Extension Education

Network for Environment and Weather Applications: An Overview of the Digital Pest Management Decision Support Tool

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JEL Codes: A2, Q16, Q56
Keywords: Extension education, IPM, Online decision, Precision agriculture, Risk assessment

Abstract
This manuscript provides an overview of an online decision support system (DSS) developed to help growers implement integrated pest management (IPM) practices by delivering short-term risk forecasts for crop management, pest control, and disease prevention. Launched in 1995 by Cornell University's New York State Integrated Pest Management (NYSIPM) Program, the Network for Environment and Weather Applications (NEWA) leverages local weather data from over a thousand ground-based sensors across the United States to deliver pest risk assessments for 32 models covering fruit, vegetable, ornamental, and agronomic crops. Through real-time weather data summaries, insect and plant disease models, and tailored crop tools, NEWA offers essential resources for agricultural professionals. The platform includes automated alerts for data interruptions and quality-controlled data processing to ensure reliable and timely weather inputs crucial for accurate crop and pest models. NEWA's open-source framework allows users to customize and expand the system, making it adaptable to diverse agricultural settings. Moreover, historical climate data aids in trend analysis and long-term planning, supporting precision agriculture. The platform empowers Extension educators by providing a foundation for demonstrating sustainable and effective IPM strategies, making NEWA a vital tool for enhancing agricultural resilience and data-driven decision-making.

1 Introduction

Effective dissemination of academic research extends beyond identifying beneficiaries; it requires ensuring accessibility, relevance, and practical application for its intended audience (Ellis et al. 2019). This involves clear communication, open access, engagement, practical application, localization, collaboration, feedback mechanisms, training, policy advocacy, and sustained engagement with stakeholders (Leitner and Ebner 2017). Research dissemination in agriculture has traditionally relied on journal articles, videos, podcasts, and Extension meetings. While these approaches remain valuable, technological advancements have created opportunities to enhance stakeholder engagement and empower farmers with timely, data-driven decision support tools (Mishra and Park 2005; Hino and Kahn 2016; Bayrak and Akcam 2017; Pinto, Padilla and Griffin 2023). Interactive elements in online modules further enhance learning motivation and concept retention (Bai et al. 2016). The Network for Environment and Weather Applications (NEWA) is one such tool, providing real-time weather-based pest and disease forecasting to help farmers mitigate environmental, economic, and social risks in agricultural production. Established in 1995 through a collaboration between Cornell University's New York State Integrated Pest Management (NYSIPM) Program and the Northeast Regional Climate Center (NRCC) at Cornell University, NEWA delivers practical, research-backed insights that support farm management decisions, improve crop health, and enhance environmental protection. This manuscript provides an overview of the NEWA platform and explains how this online, open-access decision support system (DSS) integrates historical and forecast weather data from more than 1,000 public and private weather stations to deliver critical pest and crop management information to agricultural stakeholders across 26 US states as of 2024. We also highlight NEWA's potential impact on economic savings, Extension education, and agricultural resilience, emphasizing its adaptability to emerging technologies and diverse agricultural contexts.

Agricultural decision support tools such as NEWA are essential in modern farming, where adapting to new technologies and evolving stakeholder needs is critical for sustainable production (Mishra and Park 2005). Web-based platforms that integrate real-time weather data and forecasting—such as NEWA—have been shown to improve farm productivity and reduce economic losses from climate variability (Rahman et al. 2023). Many universities—including the University of Maryland, Purdue University, Kansas State University, and Colorado State University—have developed interactive online dashboards to help farmers make informed decisions. For instance, the Dashboard for Agricultural Water Use and Nutrient Management (DAWN) at the University of Maryland provides reliable water and nutrient forecasts for Corn Belt farmers (Liang et al. 2024), while Kansas State University's Meat Demand Monitor Dashboard (MDMD) offers real-time insights into consumer behavior and meat market trends (Bina and Tonsor 2024). Some earlier platforms, such as the USDA-NIFA-funded Integrated Pest Management–Pest Information Platform for Extension and Education (ipmPIPE; Vankirk et al., 2012), were developed in response to significant threats like soybean rust (Isard et al., 2006) and other key pests. These platforms facilitated the development of early model visualization tools for tracking, issuing warnings, and supporting management decisions. Other examples include platforms focused on pecans (Calixto et al., 2011), cucurbits (Ojiambo et al., 2011), and legumes (Langham et al., 2011), each tailored to address specific crop-pest challenges through coordinated monitoring and decision support systems. These platforms demonstrate the growing role of decision support tools in Extension education and farm management, helping farmers explore new production strategies, optimize resource use, and improve financial outcomes.

