NB Weather Mapping for Intensive Crop Management C1819-0977-Y5

Objectives

To establish and maintain a province-wide weather monitoring network to support environmentally sustainable crop production management practices through crop and variety selection and integrated pest management programs.

Summary

NBSCIA has completed a series of projects (EMP15-003-3: NBSCIA Agricultural Geomatics Service),C1819-0557: Climate Mapping for Intensive Crop Production, C1819-0977 NB Agricultural Weather Network, C1819-0977-Y2,3 and 4 NB Agricultural Weather Network for Intensive Crop Management to expand the number of Davis weather stations throughout the province and enable export of the PAT data from the NB Potato Crop, Weather and Pest Information portal (http://agri.gnb.ca/010-001/WebServiceData.aspx) in a GIS compatible format.

Due to the COVID 19 pandemic during 2020 the delivery and installation of the additional stations was delayed; therefore, the 2021 and 2022 seasons provided the first opportunity to test data import and mapping for the entire network of 62 Davis Vantage Pro weather stations.

During 2021 NBSCIA members and other station hosts were provided station Ids enabling them to access the Davis Weatherlink app on smart phones and read real time weather conditions at a particular station location. This very popular feature particularly for determining wind speed for spraying decisions was expanded to all producers in 2022.

Technical issues related to the operation or function and settings of the stations requires significant manual intervention on the part of NBDAAF staff to ensure accuracy. Additionally, an updated platform by Davis requires manual intervention to download the data from the newest NBSCIA stations to enable import to the PAT NB Potato Crop, Weather and Pest Information portal for export to the Arc GIS database for interpolation and map presentation.

There was a significant breakdown in the system which once again resulted in two deliverables not being satisfactorily accomplished as planned: 1) improved definition and understanding of the heat unit rating for corn and soybean, in relation to physiological maturity in New Brunswick and 2) assessment of existing models for forecasting occurrence and severity of crop pests.

Month ending accumulations for CHU, GDD and rainfall for all stations were posted in a map format to the NBSCIA website.

Historical last spring freeze date, last spring frost risk date, first fall frost risk date and first fall freeze date were calculated and reported for the station locations managed by NBSCIA.

This enhanced weather station network will provide New Brunswick farmers another valuable tool to manage climate change initiatives to remain competitive in an increasing global market demanding environmentally sustainably produced commodities. Data provided by the network will provide critical information to support 4R Nutrient Management and reference key weather parameters over future year.

Conclusion

Given the manual effort involved on the part of NBSCIA and NBDAAF staff the preparation of weather maps more frequently than monthly is logistically difficult for time sensitive intensive crop management for predictive pest modelling. However, with the renewed effort by NBDAAF and NBSCIA it may become a reality.

After interpolation the mapped data has the potential to improve the definition and understanding of the microclimatic heat unit ratings applied to significant agricultural crops and improve integrated pest management and environmentally sustainable production practices. Adding soil temperature and moisture parameters would support efforts to new or enhanced cropping strategies reduce GHG emissions and monitor the impact of climate change.

Looking forward to 2030 and beyond an expanded NB Ag Weather Network will serve as a reference or bench mark for monitoring extreme weather events, attributed to climate change, within New Brunswick.

Providing open access to all sixty-two stations will enable real time decision making by producers in support of environmentally sustainable crop production.

Cartographie météorologique du NB pour la gestion intensive des cultures C1819-0977-Y5

Objectifs

Établir et maintenir un réseau de surveillance météorologique à l'échelle de la province afin d'appuyer les pratiques de gestion des cultures durables sur le plan environnemental par la sélection des cultures et des variétés et par des programmes de lutte intégrée contre les ravageurs.

