The DTN Ag Weather Network

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Who DTN Serves…

500,000
ag subscribers

40,000
paying Market Strategies users

30,000
unique daily website visitors

A Global Weather Station Network for Agriculture

Project Climate Smart

dtn The Progressive Farmer

Project Climate Smart

Supports these UN SDG's:

- End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

- Take urgent action to combat climate change and its impacts

- Strengthen the means of implementation and revitalize the global partnership for sustainable development

By:

- Uniting the efforts of Governments, civil society, the private sector, and the UN in implementing new technologies in agriculture
- Aligning the strategic interests of all stakeholders, and effecting management, financing, development, and training
- Using scientific developments, unique technological solutions, and the latest information technology

Climate change is increasing weather volatility and changing the weather conditions that farms experience

Climate change results in increased weather volatility including more extremes of rainfall and temperature such as droughts, floods, and heat waves

Even small changes in local climate have an impact on agriculture

Not all climate changes are bad…some regions are seeing longer growing seasons

Improved weather observations on farms will allow better measurement of the impacts of climate change on agriculture, and will lead to greater food production

Existing meteorological observation networks are incapable of providing the weather measurements needed for precision agriculture, because they are located in cities or at airports, and not in rural areas where farming takes place

Weather technology has advanced to the point where inexpensive, accurate, and timely weather observations can be wirelessly collected and used in precision agriculture applications

A more dense network of weather observations can serve to establish better climate records in rural areas where data is scarce and climate changes are important

Food production is increased when precise information about weather, crops, and farming operations is used

This practice, called “Precision Agriculture” has been shown to lead to significant improvements in efficiency and food production

Larger farms, and new farming technology produces quantitative data that can be used to reduce input costs, optimize operations, and assess the impact of weather on yields

Climate Smart - Local Weather Station

Collects the weather observations

- Measures:
  - Temperature, Humidity, Pressure, Wind, Rain
  - Solar radiation, soil temperature, soil moisture
- Takes a data sample every 15 minutes
- Self (solar) powered
  - Wired or wireless communication to internet
- Can be installed and operational in 1-2 hours

Davis Vantage Pro 2 (or equivalent)

Climate Smart – An Agricultural Decision Support System (DSS)

Provides enhanced displays for alerting and planning

DSS provides users:

– Real-time conditions from their weather stations

– Precision Forecasts based on their station's data

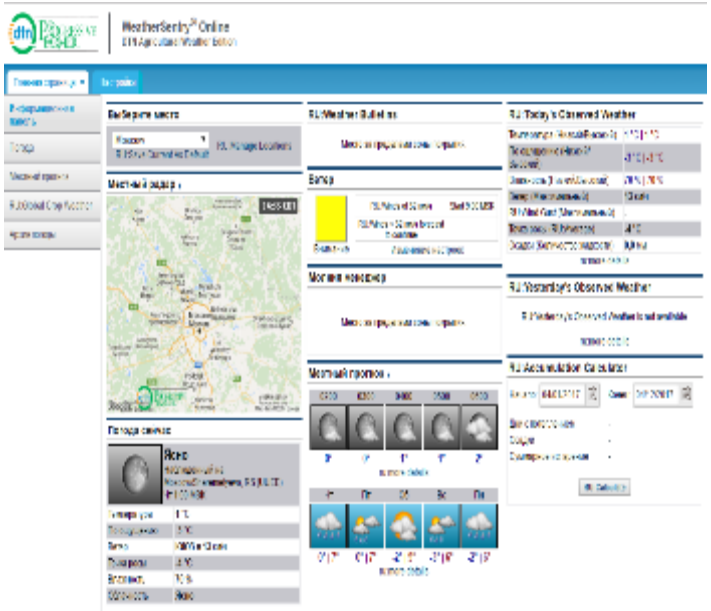
– Historical data archive

– Map display of conditions in their area

– Alerting for current and forecast weather changes

- Calendar for planning operations

– Display on a desktop or mobile device



DTN Ag Weather Station

DTN Ag Weather Station…

Records field-level agronomic data

Delivers precise, current conditions

Supplies industry-leading weather forecasts

Generates field-specific weather alerts

Four key benefits of DTN Ag Weather Station

1. **Resource allocation** – helps determine best placement of labor, equipment, chemicals, & irrigation

2. **Potential yield boost** – third-party research showed a 5.5 bu/acre increase in corn yields from better-timed chemical applications

Four key benefits of DTN Ag Weather Station

3. **Potential cost savings** – the same study indicated a 2-inch per acre water savings & reduced energy costs through smarter irrigation