Cornell University's NYSIPM Program has long promoted sustainable pest management practices by mitigating environmental, health, and economic risks. Studies have shown that adopting integrated pest management (IPM) can significantly reduce pesticide use while maintaining crop quality. For example, IPM Extension programs for apple growers in the late 1980s led to 30 percent fewer insecticide applications, 47 percent fewer miticide applications, and 10 percent fewer fungicide applications, translating to annual savings of $95.80 per hectare (Kovach and Tette 1988). Despite its benefits, research indicate a need for increased awareness and educational outreach to expand the use of NEWA. Among nonusers, 59 percent indicated they were unaware of the tool, while another 25 percent stated they did not know how to use it (Olmstead and Carroll 2018). This suggests a coordinated outreach effort is necessary to introduce potential users to the platform's capabilities. Providing educational resources, workshops, and presentations would help recruit additional users who could benefit from integrating NEWA into their IPM decision-making processes. Expanding awareness and training efforts could increase adoption, particularly among smaller-scale growers who may not yet realize how NEWA can enhance their farm management strategies. However, widespread adoption of IPM continues to face barriers, including costs, practical implementation challenges, and limited awareness (Lane, Walker, and Grantham 2023). Surveys also indicate that many farmers and Extension educators lack a clear understanding of IPM principles and face challenges accessing training and resources (Frank and Blevins-Wycoff 2024).

NEWA addresses these challenges by providing growers with a user-friendly, web-based decision support tool that enhances IPM decision-making through real-time weather and pest forecasting models. It offers 31 crop-specific tools for disease and pest control, irrigation, and crop thinning, enabling data-driven management. Its open-access framework supports customization and collaboration, driving widespread adoption. By delivering research-backed guidance on pest and disease risks, NEWA helps farmers make proactive, informed decisions. Integrating historical and forecasted weather data further enhances its utility, allowing growers to anticipate and respond to climate variability. This manuscript highlights how NEWA improves pest management, optimizes resource use, and reduces production risks, ultimately promoting sustainable agriculture.

2 What Is NEWA?

NEWA is an online open-access DSS website-only platform that integrates historical and forecast weather data from more than 1,000 public and private weather stations to provide agricultural stakeholders with critical information about pests and crop management in 26 US states as of 2024. Through NEWA, NYSIPM offers a suite of curated research-based tools and models designed to aid farmers and agricultural professionals in managing pests (insects and plant diseases) and crop load more effectively. Real-time, quality-controlled historical hourly microclimate data from ground-based on-farm weather stations are combined with the National Digital Forecast Database (NDFD) forecast data to help users make informed decisions that enhance crop health, optimize pest management, and improve overall agricultural productivity. The system is widely used across various agricultural sectors and is known for its accuracy, reliability, and user-friendly interface.

2.1 NEWA Online Tools and Features

Table 1 presents a summary of these key tools and features across different crop categories, highlighting the breadth of NEWA's offerings and their role in supporting sustainable, data-informed decision-making in agriculture. NEWA provides an array of 31 decision support tools tailored to specific crops, offering real-time data and actionable insights to assist farmers with disease and pest control, irrigation plans, and thinning management, among others (Table 1). These tools are designed to address the unique challenges associated with such crops as apples, grapes, berries, vegetables, and ornamentals, providing growers with localized, data-driven recommendations to optimize their agricultural practices.

For example, the Apple Disease Management tools monitor critical apple diseases such as apple scab (*Venturia inaequalis*), fire blight (*Erwinia amylovora*), sooty blotch (*Gloeodes pomigena*), and fly speck (*Zygophiala jamaicensis*) by assessing real-time infection risk and offering management guidelines for control. Insect pest tools—such as those for apple maggot (*Rhagoletis pomonella*) and codling moth (*Cydia pomonella*)—use degree-day models to predict optimal monitoring and treatment times. Similarly, the apple carbohydrate thinning and irrigation tools help optimize fruit thinning and water use by incorporating orchard-specific data.

For grape growers, NEWA offers models that manage key diseases such as black rot (Guignardia bidwellii) and phomopsis cane and leaf spot (*Phomopsis viticola*), alongside tools for pests such as grape berry moth. Vegetable management tools, including the beet cercospora leaf spot (*Cercospora beticola*) and onion maggot (*Delia antiqua*) monitors, provide critical insights to support timely interventions and maintain crop health and productivity. By leveraging these tools, farmers can implement more targeted interventions, reduce environmental impact, and improve crop outcomes across a variety of agricultural systems.

Table 1. Short-Term Risk Forecast Tools Available on the Network for Environment and Weather Applications (NEWA) Platform at https://newa.cornell.edu

