DTN°

Climate Smart Initiative

New technologies for precision agriculture

Addressing the United Nations Sustainable Goals

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. DTN considers sustainable development in all areas of activity and understands the responsibilities of current and future generations. We recognize the importance of collaboration between global businesses and public organizations.

DTN launches Climate Smart Initiative

Climate Smart is designed to help increase food production in areas besieged by hunger caused, in part, by increased weather volatility and climate change. Its goal is to introduce new precision agriculture and climate monitoring technologies in currently unmonitored rural areas, reducing the impact of weather and boosting crop yields.

DTN Vision

To be the independent, trusted source of insights to our customers who feed, fuel, and protect the world.

17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOAL 17

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

To achieve the ambitious goals of the 2030 agenda, we must bring together governments, civil societies, private companies, the United Nations, and other key actors to mobilize all available resources. Through this revitalized and enhanced global partnership, we can support the needs of our least developed counties, ensuring equitable progress for all.

The Climate Smart Initiative is based on these principles:

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

- Climate change results in more extreme temperatures and rainfall, leading to more frequent and significant droughts, floods, and heat waves.

- For many areas, small changes in local climate have resulted in longer growing seasons. By improving the observation of weather conditions for individual farm fields, we can more accurately measure the impacts of climate change on agriculture and support decisions that lead to improved efficiencies and greater food production.

- Most existing weather observation networks do not provide the accurate measurements needed to support precision agriculture. Observation stations are typically located in urban areas or at airports, which are usually many miles away from rural farms.

- Technology has advanced to the point where accurate and timely weather observations can be collected using inexpensive, wireless solutions.

- Better climate records can be established by creating a more dense network of weather observations in places where data is scarce. When relevant, accurate weather and agronomic information are collected, farming operations and food production can be enhanced.

- The practice of precision agriculture has yielded significant improvements in resource use and food production.

- The quantitative data produced by larger farms can support cost-saving and operational decisions.

The success of the Climate Smart Initiative requires local and regional partners. Organizations are welcome to participate.

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13 CLIMATE ACTION

SUSTAINABLE DEVELOPMENT GOAL 13

Take urgent action to combat climate change and its impacts.

Climate change presents the single biggest threat to development, and its widespread, unprecedented impacts disproportionately burden the poorest and most vulnerable. Urgent action to combat climate change and minimize its disruptions is integral to the successful implementation of the Sustainable Development Goals.

The Climate Smart Initiative

- Unites the efforts of governments, civil society, the private sector, and the United Nations in implementing new agriculture technologies.
- Focuses on the strategic interests of all stakeholders and empowers decisions that affect all levels of management and decision making.
- Improves living standards in developing countries and regions through the interaction of governments, civil societies and the private sector.
- Employs the newest technology, scientific developments, and operational insights.

DTN projects in Sustainable Development Goals

Goal 17
Enhance the cooperation of governments, civil society, the private sector, and the United Nations.

Goal 13
Establish a climate change monitoring system, based on actual weather observations, to help governments, civil society, and the private sector make better-informed decisions.

Goal 2
WeatherSentry® Global Agriculture Edition provides critical, field-based insights to help increase yields and reduce costs.

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2 ZERO HUNGER

SUSTAINABLE DEVELOPMENT GOAL 2

End hunger, achieve food security, and improve nutrition through sustainable agriculture.

Goal 2 aims to end hunger and all forms of malnutrition by 2030. It also commits to universal access to safe, nutritious, and sufficient food at all times of the year. This will require sustainable food production systems and resilient agricultural practices, equal access to land, technology and markets, and international cooperation on investments in infrastructure and technology to boost agricultural productivity.

By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious, and sufficient food all year round.

Proposal for sustainable agriculture development and increased food production

Accurate, relevant weather information is critical to achieving the sustainable development goals outlined in report A/70/472. One of agriculture's most recent, important developments is a collection of practices known as Precision Agriculture. For sustainable food production to be successful, Precision Agriculture is vital to the strategy.

Precision Agriculture is a farm management concept based on observing, measuring, and responding to inter and intra-field crop variabilities. Its goal is to create a holistic decision support system (Ag-DSS) for operations management and resource preservation and optimization.

Among Precision Agriculture's many methods is a phytogeomorphological approach that ties multi-year crop growth stability and characteristics to topological terrain attributes. This approach includes the impact of a farm field's terrain on its hydrology, which requires accurate rainfall measurements.

