

Drone Technology in Agriculture

2020-2021 STUDENT BOARD PROJECT



**FORT HAYS STATE
UNIVERSITY**

Forward thinking. World ready.





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Background

- Advantages of Drone Usage
 - Some may be inexpensive – Parrot Bebop
 - Easy use
 - GPS
 - Lowers costs from renting planes
- Disadvantages of Drone Usage
 - Legal restrictions
 - Requires a License
 - May become expensive based on quality
 - Severe weather prevents usage



Steps to Start Flying Your Own Drone

- Understand the Rules for a FAA Part 107 license
- Obtain remote pilot certification
- Register drone with FAA

Requirements

- Aircraft weight: .55 to 55 pounds
- UAV must remain in visual line of sight of pilot running controls
- Operate time: 30 minutes before sunrise - 30 minutes after sunset
- Maintain max altitude of 400 feet, less than 100 mph
- No carrying hazardous materials
- Should not be flown over crowds or populated areas
- Understand Airspace
 - FAA Website: Visualize It
 - FAA App: B4UFLY
 - See restrictions and requirements surrounding your planned flying location

Becoming a Certified Pilot

- Pass electronic knowledge test - 60 multiple choice questions, \$160
 - 120 minutes to complete, Must get 70%
- FAA PSI exam center: schedule test and locate a testing center
 - Closest center is Salina
- Before scheduling: create a FAA tracking number (FTN) through IACRA
 - Integrated Airman Certification and Rating Applications
- Test Prep: 1 week
 - FAA Materials, Instructional Classes
 - Must take recurrent knowledge test within every 24 month period after passing initial exam

Register Your Drone

- FAA's DroneZone website
- \$5 per drone & valid for 3 years
- N-number assigned to drone
 - Must be visible on exterior of the drone
- Complete TSA Background Check
- Entire process can take over two months to complete

Special Requirements: Spray Drones

- Need Part 137 Agricultural Aircraft Operator Certification
 - Part 107 + waiver
- 500 ft buffer zone waiver
- Fill out paperwork that will go to FAA office
- Safety inspector from FSDO will arrange meeting with you
 - Flight Standards District Office
 - Watch aircraft and pilot, test emergency preparedness skills
 - Fill out flight maintenance checklist, log flight hours
- Commercial pesticide applicators license
- Aviation Lawyers - Jonathan Rupprecht
- Approx. 6-12 month process



