How technology is changing the face of our greatest industry - Farming

LEON SCHUMACHER
PROF & CHAIR - UNIVERSITY OF MISSOURI
NATIONAL FARMERS CONVENTION – JANUARY 25, 2017

Impact of Mechanization on our society

Great Engineering Achievements of the 20th Century:

<table>
<thead>
<tr>
<th>Order</th>
<th>Topic</th>
<th>Order</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electrification</td>
<td>7.</td>
<td>Agricultural Mechanization</td>
</tr>
<tr>
<td>2.</td>
<td>Automobile</td>
<td>8.</td>
<td>Computers</td>
</tr>
<tr>
<td>3.</td>
<td>Airplane</td>
<td>9.</td>
<td>Telephone</td>
</tr>
<tr>
<td>4.</td>
<td>Water Supply and</td>
<td>10.</td>
<td>Air Conditioning and</td>
</tr>
<tr>
<td></td>
<td>Distribution</td>
<td></td>
<td>Refrigeration</td>
</tr>
<tr>
<td>5.</td>
<td>Electronics</td>
<td>11.</td>
<td>Highways</td>
</tr>
</tbody>
</table>

The next on the list? Number 13 was the Internet!

Technology – this will be the game changer for agriculture...

- 9 Billion people by 2050
- 70% increase in food to feed 9 Billion people
- Technology that will help make this possible:
  - smart power systems
  - precision agriculture tools
  - farm management software
  - affordable sensors
  - smart internet systems, a mesh like internet grid
  - A plan to transfer our technology to other countries

How could these systems change agriculture / farming?

- Remote livestock monitoring
- Cameras in the calving barn
- Temperature sensors alerting us
- Remote grain bin monitoring
- Security
- Temperature, moisture, grain quality
- Water quality of a well, pond, or tank
- Potential to disable a system that is failing or has not been serviced properly
- Thermostats/integrated controllers for your home, business, barn shop, livestock facility, grain facility
- These can ALL BE MONITORED WITH YOUR CELL PHONE...

How technology changed my business - A personal example...

While teaching at MU, over a Thanksgiving break in 1997, I started an internet business. How do I manage this when I am in Germany, England, India, Poland, Georgia, or Costa Rica?

Answer: Of course, I have good help but, Electronic systems alert me via my smart phone and/or email to receive or have access to:

- a text memo when someone steps into the datacenter
- a text message when a web or mail server faults
- a text memo informing me when my emergency generator starts
- A text memo informing me when my generator automatically stops
- Email when a mesh type Wi-Fi access point goes offline
- Email when a hard drive fails in a server
- Email when a server is attacked
- Security cameras that monitor this equipment
- The screen of a computer (console)

How could these systems change agriculture / farming?

- Remote livestock monitoring
- Cameras in the calving barn
- Temperature sensors alerting us
- Remote grain bin monitoring
- Security
- Temperature, moisture, grain quality
- Water quality of a well, pond, or tank
- Potential to disable a system that is failing or has not been serviced properly
- Thermostats/integrated controllers for your home, business, barn shop, livestock facility, grain facility
- These can ALL BE MONITORED WITH YOUR CELL PHONE...

Grain related monitoring systems
What other systems might we see deployed in agriculture?

- The equivalent of fitbits for animals →
  - So a horse at the Kentucky Derby is able to perform better
  - So a horse at the Kentucky Derby does not have a heart attack during the race

- A wet spot in the grain bin is found before grain is spoiled
  - Alert the manager or better yet; the bin automatically responds

- A sensor in the field notes the insect, fertilizer condition, moisture condition and alerts the farm manager
  - A “rowbot” may be deployed →

Similar John Deere Systems apps free on Google Play - 32

- John Deere PowerAssist™ App
  - Warranty exploration & Engine information search
  - John Deere Mower Plus
  - Helps track lawn care
  - Mobile Version for jdpartsdeere.com
  - JD Link →
    - Ultimate Data (if applicable), Multiple machine mapping, Directions to machines, Ping Machines, View and acknowledge alerts, Engine Hours, John Deere Remote Display Access, Users can filter multiple alert categories at once, etc.

Other smart phone Apps...

- Case IH - 32 apps on Google Play
- Caterpillar - 9 apps on Google Play
- AGCO - 3 apps
- Grain systems - ADM, Bin Sense, Dry grain calculator →
- TeJet App →
  - calculate pesticide volume
  - Reduce environmental risks
  - Tractor rollover detection →

USDA Spraying app

- Accesspoint, Switch, cameras...

Center Pivot Irrigation system App

- Unifi® AP AC LR
  - 802.11ac Long Range Access Point
  - Fully Managed Gigabit Switch
  - Unifi® Video Camera PRO
  - IP Camera with Infrared & Optical Zoom
More equipment may be needed...

- Microwave link, router + internet via Internet company...

US government is committed to delivering broadband internet...

- USDA Seeks Applications for Nearly $12 Million in Broadband Grants for Rural Communities

WASHINGTON, April 18, 2016 – Agriculture Secretary Tom Vilsack announced today that USDA is soliciting applications for grants to establish broadband in unerved rural communities through its Community Connect program. Community Connect is administered by USDA’s Rural Utilities Service and helps to fund broadband deployment into rural communities where it is not economically viable for private sector providers to provide service.

Summary

- These mobile apps:
  - helping to reduce grain spoilage
  - telling us when crops need water to maximize production
  - Help control weeds populations
  - Facilitate fertilizer application etc.
  - Remotely monitor agric. systems
  - Ultimately help us feed 9 billion people around the world

In so many ways, the future is in our hands...

- Cell phones will be used
- Telco Internet / cable company internet will be used
- Mesh internet network will eventually make this a reality
- Thoughts / Questions?
- Thank you for your attention!