Résumé

L'AASCNB a réalisé une série de projets (EMP15-003-3 : Service de géomatique agricole de l'AASCNB), C1819-0557 : Cartographie climatique pour la production de cultures intensives, C1819-0977 Réseau météorologique agricole du Nouveau-Brunswick, C1819-0977-Y2,3 et 4 Réseau météorologique agricole du Nouveau-Brunswick pour la gestion des cultures intensives afin d'augmenter le nombre de stations météorologiques Davis dans la province et de permettre l'exportation des données PAT du portail d'information sur les cultures, les conditions météorologiques et les ravageurs de la pomme de terre du Nouveau-Brunswick (http://agri.gnb.ca/010-001/WebServiceData.aspx) dans un format compatible avec le SIG.

En raison de la pandémie de COVID 19 en 2020, la livraison et l'installation des stations supplémentaires ont été retardées ; par conséquent, les saisons 2021 et 2022 ont fourni la première occasion de tester l'importation et la cartographie des données pour l'ensemble du réseau de 62 stations météorologiques Davis Vantage Pro.

En 2021, les membres de l'AASCNB et d'autres hôtes de stations ont reçu des identifiants de stations leur permettant d'accéder à l'application Davis Weatherlink sur les smartphones et de lire les conditions météorologiques en temps réel à l'emplacement d'une station particulière. Cette fonction très populaire, en particulier pour déterminer la vitesse du vent pour les décisions de pulvérisation, a été étendue à tous les producteurs en 2022.

Les problèmes techniques liés au fonctionnement ou à la fonction et aux réglages des stations nécessitent une intervention manuelle importante de la part du personnel du MAAP afin d'assurer l'exactitude des données. De plus, une plateforme mise à jour par Davis nécessite une intervention manuelle pour télécharger les données des stations les plus récentes de l'AASCNB afin de permettre l'importation dans le portail PAT l'information sur la culture de pommes de terre, la météo et les parasites au N.-B. pour l'exportation dans la base de données Arc GIS pour l'interpolation et la présentation de cartes.

Il y a eu une panne importante dans le système qui, une fois de plus, a eu pour conséquence que deux résultats n'ont pas été atteints de manière satisfaisante comme prévu : 1) amélioration de la définition et de la compréhension de l'unité thermique pour le maïs et le soja, en relation avec la maturité physiologique au Nouveau-Brunswick et 2) évaluation des modèles existants pour la prévision de l'occurrence et de la sévérité des ravageurs des cultures.

Les accumulations de fin de mois pour l'UTM, la DJC et les précipitations pour toutes les stations ont été affichées sous forme de carte sur le site Web de l'AASCNB.

La date historique du dernier gel de printemps, la date du dernier risque de gel de printemps, la date du premier risque de gel d'automne et la date du premier gel d'automne ont été calculées et rapportées pour les stations gérées par l'AASCNB.

Ce réseau amélioré de stations météorologiques fournira aux agriculteurs du Nouveau-Brunswick un autre outil précieux pour gérer les initiatives liées au changement climatique et rester compétitifs sur un marché

mondial de plus en plus exigeant en matière de produits de base respectueux de l'environnement. Les données fournies par le réseau apporteront des informations essentielles pour soutenir la gestion des éléments nutritifs 4R et les paramètres météorologiques clés de référence au cours des années à venir.

Conclusion

Compte tenu de l'effort manuel requis de la part du personnel du L'AASCNB et du MAAPNB, la préparation de cartes météorologiques plus fréquemment qu'une fois par mois est logistiquement difficile pour la gestion des cultures intensives sensibles au temps et pour la modélisation prédictive des ravageurs. Cependant, grâce aux efforts renouvelés du L'AASCNB et du MAAPNB, cela pourrait devenir une réalité.

Après interpolation, les données cartographiées ont le potentiel d'améliorer la définition et la compréhension des unités thermiques microclimatiques appliquées aux cultures agricoles importantes et d'améliorer la lutte intégrée contre les ravageurs et les pratiques de production durables sur le plan environnemental. L'ajout de paramètres relatifs à la température et à l'humidité du sol soutiendrait les efforts visant à mettre en place des stratégies de culture nouvelles ou améliorées, à réduire les émissions de gaz à effet de serre et à surveiller l'impact du changement climatique.