Commodity	Risk Model Type	Target	URL
Apples	Crop management	Apple carbohydrate thinning	https://newa.cornell.edu/apple-carbohydrate-thinning
		Pollen tube growth model	https://newa.cornell.edu/pollen-tube-growth-model
		Apple irrigation	https://newa.cornell.edu/apple-irrigation
	Disease	Apple scab	https://newa.cornell.edu/apple-scab
		Fire blight	https://newa.cornell.edu/fire-blight
		Sooty blotch and flyspeck	https://newa.cornell.edu/sooty-blotch-flyspeck
	Insect	Apple maggot	https://newa.cornell.edu/apple-maggot
		Codling moth	https://newa.cornell.edu/codling-moth
		Obliquebanded leafroller	https://newa.cornell.edu/obliquebanded-leafroller
		Oriental fruit moth	https://newa.cornell.edu/oriental-fruit-moth
		Plum curculio	https://newa.cornell.edu/plum-curculio
		San Jose scale	https://newa.cornell.edu/san-jose-scale
		Spotted tentiform leafminer	https://newa.cornell.edu/spotted-tentiform-leafminer
Berries	Disease	Strawberry diseases	https://newa.cornell.edu/strawberry-diseases
	Insect	Blueberry maggot	https://newa.cornell.edu/blueberry-maggot
Field crops	Disease	White mold in beans	https://newa.cornell.edu/white-mold-in-beans
	Insect	Alfalfa weevil	https://newa.cornell.edu/alfalfa-weevil
		Seedcorn maggot	https://newa.cornell.edu/seedcorn-maggot
		Western bean cutworm	https://newa.cornell.edu/western-bean-cutworm
Grapes	Disease	Grape diseases	https://newa.cornell.edu/grape-diseases
	Insect	Grape berry moth	https://newa.cornell.edu/grape-berry-moth
		Spotted lanternfly	https://newa.cornell.edu/spotted-lanternfly
Ornamentals	Insect	Conifer pests	https://newa.cornell.edu/conifer-pests
Vegetables	Insect	Cabbage maggot	https://newa.cornell.edu/cabbage-maggot
		Onion maggot	https://newa.cornell.edu/onion-maggot
	Disease	Beet Cercospora leaf spot	https://newa.cornell.edu/beet-cercospora-leaf-spot
		Onion diseases	https://newa.cornell.edu/onion-diseases
		White mold in beans	https://newa.cornell.edu/white-mold-in-beans
Other	Weather	All weather data query	https://newa.cornell.edu/all-weather-data-query
		Degree day calculator	https://newa.cornell.edu/degree-day-calculator
		Regional weather events	https://newa.cornell.edu/regional-weather-events/

2.2 NEWA's Impact

NEWA has demonstrated significant impact and outreach within the agricultural community, as evidenced by its extensive user base and engagement metrics. Since August 2022, the platform has attracted 73,060 users in the United States, according to Google G4 analytics (Figures 1 and 2). User engagement has been strong, with 129,165 active sessions and an engagement rate of 54.6 percent. On average, users participate in 1.77 sessions, spending approximately 3 minutes and 56 seconds per session. These metrics highlight the value of NEWA's tools and models, which users actively depend on for informed pest management, disease control, and crop management decisions. Notably, the platform is accessed and utilized even in states without a weather station (Figures 1 and 2), reflecting its widespread relevance and adaptability. This high level of participation underscores NEWA's effectiveness in promoting sustainable farming practices.

Apple and grape production systems drive the adoption of NEWA risk tools across the continental United States, including the Northeast, Mid-Atlantic, Upper Midwest, and regions as far west as Utah and Idaho (Figures 1 and 2).