Cost Comparison



Mavic Air 2

\$800



Mavic 2 Zoom

\$1350



Mavic 2 Pro

\$1600



Phantom 4 Pro

\$1600

Field Agent Software: \$49 per month
Sensors: \$3000-\$5000

DJI Alternatives



Parrot

\$700



Powervision

\$1200



Autel Evo 2 Pro

\$1350

Spray Drones



Agras MG-1

\$6,000-\$10,000



Agras T-20

\$15,000-\$25,000

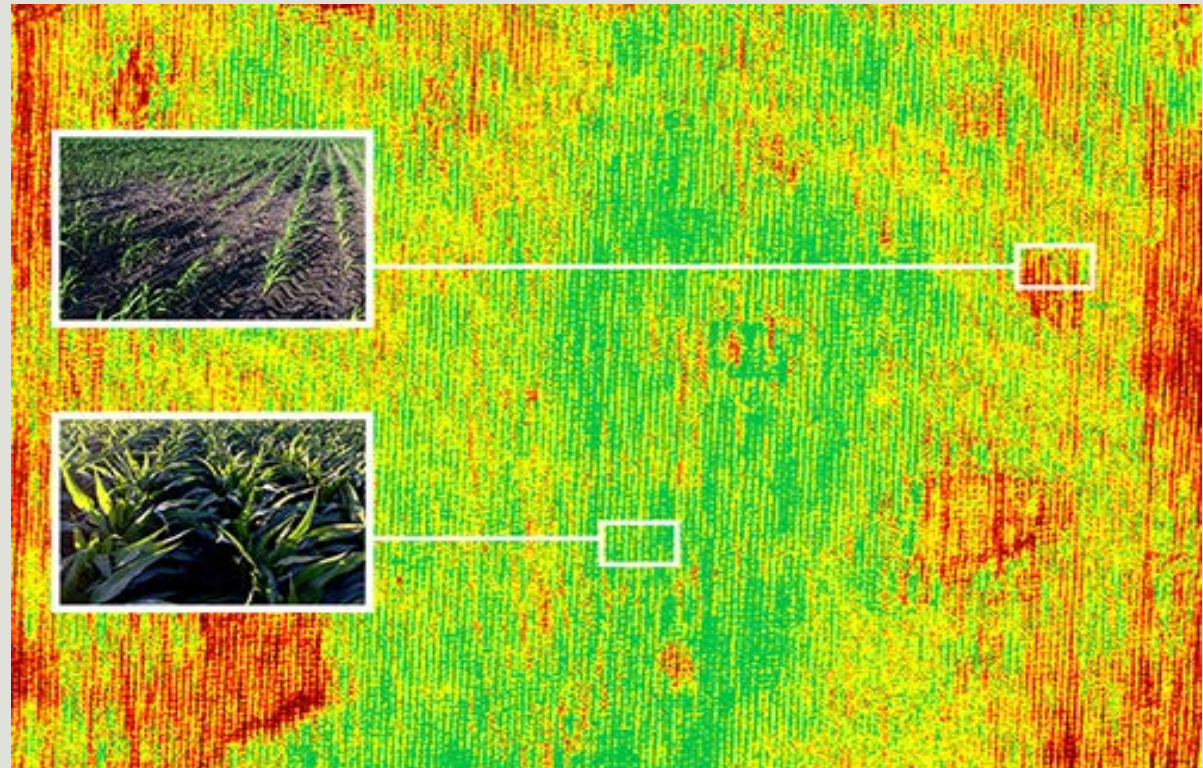
Current Agricultural Uses

- Soil & Field Analysis

- Dead zones
- Elevation and drainage patterns
- Soil nutrient content
- Nitrogen monitoring
- NDVI Technology
- 60-80 acres in approx. 30 minutes

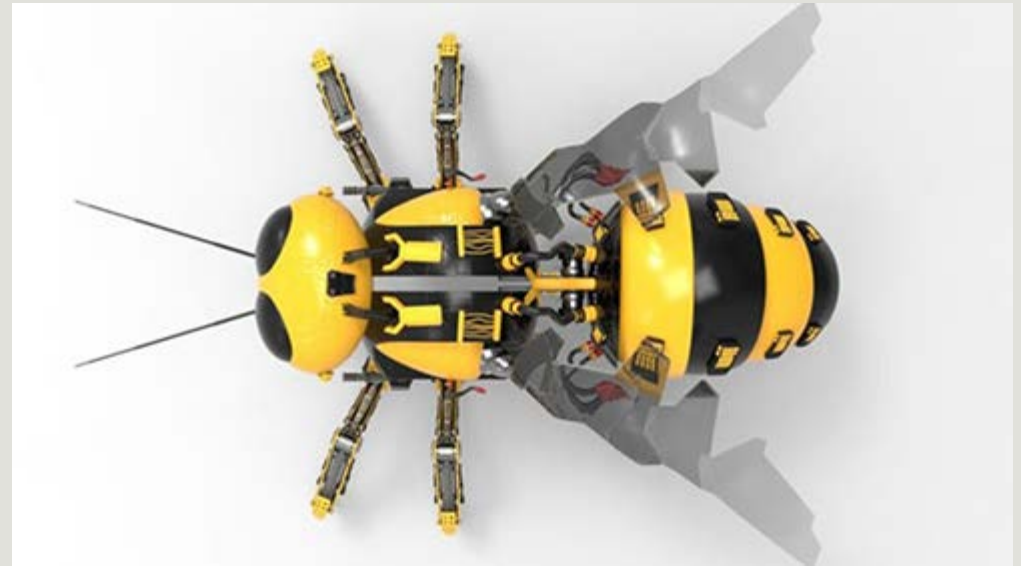
- Crop Spraying

- Legal limitations
- 3-4 minutes per acre
- 10-15' spray width
- 4-5 gallon tanks



