browser Protections

**8** Malware Defenses

**9** Limitation and Control of Network Ports, Protocols, and Services

**10** Data Recovery Capabilities

**11** Secure Configuration for Network Devices, such as Firewalls, Routers and Switches

**12** Boundary Defense

**13** Data Protection

**14** Controlled Access Based on the Need to Know

**15** Wireless Access Control

**16** Account Monitoring and Control

## Organizational

**17** Implement a Security Awareness and Training Program

**18** Application Software Security

**19** Incident Response and Management

**20** Penetration Tests and Red Team Exercises

Best practices can be implemented at every level, creating defense in depth and building resiliency into Precision Agriculture networks.

Farmer

Equipment Manufacturers

Software Developers
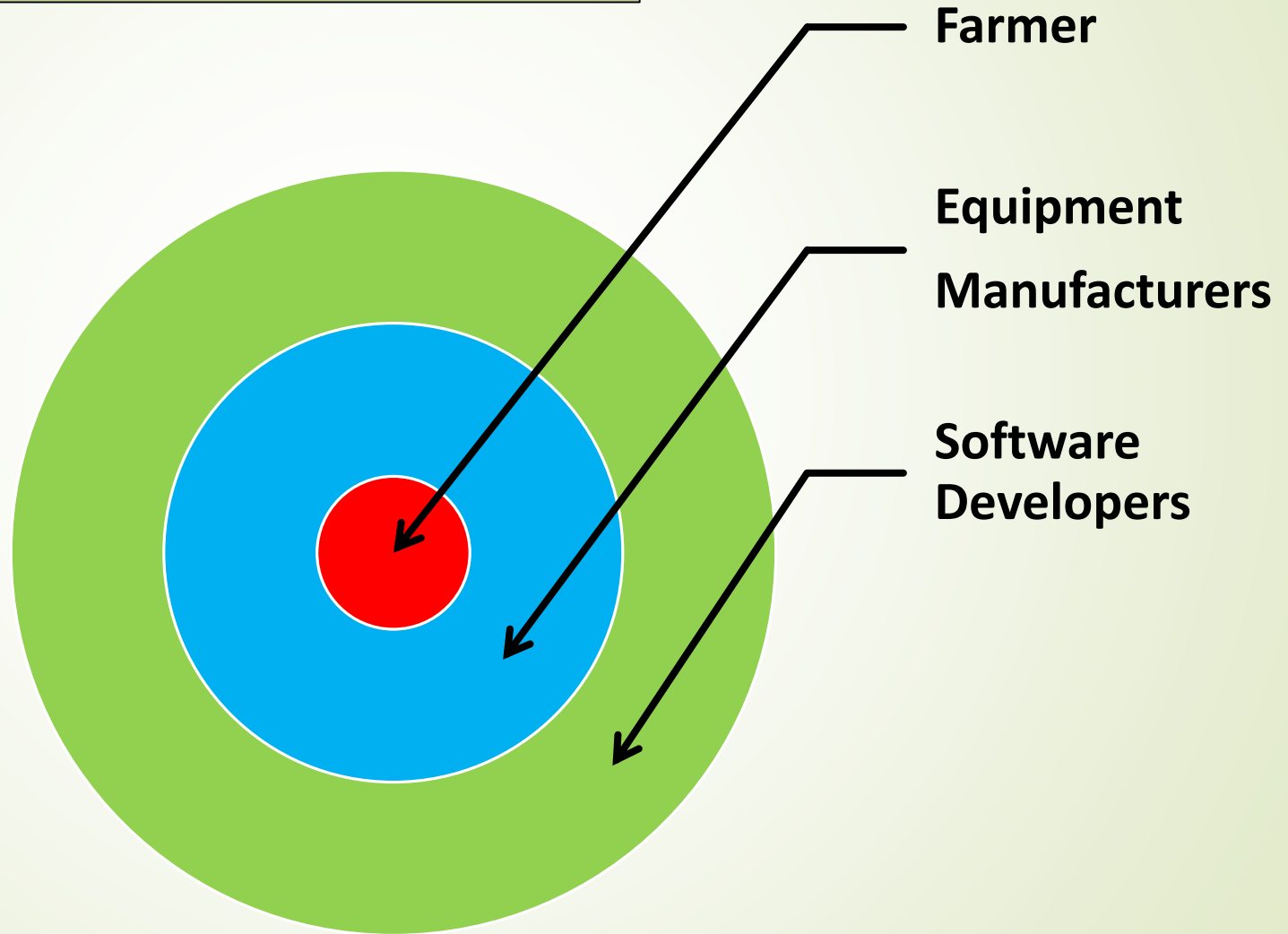
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