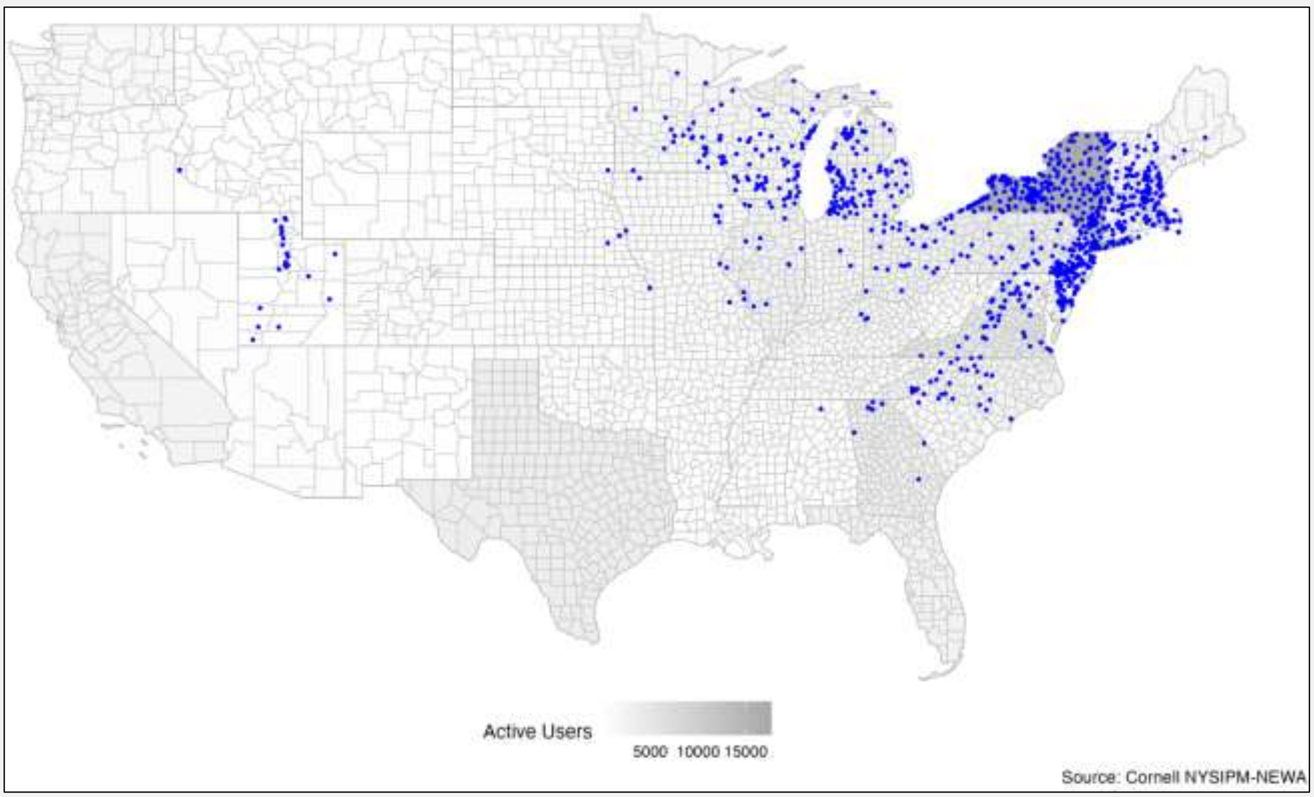

Figure 1. Number of NEWA active users and weather station locations in the continental United States, 2022–2024

Source: Cornell NYSIPM-NEWA.

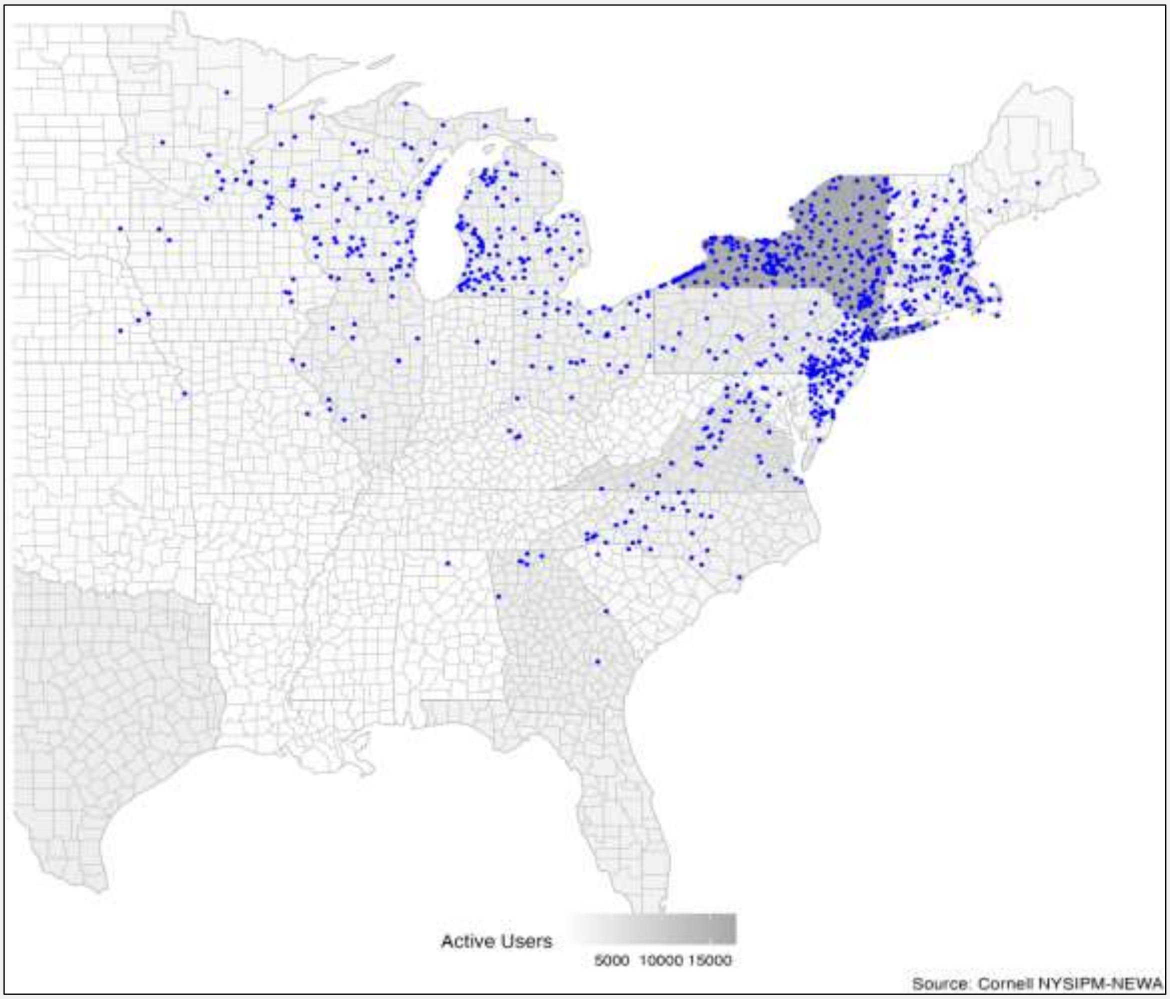

Figure 2. Number of NEWA active users and weather station locations in the Northeast US, 2022–2024

Source: Cornell NYSIPM-NEWA.

3 Educational Value

NEWA plays a vital role in Extension education and classroom instruction by enhancing decision-making in IPM and weather-informed agricultural practices. As a digital decision support tool, NEWA helps farmers and students interpret real-time and historical weather data to predict pest and disease risks, optimize pesticide applications, and improve farm management strategies.