4. **Improved efficiencies** – more precise weather forecasts support better planning & scheduling

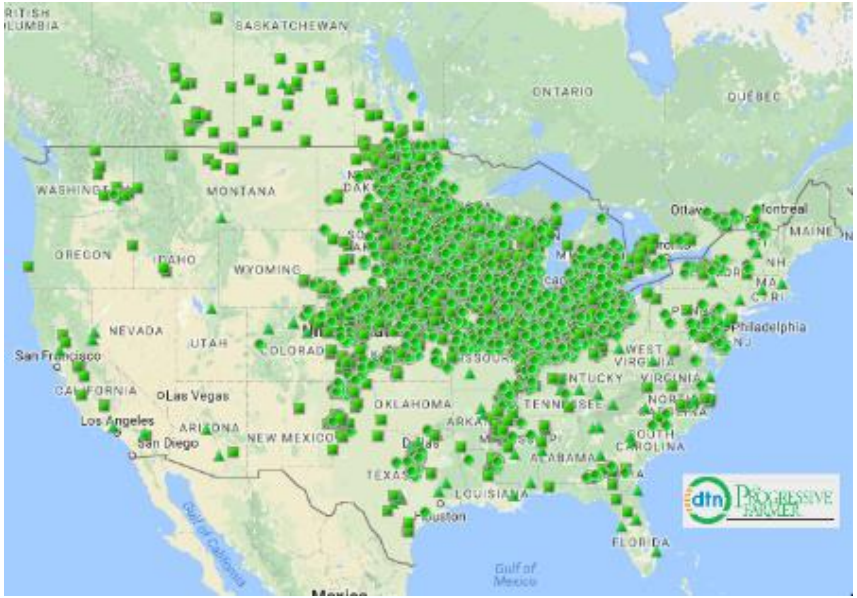
Components

Real-time monitoring & recording

- Gathers & records real-time observed weather conditions for more than 10 parameters — right from your own fields

DTN's Agricultural Weather Network

- Combines the largest ag weather network with radar-derived precipitation to produce precise, accurate field-level precipitation amounts
- 6,000 precision on-farm weather stations reporting every 15 minutes
- Weather data is collected centrally, QA'd, archived, and distributed



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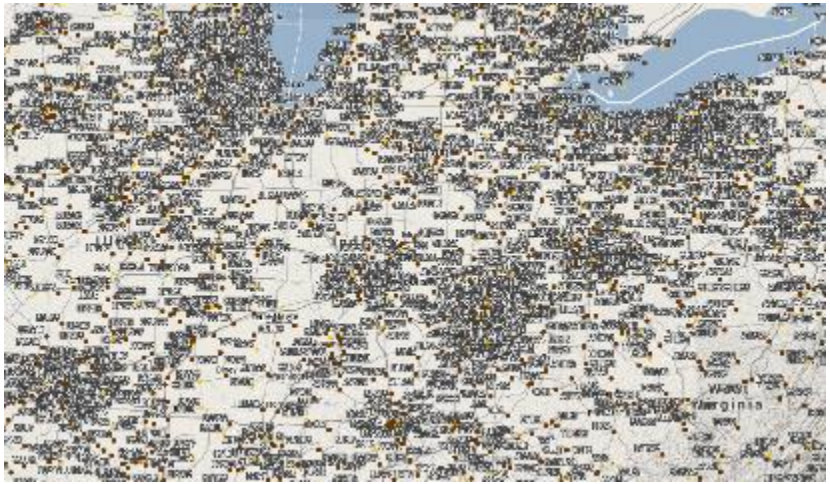
DTN’s station density

Four times more dense than the official station network

Official Weather Stations



DTN Ag Weather Network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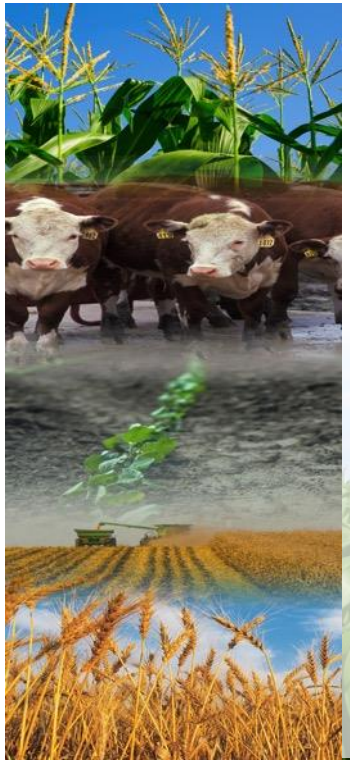
Climate Smart – Return on Investment