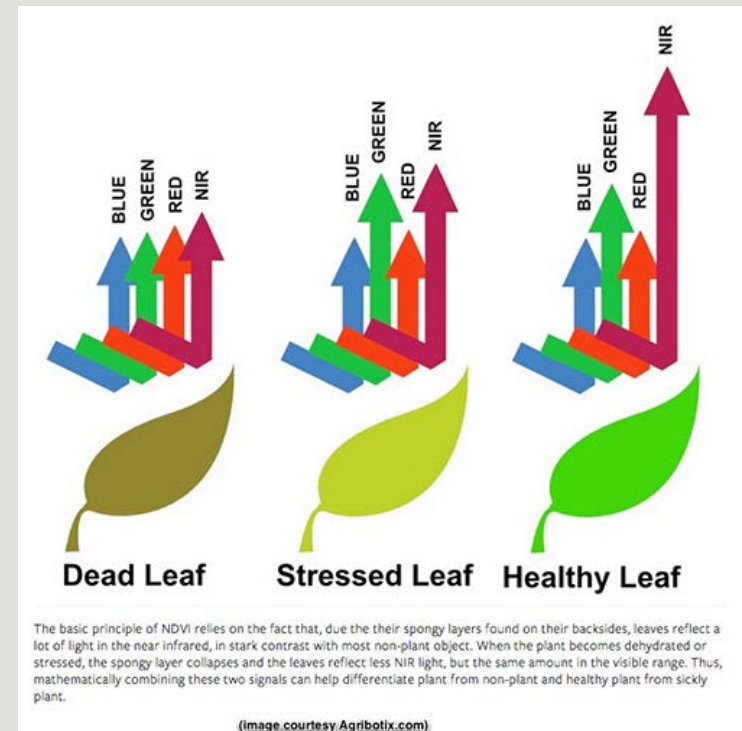
Potential Agricultural Uses

- Planting
 - Forestry
 - Efficient in inaccessible areas
- Pollination
 - Small drones
 - Pollinate without damaging the plant
 - Tested in Japan



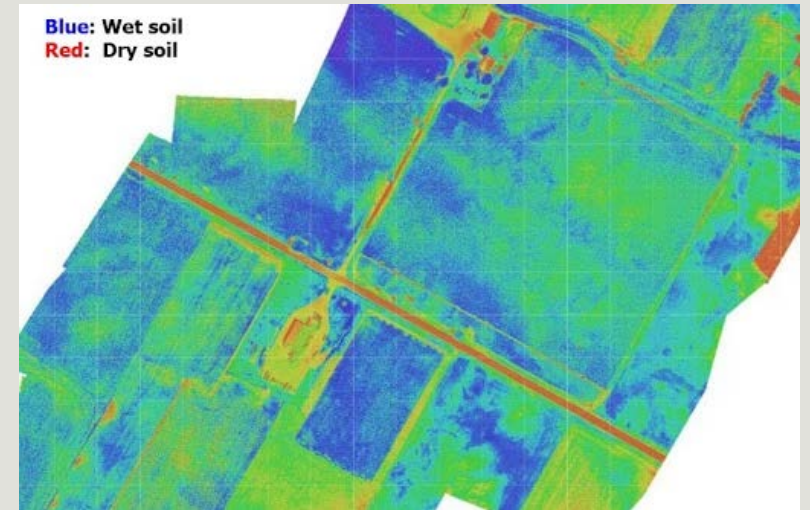
Current Agricultural Uses

- Crop Monitoring & Assessment
 - NDVI(Normalized Difference Vegetation Index) imagery is utilized to measure plant biomass
- May be applied in the crop insurance sector to accurately evaluate damage to fields
- Yield maps may be compared with drone imagery to diagnose and confront deficiencies



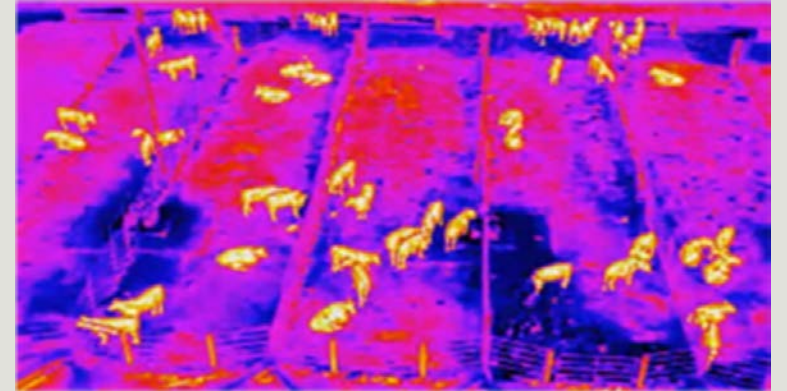
Current Agricultural Uses

- Irrigation
 - Pivot efficiency and nozzle condition can be easily monitored
 - High-definition cameras
- Microwave sensing is used to create soil moisture maps
 - L-band microwave emission sensors



Current Agricultural Uses

- Livestock Assessment
 - Allows for herding ease in difficult terrain
- Animals may be located using thermal imaging
- Management aspects such as fences, water levels, and pasture condition can all be monitored through imagery
- Health may be monitored through a RFID system
 - Keeps producers updated on animal temperature, movement, and estimated weight



Agriculture Drone Market

- Expected to grow from 1.2 billion in 2020 to 5.7 billion in 2025
 - Pressure on global food supply due to growing world population - 9.1 billion by 2050
 - Advancements of technology in precision agriculture
- Field mapping - most common use of drones in agriculture
- North America is the largest adopter of drone technology
 - Followed by Europe and Asia Pacific
- Created jobs:
 - Pilots, engineers, service providers, data analysts, software developers
- Industries:
 - Energy/Infrastructure, Agriculture, Marketing/Advertising, Disaster Management, Delivery Services, Insurance, Emergency Response