3.1 Extension Education

The Extension educational value of NEWA is substantial, especially when viewed within the broader context of web-based DSS platforms in agriculture. These platforms integrate weather data and forecasting to significantly enhance the decision-making processes of farmers. NEWA, as part of this ecosystem, provides timely and relevant weather information that plays a critical role in optimizing agricultural productivity and managing the risks associated with climate variability.

Web-based platforms such as NEWA are effective in disseminating weather forecasts and agrometeorological advisories, which have been shown to improve farmers' economic outcomes through education. Rahman et al. (2023) show that weather-based agricultural advisory services enable farmers to adopt weather-resilient practices, leading to increased self-sufficiency, productivity, and economic benefits. Kumar et al. (2024) support these findings by highlighting how access to accurate weather information helps farmers reduce weather-related losses and make informed farm management decisions that enhance agricultural output.

The integration of historical and forecasted weather is another key aspect of NEWA's educational value. The concept of an agricultural DSS, as noted by Yu, Yang, and Zhang (2011), relies on meteorological data as a crucial input, allowing farmers to base their decisions on current and forecasted weather conditions. This approach is vital not only for immediate farm operations but also for long-term strategic planning, helping farmers better understand and adapt to climate risks and variability (Moyo, Dorward, and Craufurd 2017). Historical risk calculations provided by NEWA help farmers understand short- and long-term trends. In NEWA, historical risk calculations use past weather data to identify patterns and probabilities of pest or disease outbreaks, frost risk, and other climate-sensitive events. By analyzing these trends, farmers gain insight into seasonal and annual variations, enabling them to make informed decisions about planting, pest management, and other agricultural practices. This historical perspective, combined with forecasted weather, helps farmers prepare for both short-term and long-term climate impacts, mitigating potential losses and enhancing resilience to variability.

NEWA is also considered an agri-advisory service (AAS), playing a crucial role in enhancing farmers' decision-making capabilities to enhance their performance. Narasimha et al. (2023) demonstrates how an AAS can guide crop selection and input management, leading to better economic outcomes. Singh et al. (2023) emphasizes the importance of accurate weather services in supporting both tactical and strategic farmer decisions that are essential for maximizing crop yield and quality. Thus, NEWA's ability to deliver accessible and actionable weather information contributes significantly to farmers' ability to adapt to changing short-term and climatic conditions and demonstrates its role as an essential educational resource for the agricultural community. The NEWA Grape Diseases Model (Figure 3) serves as a successful case study in the efficacy of a DSS within Extension education, particularly in the management of critical grapevine diseases such as powdery mildew (*Erysiphe necator*), phomopsis cane and leaf spot (*Phomopsis viticola*), and black rot (*Guignardia bidwellii*). By leveraging real-time weather data and integrating them with established epidemiological research, this model provides grape growers with a five-day risk forecast, enabling them to make informed, timely decisions about disease management actions. This proactive approach is especially valuable in regions where these grapevine diseases are prevalent, allowing growers to adopt preventive rather than reactive strategies for disease control.

The efficacy of disease forecasting models such as the NEWA's Grape Diseases Model has been well-documented in research. For instance, Rutto, Mersha, and Nita (2021) show that using disease forecasting systems enhances the effectiveness of fungicides by timing applications to coincide with predicted infection periods. This approach not only maintains effective disease control but also reduces the frequency of fungicide applications, which is particularly beneficial for managing grapevine diseases like phomopsis cane and leaf spot. These diseases can cause significant crop losses, especially in humid climates (Nita et al. 2008). By optimizing fungicide application through using the NEWA model, growers can reduce costs and minimize the environmental impact associated with excessive agrichemical use.

The utility of the NEWA model is further demonstrated by its ability to provide specific risk assessments for each disease, enabling growers to prioritize management efforts effectively. For example, the risk forecast for powdery mildew is critical, as this disease can spread rapidly under favorable conditions, leading to considerable yield losses if not addressed promptly. The predictive nature of the NEWA model allows farmers to implement preventive control measures, such as targeted fungicide applications at optimal times, thereby strengthening overall disease management strategies (Guarnaccia et al. 2018).

The Extension educational value of the NEWA Grape Diseases Model is also enhanced by its integration with ongoing research into grapevine diseases. For example, González-Domínguez et al. (2021) show that the incidence of phomopsis cane and leaf spot is closely linked to environmental factors such as humidity and temperature. By using the model to educate growers about these relationships, Extension services can foster a deeper understanding of disease dynamics and the critical importance of timely interventions. This improves immediate disease management outcomes and contributes to the long-term sustainability of grape production

Figure 3 shows selected NEWA features such as (1) a self-guided video tutorial and selectable user-defined model parameters using the default current date, which automatically includes a five-day integrated forecast or a user-defined historical date of interest; (2) daily qualitative risk assessments for powdery mildew, phomopsis cane and leaf spot, and black rot, based on published research and guidance from university experts; and (3) Extension-focused management guidelines that are responsive to the calculated risk level, time of year, and crop production status.

3.2 Classroom Education

The use of a DSS such as NEWA in classroom settings is effective for enhancing agricultural education, particularly in vocational and university programs. These tools provide students with valuable hands-on experience in interpreting real-time weather data and applying them to agricultural management practices. By incorporating DSSs into curricula, educators can bridge the gap between theoretical knowledge and practical applications, thereby equipping students with the skills necessary to thrive in modern agriculture.