- A typical 500-hectare producer can lose $15,000 per fertilizer application costs if unexpected rain occurs within 24 hours of application
- A typical 5,000-hectare producer can lose $37,000 per chemical application costs if unexpected high winds cause the spay to drift

Planting	Growing	Harvesting
Field work	Fertilizer	Drying
Seeds	Spraying	Field work
Equipment	Pre-selling (Futures)	Selling

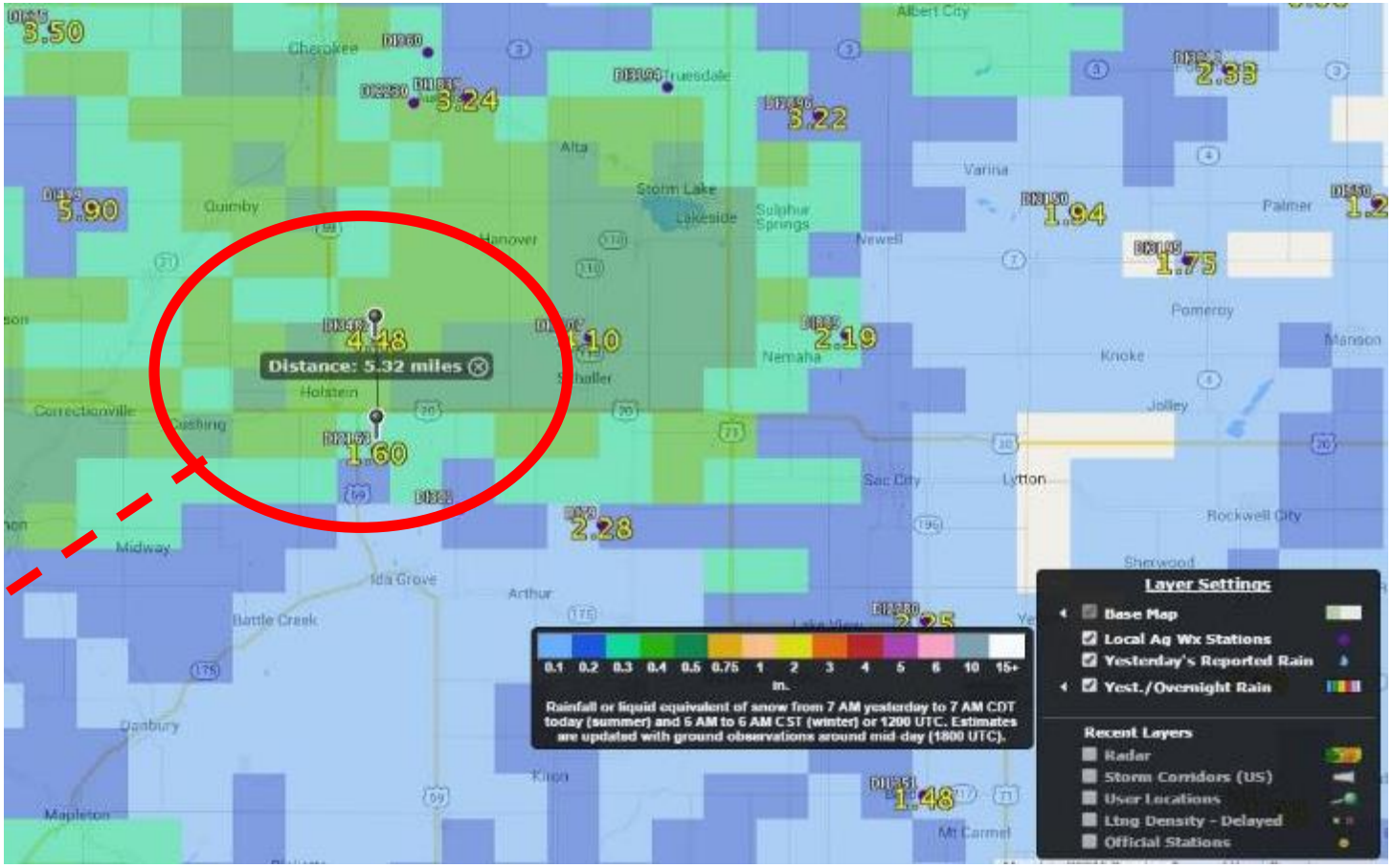
- **Timing of Precipitation and amounts**
- **Timing of Wind speed and duration**
- **Precision Farm based Forecasts**
- **Decision Support Tools**