Challenges

- Most drones are made by Chinese manufacturers
- Tariffs dependent on the current administration's relationship with China
 - Could affect the rate of adoption and profitability of drone technology
- DJI Blacklisted - change market dynamics
- Ag Gag Laws
 - Animal Rights Activists

Impact on High Plains Farm Credit

- Certification process to fly a drone is easy
- GPS tracking of customers real estate for easy locating in the future
- Could attract more farmers and ranchers with timely and efficient inspections
 - Could expand client radius with the convenience
 - Saves time for HPFC employees by not having to drive to properties
 - Although, personal relationships with customers may be rendered
 - Customers prefer to bring business to places with personalized service
- Allows photo and/or video content on current, intermediate, and long- term assets enabling HPFC to refer to such content during internal meetings, customer appointments, and audits
 - Providing solid proof of security

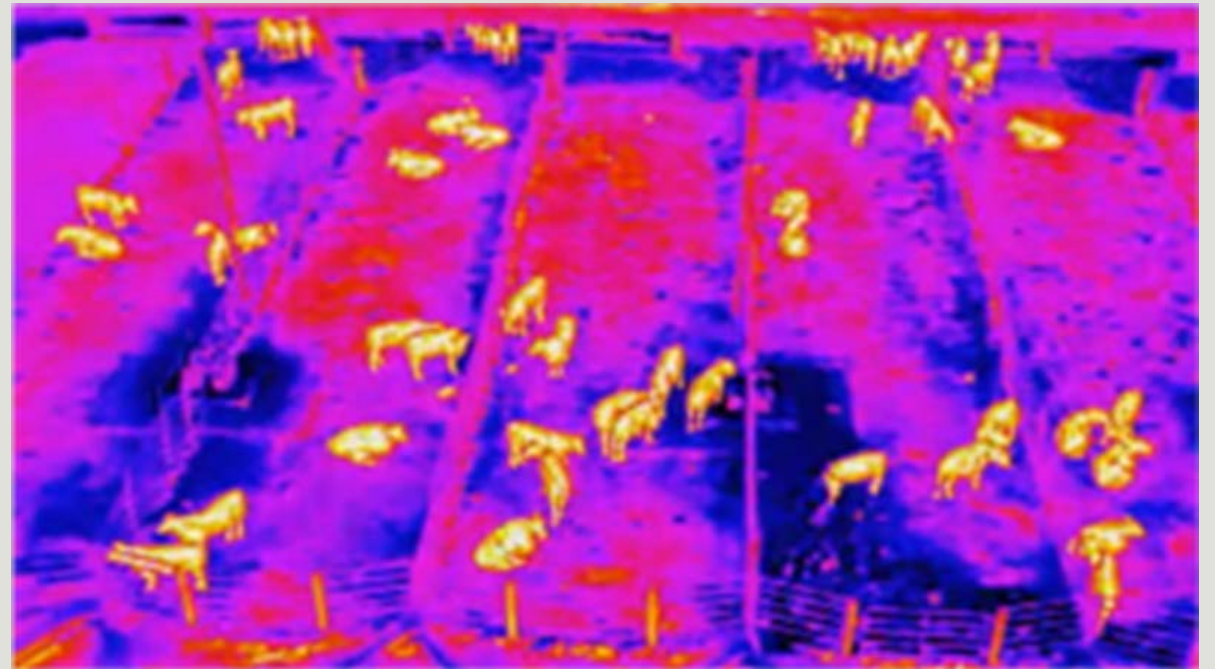
Third Party Information

- If someone within the institution is not able to acquire drone certification, outsourcing to a third party is an option.
 - Protects against fraud and risk management
- It requires another party to be included in the process
 - It is an added expense to the loan office
 - Added exposure to the borrower's personal information
- Likely more beneficial to train someone within the institution for drone operation than to outsource to another company.

Drone Services in HPFC Service Area

- Heartland Soil Services
 - Landonoldham@gmail.com
- APIS Remote Sensing Systems – Hays
 - Apisremote.com
- Crop Quest Agronomic Services – Dodge City
 - Cropquest.com
- Simpson Farm Enterprises
 - Locations in Ransom, Hays, Great Bend, Beloit, & Grand Island, NE
 - Partnership with APIS Hays to provide drones, training, and sensors
 - Simpsonfarm.com

Conclusion



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