NEWA's tools, such as the Grape Diseases Model, exemplify how a DSS can be integrated into agricultural education to help students understand complex agricultural systems. Like the Soil Navigator decision support tool, which aids students in assessing soil functions and management practices at local scales (Wall et al. 2020), NEWA allows students to explore the relationships between environmental conditions and disease development in crops. This practical experience helps students understand the importance of timely interventions in disease management, preparing them for real-world challenges in crop production. NEWA fosters an educational environment where students can engage directly with data, developing evidence-based decision-making skills essential for sustainable agriculture.

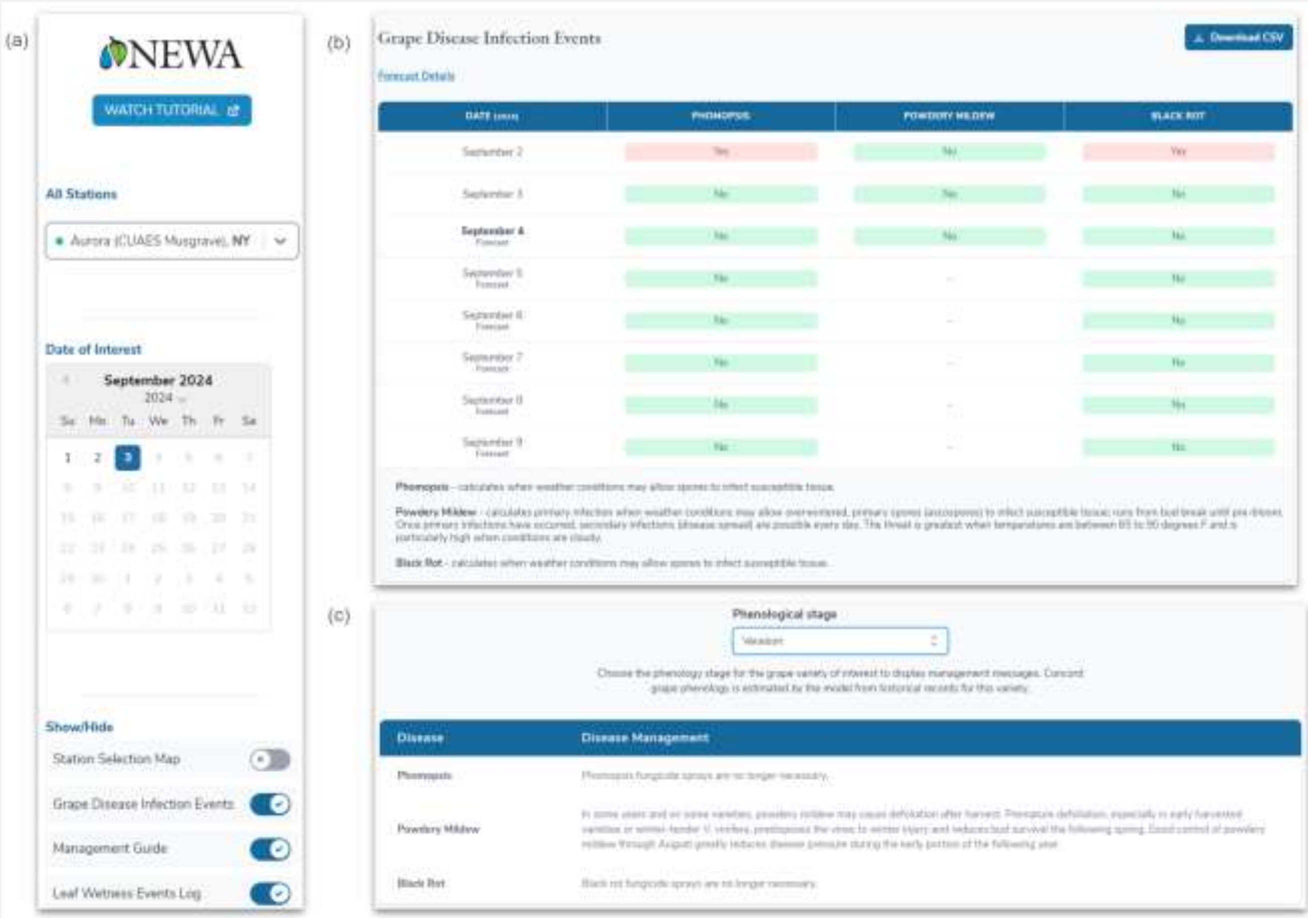

Figure 3. User features and outputs for the NEWA grape diseases model

Source: Cornell Integrated Pest Management-NEWA.

In addition to improving agricultural management skills, NEWA can enhance students' understanding of broader ecological and environmental processes. For example, the integration of crop management and climate change mitigation strategies using DSSs, as discussed by Jabbour, McClelland, and Schipanski (2021), parallels the educational value of NEWA in showing how weather conditions influence disease pressures and crop health. This interdisciplinary approach reinforces how environmental factors impact agricultural productivity and highlights the role of technology in addressing these challenges.