Examples of these issues …

Both the official observations and the radar observations can miss significant rainfall

Image Summary:

1. Nearest NWS Radar is 22 miles SE from these locations
2. Radar legend below indicates 24 hour accumulations from 0 to 0.5 inches
3. **Local Stations measured over 4 inches**
4. **Almost a 3 inch difference in less than 3 miles**



DTN’s Interpolated Data Service for Precision Ag

DTN combines a dense network with radar data for precise answers

2016 Growing Season Results – (April 15 – Sept 30)

Using official data only:

- Nearest official station 25.1 miles SW
- Precipitation Total = **15.72**
- Growing Degree Day Total = 3,367

Adding radar data:

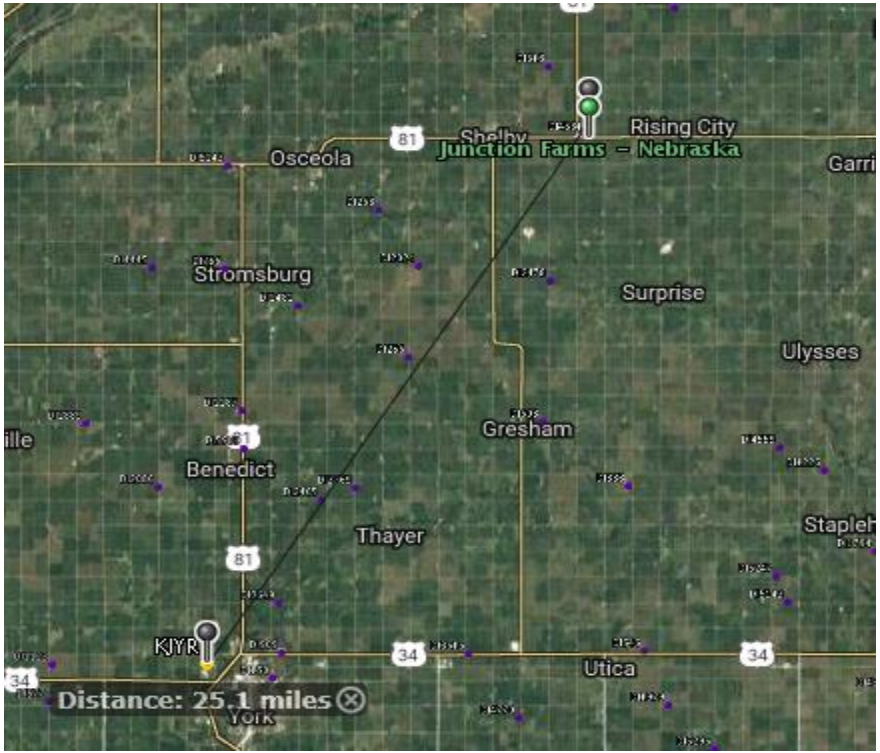
- Lat / Long based from nearby stations
- Precipitation Total = **20.85**
- Growing Degree Day Total = 3,278

Using the DTN IDS solution:

- DTN Ag Weather Station
- Precipitation Total = **25.72**
- Growing Degree Day Total = 3,067

Typical Example:

Junction Farms, Butler County, NE



Local Weather Station	Internet Collection	Data Collection and Management	Internet Distribution	Online/Mobile Display
Collects weather observations	Wired or wireless communications	Cloud-based data management	Making products available to end users	Browser or App display

Other benefits of the DTN Ag Weather Network

Making data useful for end users

Performs all data management functions:

- Communications management
  - ✓ Monitor data flow from each station
- Quality Control
  - ✓ Clean all data to insure consistency
- Precision Farm-Level Forecasts
  - ✓ Generate a hour-by-hour forecast trained by the observations
  - ✓ 15 day future view
- Distribution
  - ✓ Make all data available for users instantly
- Historical Archive
  - ✓ Maintain a historical record of data and metadata for each station

An Agricultural Decision Support System (DSS)

Provides enhanced displays for alerting and planning

DSS provides users:

- Real-time conditions from their weather stations
- Precision Forecasts based on their station's data
  - ***Ranked #1 in forecast accuracy for 10 years in a row***
- Historical data archive
- Map display of conditions in their area
- Alerting for current and forecast weather changes
  - Calendar for planning operations
- Display on a desktop or mobile device

–Now expanding globally!