ICRD

Research Article

CLIMATE ADAPTATION OPTIONS FOR AGRICULTURAL PRODUCERS MANAGING RISKS

E. L. Smith[1], R. Audet[2], R. Hardin[3], P. Brouillette[4] and B. McDonald[1]

[1]Agriculture and Agri-Food Canada, Truro, Canada
[2]Agriculture and Agri-Food Canada, Quebec, Canada
[3]Agriculture and Agri-Food Canada, Fredericton, Canada
[4]Mesonet Quebec, Delta Building (9th Floor), Quebec City, Canada

A R T I C L E   I N F O

ABSTRACT

Agriculture is an industry completely dependent on weather and Atlantic Canada is experiencing a changing and variable climate. These changes are creating many challenges for agricultural producers, especially as it relates to; flooding and flood protection, seed germination, soil moisture, crop type, pest management, and overall crop health and growth. AgWeather Atlantic (http://atl.agrometeo.org) is providing agricultural producers with more localized and agriculturally-based information to help producers better manage climate and weather-related risks on the farm. AgWeather Atlantic is being led by Agriculture and Agri-Food Canada in partnership with Mesonet Solutions, Environment and Climate Change Canada and many other provincial and industry groups within the region, such as; Federations of Agriculture, Soil and Crop Improvement Associations, Watershed groups, among others. Weather data is tailored to producer's needs with information on crop heat units, frost alerts, crop reports, as well as pest management information. AgWeather Atlantic is providing producers with on-line decision support tools to help reduce on-farm environmental and economic risks. These tools are currently contributing to improved environmental performance and support on-going adaptation to climate change.

Introduction

Producers in the Atlantic Canada region have voiced concerns when it comes to climate change and variability. Agricultural areas have faced challenges when it comes to flooding/flood protection, crop type, seed germination, high winds, increases in crop pests, new pests, soil moisture, and overall crop health and growth (Rapaport et al. 2017). Producers are in need of a business risk management tool to help them deal with some of these on-farm challenges. AgWeather Atlantic http://atl.agrometeo.org (Smith et al. 2012) is providing Atlantic producers with more localized weather data by tapping into to as many weather station networks as possible, with quality control always being top of mind. The weather data provided is not just typical weather data, it is tailored to the needs of agricultural producers and crop advisors to help minimize weather and climate related risks. The purpose of AgWeather Atlantic is to improve access to regionally relevant agriculture and climate info for the Atlantic Canadian region.

AgWeather Atlantic is being led by Agriculture and Agri-Food Canada in partnership with Mesonet Solutions, Environment and Climate Change Canada and many other provincial and industry groups within the region. This website customizes the input data so that it displays important information for farmers and

crop advisors such as; growing degree days, a hay drying index, frost alerts, an alfalfa fall harvest tool, bioclimatic models to aid in pest management, as well as detailed crop reports for various commodities. These decision support tools are now helping producers in the region make important business risk management decisions (i.e management of pests and pesticides, water, nutrients, etc).

AgWeather Atlantic

What differentiates AgWeather Atlantic from other weather-related websites?

- It provides more localized quality-controlled weather and climate data. Currently, there are over 150 stations in the AgWeather Atlantic network (covering the provinces of Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland), 85 of which are in agricultural areas.
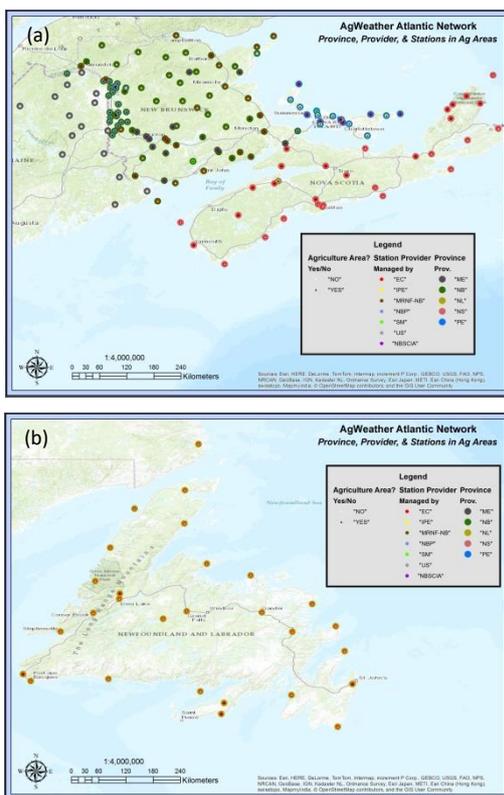
Figures 1a and b: AgWeather Atlantic network coverage in the Atlantic region: Nova Scotia (NS), Prince Edward Island (PE), New Brunswick (NB) and Newfoundland (NL).

- It provides tools that can forecast the development of pests; it can help plan hay harvesting, schedule irrigation, and provides various agro-climate indices to monitor the development of crops and moisture conditions.
- It integrates weather forecasts in these tools to give a greater lead time for decision making for producers and crop advisors.
- It provides interactive radar animations and real-time hourly quality-controlled data.
- It provides agricultural weather reports for specific crops that summarize weather conditions over the past week.
- It offers a more user-friendly web interface and visualization tools to display maps and graphs.
- It is responsive to the needs of the agricultural sector and stakeholders are directly involved in its development.