The application of DSS platforms such as NEWA in vocational training programs provides an avenue for future agricultural professionals to develop practical, data-driven skills in managing crops, disease risks, and environmental conditions. Like Dzalbs et al. (2023), who highlight the importance of DSSs in promoting evidence-based agricultural practices, NEWA helps vocational students connect theoretical concepts with real-time decision-making processes.

The interdisciplinary application of platforms, such as NEWA, in education is echoed in studies that emphasize their role in fields such as irrigation planning and environmental science (Papathanasiou et al. 2021). This integration of technology and agriculture allows students to appreciate the interconnectedness of agricultural and ecological systems, promoting a holistic understanding of farming practices. Using platforms such as NEWA, students are better equipped to make informed decisions that balance productivity with sustainability, ultimately fostering a new generation of agricultural professionals who are skilled in both technological and ecological aspects of farming.

3.3 Economic Impact

NEWA has the potential to provide significant economic benefits to growers by enabling preventive rather than reactive agricultural practices, such as targeted pesticide applications and early pest risk mitigation. While no comprehensive research has been conducted to quantify the overall economic impact of NEWA on grower profitability, a 2017 survey provided insights into its perceived benefits (Olmstead and Carroll 2018). According to the survey, growers reported average annual savings of $4,329 from reducing pesticide sprays and $33,048 from preventing crop loss. On a per acre basis, these savings averaged $2,060 annually.

These figures highlight NEWA's value as a DSS that enhances resource efficiency and profitability by improving the timing and necessity of agricultural interventions. Future research is needed to build on these findings and evaluate the broader economic impact of NEWA, including long-term profitability and sustainability outcomes. As NEWA evolves, its integration of precision agriculture tools and advanced decision-making technologies could further amplify these economic benefits for growers across diverse agricultural systems.

3.4 NEWA's Impact and User Demographics

Survey results from 2017 highlight the significant role that NEWA plays in enhancing IPM practices, improving pest management decisions, and optimizing pesticide application timing (Olmstead and Carroll 2018). Users continue to recognize its value, with 77 percent agreeing or strongly agreeing that NEWA helps them reduce the number of pesticide applications. Similarly, 86 percent stated that the tool alerts them to pest risks. Meanwhile, 93 percent of users acknowledged that NEWA enhances IPM decision-making, and 95 percent agreed that it improves the timing of pesticide applications. These results confirm that NEWA is an effective DSS tool for reducing pesticide use, strengthening IPM strategies, and improving farm management efficiency.

Among those who use NEWA, 75 percent are growers and 10 percent are Extension educators. Most growers, about 60 percent, manage diversified farm operations with wide farm sizes. About 57 percent of respondents operate farms between 11 to 1,000 acres, while 4 percent manage farms larger than 1,000 acres. Additionally, 20 percent of NEWA users farm on a smaller scale, with between 2 to 10 acres. Among nonusers, the majority (44 percent) reported farming on less than 10 acres, indicating that smaller-scale growers may have different needs or lack awareness of the tool.

Most NEWA users produce multiple crops, with 46 percent growing apples, 37 percent growing other tree fruits, 34 percent growing grapes, 25 percent growing berries, and 25 percent growing tomatoes. Additionally, farmers reported growing 23 other commodities that are not yet supported by commodity-specific tools within NEWA, reflecting an opportunity to expand the platform's capabilities to meet a broader range of agricultural needs.

4 Collaborative Reach

NEWA's success is due to a collaborative research effort involving numerous land-grant universities (20), grower organizations (3), and governmental agencies (2, Table 2). Each state has a designated coordinator from universities or Extension programs across the United States who provide localized expertise and support.[1] The initiative is funded through a diverse array of sources, including federal programs such as the US Department of Agriculture (USDA) National Institute of Food and Agriculture, agricultural departments of several states, industry organizations, and grower associations. These partnerships ensure that NEWA remains a valuable tool for improving agricultural decision-making and sustainability.

[1] https://newa.cornell.edu/partners

Table 2. Land-grant university, grower association, and governmental agency partnerships of the Network for Environment and Weather Applications (NEWA) platform

Region	Name
United States	US Department of Agriculture[c] (grant funding to update the NEWA platform, 2019–2022, ongoing regional support through specialty crop block grants, and other state-level opportunities)
Connecticut	University of Connecticut[a]
Delaware	University of Delaware[a]
Georgia	University of Georgia[a]
Idaho	Utah State University affiliate
Illinois	University of Illinois at Urbana-Champaign[a]
Indiana	Purdue University[a]
Iowa	Independent growers—no affiliation
Kansas	Independent growers—no affiliation
Kentucky	Independent growers—no affiliation
Maine	University of Maine[a]
Massachusetts	University of Massachusetts[a]
Michigan	Michigan State University[a]
Minnesota	Minnesota Apple Growers Association[b]
Missouri	Independent growers—no affiliation
Nebraska	Independent growers—no affiliation
New Hampshire	University of New Hampshire[a]
New Jersey	Rutgers, The State University[a]
New York	Cornell University,[a] Cornell IPM, New York State Department of Agriculture and Markets[c]
North Carolina	North Carolina State University[a]
Ohio	The Ohio State University—OARDC[a]
Pennsylvania	Penn State University[a]
Rhode Island	University of Rhode Island,[a] Rhode Island Fruit Growers Association[b]
South Carolina	Independent growers—no affiliation
Utah	Utah State University[a]
Vermont	University of Vermont[a]
Virginia	Virginia Tech[a]
West Virginia	West Virginia University[a]
Wisconsin	University of Wisconsin–Madison[a], Wisconsin Apple and Grape Growers Associations[b]