GPS and GNSS technology is essential to Precision Agriculture. They enable farmers to pinpoint their location in a field, as well as support spatial field mapping and measurement of variables. These can include crop yield, weather, terrain features and topography, organic matter content, moisture levels, nitrogen levels, pH, EC, MG, K, and more. Similar data is collected by crop yield monitors mounted to GPS-enabled combines during harvest. Throughout the growing season, other equipment-mounted sensors can provide real-time insights into everything from chlorophyll levels to plant water status and satellite imagery. This data can be used by variable rate technology (VRT) during planting, spraying, etc. to distribute resources more optimally. Weather data can be collected from weather stations located at each field or by remotely-sensed measurements.

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KEY MARKET TRENDS

Volatility of weather

Climate change is making our weather more volatile. Severe weather events, such as extreme temperatures and extended periods of heavy rainfall or drought, are creating greater risk in global agriculture markets.

Landscape of the agriculture market

- Larger farms, more crops, and increased commodity market volatility.
- Low commodity prices reduce the margin of error for farmers; actionable insights are a must to reduce costs and boost yields.

Many data sources

Precision Agriculture can provide an abundance of information from multiple sources. To ensure optimal operational decisions, farmers need consistency, as well as accuracy and precision, from their information.

The importance of weather data to agriculture decision support solutions

Agriculture technology has rapidly evolved from basic data management to true decision support. Highly-detailed weather and agronomy information is integral to the success of Precision Agriculture. The best solutions will integrate weather data with a myriad of contextual data and agronomic models to provide specific, timely, and most importantly, actionable insights. To achieve this level of operational intelligence, DTN proposes its proven WeatherSentry Local Weather Station technology.

Weather data used in AgDSS recognizes the following principles:

- While generic weather data may be available, it is generally not focused on supporting rural agriculture operations.
- Basic weather data has limited value; the best solutions will provide added context and value by pairing it with agronomic models and field data. For example, just a one-degree shift in nighttime temperature can affect plant vigor, soil stability, nutrient availability, and pest physiology.

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DTN SOLUTION

DTN delivers unmatched weather intelligence, forecasts, and actionable insights. This enables farmers to maximize operational efficiencies and crop potential by better anticipating local temperature, precipitation, and yield anomalies.

Farmers will find value in:

- Temperature and precipitation forecast accuracy, which helps improve crop and seed selection, labor and resource use, and application of chemical treatments.
- Detailed local weather forecasts and historical data to enhance the understanding of environmental factors on yield and to help improve risk management.
- Timely alerts based on custom operational parameters to reduce risks and losses, as well as increase peace of mind.

- To support decisions throughout the growing season, actual and model-derived weather-driven parameters, such as soil moisture, tractability, potential evapotranspiration, GDDs, etc., are needed.
  - **Pre-season**
    - Seed analysis
    - Resource planning
  - **In-season**
    - Crop stage, stress, alerts
    - Pest and insect risks
    - Tractability, soil moisture
    - Treatment windows, harvest dates
  - **Post-season**
    - Yield to stress ratio
    - Year-over-year comparisons
    - To eliminate geographic, accuracy, and time-based errors, weather data should be from blended (interpolated) sources. These may include:
      - Official national meteorological services
      - Private weather station networks
      - Local weather stations
      - Doppler radars
      - Weather satellites
      - Atmospheric forecasting models
- Agriculture-specific data is key to testing and adjusting models to growing and non-growing season variables. Since weather data and observations are key to an AgDSS, they are essential to sustainable food production systems.

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2 ZERO HUNGER

Technology contributes to the achievement of specific targets in goal 2.

By 2030, double the productivity and incomes of small-scale food producers. In particular, women, indigenous peoples, family farmers, pastoralists, and fishers through secure and equal access to land and resources. These may also include knowledge, financial services, markets, and opportunities for non-farm employment.

Increase international cooperation and critical investments in rural infrastructure, agricultural research, extension services, technology, and gene banks for livestock and plants. This will help enhance productive capacity, particularly in developing countries.