À l'horizon 2030 et au-delà, un réseau agrométéorologique élargi servira de référence ou de point de repère pour la surveillance des phénomènes météorologiques extrêmes, attribués au changement climatique, au Nouveau-Brunswick.

L'accès libre aux 62 stations permettront aux producteurs de prendre des décisions en temps réel en faveur d'une production végétale durable sur le plan environnemental.

Project title and number: C1819-0977-Y5 NB Weather Mapping for Intensive Crop Management

Project leader and collaborators: Ray Carmichael, MSc. Ag., NBSCIA Club Agrologist will managed project activities and reporting, with support from other NBSCIA regional coordinators. The NBDAAF collaborator is David Wattie, Integrated Pest Management Specialist, Wicklow Regional Office. Bill Jones, exp, Halifax, provides contracted GIS advice and mapping support.

Summary: NBSCIA has completed a series of projects (EMP15-003-3: NBSCIA Agricultural Geomatics Service),C1819-0557: Climate Mapping for Intensive Crop Production and C1819-0977 NB Agricultural Weather Network and C1819-0977-Y2,3 and 4 NB Agricultural Weather Network for Intensive Crop Management to expand the number of Davis weather stations throughout the Province and enable export of the PAT data from the NB Potato Crop, Weather and Pest Information portal (http://agri.gnb.ca/010-001/WebServiceData.aspx) in a GIS compatible format.

The objective of this project activity is to establish a Province wide weather monitoring network to support environmentally sustainable crop production management practices through crop and variety selection and integrated pest management programs

Due to the COVID 19 pandemic during 2020 the delivery and installation of the additional stations was delayed therefore the 2021 and 2022 seasons provided the first opportunity to test data import and mapping for the entire network of 62 Davis Vantage Pro weather stations.

During 2021 NBSCIA members and other station hosts were provided station Ids enabling them to access the Davis Weatherlink app on smart phones and read real time weather conditions at a particular station location. This very popular feature particularly for determining wind speed for spraying decisions was expanded to all producers in 2022.

Technical issues related to the operation or function and settings of the stations requires significant manual intervention on the part of NBDAAF staff to ensure accuracy. Additionally, an updated platform by Davies requires manual intervention to download the data from the newest NBSCIA stations to enable import to the PAT NB Potato Crop, Weather and Pest Information portal for export to the Arc GIS database for interpolation and map presentation.

A significant breakdown in the system, once again resulted in two deliverables not being satisfactorily accomplished as planned: 1) improved definition and understanding of the heat unit rating for corn and soybean, in relation to physiological maturity in New Brunswick and 2) assessment of existing models for forecasting occurrence and severity of crop pests. Month ending accumulations for CHU, GDD and rainfall for all stations were posted in a map format to the NBSCIA website: https://www.nbscia.ca/weather-maps/#nb2021

Historical last spring freeze date, last spring frost risk date, first fall frost risk date and first fall freeze date were calculated and reported for the station locations managed by NBSCIA.

This enhanced weather station network will provide New Brunswick farmers another valuable tool to manage climate change initiatives to remain competitive in an increasingly global market demanding environmentally sustainably produced commodities. Data provided by the network will provide critical information to support 4R Nutrient management and reference key weather parameters over future years.

Introduction: In areas of significant crop production where demand warrants, there are commercial service providers for climate monitoring and pest risk forecasting such as Weather INnovations Consulting LP (WIN), Chatham, ON. WIN's environmental monitoring network encompasses Ontario,

Manitoba, Saskatchewan, Michigan and Western Europe. The New Brunswick agricultural community and diverse microclimates is not large enough to attract commercial service providers such as WIN.