Why is AgWeather Atlantic important?

The success of crop production is highly dependent on weather. Rain, wind, temperature, etc. all have a major impact on yields and crop conditions, and will influence the incidence of pests and diseases. Producers in the Atlantic region are seeing more extreme weather events and climatic variability, and because of this, it is even more important to be able to make informed decisions when it comes to on-farm management. AgWeather Atlantic can help producers reduce their on-farm environmental and economic risks with indicators and decision-support tools offered by the website. These tools can contribute to improved environmental performance and support on-going adaptation to climate change. AgWeather Atlantic provides high quality data for decision making on a modern farm business.

AgWeather Atlantic has also become an important platform for the development and transfer of decision support tools based on results from Agriculture and Agri-Food Canada's Research and Development such as; bioclimatic models supported by Computer Center for Agricultural Pest Forecasting (Agriculture and Agri-Food Canada 2017), agro-climate indices for forage crops and "SCAN" (nitrogen fertilization tool under development).

What is Mesonet Solutions?

Mesonet Solutions is a private non-profit organization made up of the following organizations which also contribute to the maintenance of the data processing system and provide data from their own weather networks; Hydro-Quebec, Rio-Tinto, the Quebec

Department of Forestry (MFFPQ) and the Quebec Crop Insurance Board (FADQ).

What support tools does AgWeather Atlantic currently provide producers?

- Current conditions as well as 7-day local forecasts (i.e. temperatures, wind speed and direction, relative humidity, precipitation, soil temperatures, etc.)
- Meteograms for a wide range of weather and climate parameters
- Satellite images and animation links
- Radar images
- Historical climate data
- Moisture indicators
- Thermal indicators (i.e. growing degree days, corn heat units, etc.)
- Hay drying index
- Alfalfa fall harvest tool
- Bioclimatic models (i.e. colorado potato beetle, apple maggot, fire blight (apples), European apple sawfly, corn borer, carrot rustfly, cranberry tipworm, etc.)
- User guides on how to use the site and decision support tools
- Webinars for users (Smith and McDonald 2017)
- An App for producer convenience in the field

Conclusion and Outcome of the Research

Looking Ahead: The future of AgWeather Atlantic

Over the next couple of years additional information/on-farm decision support tools will be incorporated onto the AgWeather Atlantic website, the goals are to:

- Improve short-term weather forecasts by adding Nowcasts (12 hr)
- Integrate medium term (15d) probabilistic ensemble forecasts into agro-climate indices and models
- Add more pest forecasting models using the Computer Center for Agricultural Pest Forecasting (Agriculture and Agri-Food Canada 2017) (http://www.agr.gc.ca/eng/science-and-innovation/results-of-agricultural-research/computer-centre-for-agricultural-pest-forecasting-cipra/?id=1376403227682)
- Add more forage crop agro-climate indices
- Develop new agro-climate summaries (i.e. frequency of extreme events, number of hours with freezing temperatures, etc.).

- Make mobile application improvements (AgWeather App: now available for the iphone and android)
- Expand the weather station network to help address gaps in weather information in the region
- Add additional historical data
- Expand crop reports for all commodities

We will continue working with our Steering Committee to ensure that we are providing what is needed by producers and the industry. Our goal is to ensure the long-term sustainability of AgWeather Atlantic for the region. AgWeather Atlantic has the potential to benefit virtually all commodities that are farmed in the Atlantic region now and those that will be introduced in the future.

Please note additional information on AgWeather Atlantic can also be found at http://atl.agrometeo.org, YouTube (Smith and McDonald 2015), or the AgWeather Atlantic factsheets and user guide (Smith et al. 2016). It is also important to note that AgWeather Atlantic is a sister project to AgroMétéo Quebec (http://www.agrometeo.org/).

Acknowledgements

References

Agriculture and Agri-Food Canada. 2017. Computer Center for Agricultural Pest Forecasting (CIPRA). Available from: http://www.agr.gc.ca/eng/science-and-innovation/results-of-agricultural-research/computer-centre-for-agricultural-pest-forecasting-cipra/?id=1376403227682 (Jul. 28, 2017).

Rapaport, E., Starkman, S. and Towns, W. 2017. Atlantic Canada. In K. Palko and D.S. Lemmen (Eds.), Climate risks and adaptation practices for the Canadian transportation sector 2016 (pp. 218-262). Ottawa, ON: Government of Canada.

Smith, E. L., Audet, R. and Brouillette, P. 2012. Mesonet Solutions. AgWeather Atlantic. Available from: http://atl.agrometeo.org (May 20, 2012).

Smith, E. L. and McDonald, B. 2015. YouTube Video: AgWeather Atlantic. Available from: https://www.youtube.com/watch?v=0lM50aLFewI (Jan. 22, 2015).

Smith, E. L., Audet, R. and McDonald, B. 2016. AgWeather Atlantic factsheets and user guides. Available from: http://atl.agrometeo.org/weather/help (May 15, 2016).

Smith, E. L., Audet, R. and McDonald, B. 2017. Webinars 1-4: (i) AgWeather Atlantic Overview, (ii) AgWeather Atlantic Forage Decision Support Tools, (iii) AgWeather Atlantic Pest Decision Support Tools, (iv) Fire Blight-MaryBlyt. Available from: http://atl.agrometeo.org/weather/webinars (Jan. 10, 2017).