Understanding the impact of climate change and weather volatility on agriculture

Weather data plays a critical role in understanding local climate challenges and weather patterns, which is essential when deciding what and when to plant. While climate change is well documented, how these changes manifest themselves on a local scale is often not well understood. DTN has published two white papers on the subject:
- Essential Background for Understanding Climate Change and Associated Business Risks
- Preparing for Increased Weather Volatility

These papers illustrate that:
- Climate change is leading to more volatile weather patterns, which result in more slower or stalled weather systems that can cause intense droughts or floods.
- Recent climate trends show a tendency for an increased number of extreme weather events and their corresponding disruptions.
- Changes in local climates are occurring today.
  - For example, over the last 30 years, growing seasons in some areas in North America and Central Asia have increased by 10 days. These changes in the large-scale climate can result in local changes in weather that can only be measured and managed with accurate local weather observations and forecasts.

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13 CLIMATE ACTION

Technology contributes to the achievement of the specific targets of goal 13.

Implement the United Nations framework convention on climate change, to jointly mobilize $100 billion annually by 2020. Focus on developing countries with meaningful mitigation actions and fast, transparent implementation of the Green Climate Fund.

Promote mechanisms to raise the capacity for effective climate change-related planning and management. Particularly in least-developed countries and small island developing states, with a special focus on local women, youth, and marginalized communities.

Solutions to reduce agricultural weather risks

Precision Agriculture and weather technology have evolved to meet the demand for farm and field-specific data. Key weather requirements include:
- Precise temperature, precipitation, wind, and other atmospheric and soil observations.
- Accurate forecasts for those parameters.
- Applications to incorporate those insights to help farmers improve their decisions.

The DTN agriculture decision support solution

DTN offers a set of integrated solutions, which includes WeatherSentry Global Agriculture Edition. It can be easily incorporated with the following components:

A local agricultural weather station
- Measures all key agricultural weather variables:
  - Precipitation
  - Temperature
  - Humidity
  - Wind
  - Pressure
- Self-powered and wireless
- Easy to install
- DTN completely manages data collection

Accurate, actionable weather data and forecasts
- All observations are professionally monitored.

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An example of a weather-related risk management scenario is when a farmer must apply chemicals to his or her field.

1. Any rainfall within 24 hours of application will wash the chemical off of the leaves, requiring reapplication.

2. Any wind speed above 16 km/hour can cause the chemical to drift off target, requiring reapplication to ensure effective treatment of the intended field.

If the cost of the chemical application is $86/hectare, and the target field is 100 hectare in size, then the total cost of the application is $8,600. Reapplication is an added $8,600, which is far higher than the cost of a weather management suite. **Therefore, return on investment can be realized within one growing season — and often much quicker than that.**

Weather station data combined with an AgDSS, such as WeatherSentry Global Agriculture Edition, can provide these important benefits:

• Accurate forecasts for an individual farm. Incorporating weather observations "trains" the weather forecast models, delivering 15-25 percent greater accuracy, as proven in consecutive forecastwatch.com accuracy studies.

• Up-to-the-minute current conditions for multiple, location-specific parameters.

• Detailed, agriculture-specific data, including soil temperature and moisture, plus access to local and global weather conditions.

• GPS-based roaming weather alerts to keep farmers on top of changing conditions.

• Instant access to years of historical weather data.

• All available using any standard browser.

A highly-visual, easy-to-use solution

• Understand the precise impact of weather on individual fields for a better return on investment in resources.

• Access accurate, actual historical data for individual fields.

• Better implement labor, equipment, chemical applications, and irrigation.

• Reduce energy costs through strategic irrigation.

• Improve planning with detailed, field-based forecasts and historical information.

• Secure bigger profits with specific actual accumulated and forecasted GDD/maturity for a crop.

• Anticipate changing conditions with patented, location-specific alerts.

• Increase convenience by accessing the solution from your mobile device.

• Select the language and measurement units of your choice.

A real-world agriculture decision support solution

DTN operates a network of more than 6,500 weather stations located on farms across the U.S. and Canada, making it North America's largest agricultural weather network. The weather station network gathers valuable insights from areas where data is not otherwise available.

Better weather information improves decision making and ROI

Accurate weather information allows farmers to run a more effective business.

• It allows for more efficient resource allocation, including when and where to place workers and equipment.

• It supports increased yields through the proper use and timing of chemical applications.

• It increases cost savings through more efficient use of water and energy with strategic irrigation.

• It eliminates the stress of monitoring physical gauges and manually tracking their results.

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