The NBDAAF Potato Analysis Tool (PAT) network was established to provide data collection from a series of weather stations that monitor temperature, relative humidity, rain, wind, solar radiation, leaf wetness and soil temperature and moisture to better manage late blight in potatoes. The NBSCIA has a number of like stations (make and model) located outside the "potato belt" area with similar capability that can be incorporated with the NB Potato Crop Weather and Pest Information to provide a Province wide Agriculture Weather network (NB Ag Weather Network) to assist in production management decisions and benchmark climate changes going forward.

NBSCIA has completed a series of projects (EMP15-003-3: NBSCIA Agricultural Geomatics Service), C1819-0557: Climate Mapping for Intensive Crop Production and C1819-0977 NB Agricultural Weather Network and C1819-0977-Y2 NB Agricultural Weather Network for Intensive Crop Management to expand the number of Davis weather stations throughout the Province and enable export of the PAT data from the NB Potato Crop, Weather and Pest Information portal https://agri.gnb.ca/010-001/Index.aspx?lang=en in a GIS compatible format https://www.nbscia.ca/weather-maps/#nb2021. C1819-0977-Y3 and Y4 NB Agricultural Weather Network for Intensive Crop Management focused on perfecting data transfer within the network to create the maps and a significant maintainance and upgrade of stations.

This enhanced weather station network will provide New Brunswick farmers another valuable tool to manage climate change initiatives to remain competitive in an increasingly global market demanding environmentally sustainably produced commodities. Data provided by the network will provide critical information to support 4R Nutrient management and reference key weather parameters over future years.

Project Objective: To establish and maintain a Province wide weather monitoring network to support environmentally sustainable crop production management practices through crop and variety selection and integrated pest management programs.

Project Deliverable(s): An expanded weather station network, upgraded station capability, improved annual and in-season maintenance to support the establishment of an NB Agricultural Weather network.

Specific deliverables for this project activity will be to:

- provide real time access to all individual stations, using the Davis Weather Link delivery model for the georeferenced climate maps (https://www.weatherlink.com/) by producers to facilitate local real time weather checks to support crop growth and pest modeling for crop scouting and IPM programs

- improved definition and understanding of the heat unit rating for corn and soybean, in relation to physiological maturity in New Brunswick

- assessment of existing phenology models for forecasting occurrence and severity of crop pests

- rainfall and heat unit bench mark maps to monitor climate change

Project results will assist producers in evaluating the environmental and climate change risks associated with their operations, acquire knowledge and technical resource tools to address these risks and help them implement adjustments to manage such risks.

Accurate predictive models for pest alerts to a field scale will enable the farmers to undertake more timely pesticide applications, hence reduce the environmental load improving sustainability.

Results and Discussion:

The locations of the 62 network stations are identified in Illustration 1, below.

Compounding the COVID 19 pandemic during 2020 which delayed delivery and installation of all the stations until September, the early season (May 2021) Public Health Guidelines established to manage the spread COVID-19 impeded the ability of staff to service the stations and insure proper operation prior to start of the season therefore the 2021 and 2022 seasons provided the first opportunity to test data import and mapping for the entire network of 62 Davis Vantage Pro weather stations.

When stations are malfunctioning and data is not downloaded automatically, considerable manual intervention is required to input and verify the data. This is compounded by the fact that the newest Davis stations have to be the individually downloaded by a NBSCIA coordinator from the Davies cloud link. The NBSCIA station data is then combined with the Web Service data for export to the Arc GIS for interpolation by the GIS contractor and map presentation in .pdf format posted on the NBSCIA web site.

The manual manipulation by NBDAAF to verify and format missing station data for download into the Web Service is cumbersome, tedious and time consuming. Combined with the manual input still required on the part of NBSCIA the process limits the usefulness for time sensitive crop management and predictive modelling.

NBDAAF and NBSCIA have purchased replacement parts to upgrade the oldest stations in the network to ensure all stations are recording and reporting for 2022. Regular work planning meetings lead by the NBDAAF Potato Development Centre Director have been established to facilitate coordination between the two organizations.

As a consequence of the challenges previously outlined, two deliverables were not satisfactorily accomplished: 1) improved definition and understanding of the heat unit rating for corn and soybean, in relation to physiological maturity in New Brunswick and 2) assessment of existing models for forecasting occurrence and severity of crop pests. During 2021 NBSCIA members and other station hosts were provided station Ids enabling them to access the Davis Weatherlink app on smart phones and read real time weather conditions at a particular station location. This very popular feature particularly for determining wind speed for spraying decisions and planning field operations was expanded to all producers in 2022.

Recognizing that the resolution or scale of interpolated surfaces generated from the weather station data varies with: (1) the locations of the weather stations, and (2) the spatial distribution of the stations. The further apart the stations are and/or the more unevenly they are spaced the greater the grid cell size required (or the smaller the scale).

Month ending summaries for GDD, CHU and Rainfall were prepared and posted on the NBSCIA website for 2021 https://www.nbscia.ca/weather-maps/#nb2021. It should be noted that station by station reporting varies during the course of the season impacting the integrity of the interpolated maps from month to month and year to year. However, staff have manually verified the data used for mapping and general trends are considered valid. CHU, GDD and Rainfall for the 2021 season are illustrated in Figures 2, 3 and 4 respectively. Year to year comparisons is available on the NBSCIA website.

Historical last spring freeze date, last spring frost risk date, first fall frost risk date and first fall freeze date were calculated and reported for the station locations managed by NBSCIA.

Conclusions:

Given the manual effort involved on the part of NBSCIA and NBDAAF staff the preparation of weather maps more frequently than monthly is logistically difficult for time sensitive intensive crop management for predictive pest modelling. However, with the renewed effort by NBDAAF and NBSCIA it may become a reality.

After interpolation the mapped data has the potential to improve the definition and understanding of the microclimatic heat unit ratings applied to significant agricultural crops and improve integrated pest management and environmentally sustainable production practices. Adding soil temperature and moisture parameters would support efforts to new or enhanced cropping strategies reduce GHG emissions and monitor the impact of climate change.

Looking forward to 2030 and beyond an expanded NB Ag Weather Network will serve as a reference or bench mark for monitoring extreme weather events, attributed to climate change, within New Brunswick.

Providing open access to all sixty-two stations will enable real time decision making by producers in support of environmentally sustainable crop production.

Additional project work will be necessary to provide:

a) improved definition and understanding of the heat unit rating for corn and soybean, in relation to physiological maturity in New Brunswick

b) assessment of existing crop and pest growth models for forecasting occurrence and severity of crop pests

c) rainfall and heat unit bench mark maps to monitor climate change

d) increased soil moisture and temperature mapping will support improved nitrogen management from organic and inorganic sources

Required next steps:

a) The NBDAAF, Wicklow Office continues to manage the Potato Analysis Tool (PAT) central network and provide ongoing operational overview, data verification for all 62 stations currently available.

b) Preparation of a formal working arrangement between NBSCIA and NBDAAF to insure timely and effective maintenance and operation of all network stations.

c) Development of an improved (less manual intervention) electronic delivery model for the georeferenced climate maps and predictive pest models to enable weekly publication and or custom requests.

d) Identification and assessment of various existing phenology models for forecasting crop growth and the occurrence and severity of crop disease and insect pest infestations.

e) Provide real time access to all individual stations, using the Davis Weather Link (https://www.weatherlink.com/), by producers to facilitate local real time weather checks to support work planning and intensive crop management practices.

f) Upgrade soil temperature and moisture capacity within the existing network.

g) Adjust the CHU accumulation formula start date to May1 to be consistent with Ontario for corn and soybeans.

Communication: Provincial weather maps for CHU, GDD and rainfall were posted to the NBSCIA website and delivered by email upon request.

Customized maps for individual growers can be prepared and forwarded directly by email from the NBSCIAA Geomatics Centre.

Illustration 1; NB Weather Network Station Locations