Notes: *a* = land-grant university, b = grower association, c = governmental agency. NEWA platform at https://newa.cornell.edu

5 The Future of NEWA

As emerging needs evolve in agriculture, NEWA advances efforts to provide equitable access to essential decision-making tools, particularly targeting underserved audiences in critical areas such as microclimate forecasting, precision agriculture, and data-driven pest management control strategies. Future growth will focus on ensuring that farmers and agricultural professionals, regardless of location or resources, can access the same high-quality information. By serving as an incubator for innovative

DSSs, NEWA aims to foster new ideas and approaches that can be customized to address local challenges. One promising area for development is the integration of microclimate modeling and forecasting, which would enable more accurate, localized predictions that align with farmers' specific environmental conditions.

In addition to traditional DSSs, NEWA plans to incorporate advanced technologies such as remote sensing and satellite image data to improve the precision of crop health monitoring and yield forecasting efforts. Remote sensing, for example, has proven effective in applications such as crop monitoring and yield forecasting, using indices like the Normalized Difference Vegetation Index (NDVI) to optimize decisions related to irrigation, fertilization, and pest management (Lykhovyd 2021). By integrating these tools, NEWA can offer real-time insights into crop conditions and potential pest threats, enabling farmers to make more informed, timely decisions.

NEWA aspires to integrate advanced technologies such as artificial intelligence (AI) and machine learning (ML) to revolutionize pest identification, species monitoring, and pest forecasting. By leveraging AI and ML, NEWA can analyze vast data sets to predict pest outbreaks, optimize resource use, and enhance decision-making accuracy. This approach aligns with the broader goals of precision and predictive agriculture, where localized, real-time insights empower growers to address specific challenges efficiently.

A key area for development is integrating the Environmental Impact Quotient (EIQ) (Kovach et al. 1992; Obregon et al. 2025) to assess the ecological footprint of pest management practices. Additionally, an interactive module could be designed to help users select IPM strategies. This module would be a comprehensive resource, providing tailored recommendations on chemical, biological, and cultural controls based on specific crop and pest scenarios.

NEWA's future also involves incorporating remote sensing and satellite imagery to improve crop health monitoring and yield forecasting. Tools such as the NDVI could be integrated to optimize irrigation, fertilization, and pest management practices, delivering real-time insights that enhance precision and sustainability.

At its core, NEWA remains an open-source platform, adaptable to regional and local needs. Users will continue to customize its pest and disease models, weather data, and crop recommendations, ensuring relevance across diverse agricultural communities. By evolving into a centralized, data-driven hub for agricultural decision-making, NEWA aims to bridge information gaps, support sustainable practices, and empower growers with cutting-edge tools for IPM and beyond.

6 Conclusion

NEWA has proven to be a valuable and adaptable DSS for improving agricultural decision-making and education. Its success is driven by strong partnerships across academic institutions, public organizations, and industry stakeholders, ensuring its relevance for diverse agricultural communities. The platform's open-source nature allows for continuous growth and adaptation, making it a flexible tool capable of addressing the evolving needs of the agricultural sector.

The NEWA DSS is a pioneering collaborative effort to help farmers make informed production decisions and implement IPM strategies, in New York State and beyond. Designed to increase awareness, enhance transparency, and simplify technology adoption decisions, the tool serves as a valuable resource for a variety of agricultural stakeholders including apple, berry, grape, vegetable, ornamental, and field crop farmers. Its primary objective is to provide farmers with an easy-to-use method to make informed decisions regarding pesticide applications, the application of IPM practices, planting dates, and many other agronomic activities, thus increasing the adoption of new technologies and fostering informed decision-making. Through a user-friendly interface and real-time calculations, the tool empowers growers to conduct "what-if" scenario analyses and evaluate the potential impacts of management strategy adjustments. To facilitate widespread adoption, the NEWA team plans to offer educational materials and training events. Additionally, the tool facilitates direct communication with team members, enabling users to seek assistance or clarification as needed.

A key advantage of the tool is its accessibility, requiring only an internet-connected device such as a laptop, tablet, or smartphone for use. NEWA minimizes the computational demands on the user's device by performing calculations off-screen. This feature proves especially valuable in rural areas with limited connectivity, reducing reliance on wireless connection capacity and availability. In agriculture, where mobile electronic devices are indispensable, the tool's availability across many device types ensures that farmers can easily access and utilize it. This accessibility facilitates widespread adoption of IPM strategies, promoting improved communication between experts/Extensionists and farmers, and increased technology adoption.

As NEWA progresses, its focus on equitable access to information, particularly for underserved audiences, will be key in ensuring that all agricultural professionals have the tools needed for effective decision-making. NEWA aims to serve underserved agricultural audiences by making its data and tools accessible and relevant, even in areas with limited resources or technological infrastructure. For example, NEWA's platform can be adapted to provide localized pest and disease alerts through low-bandwidth notifications or short message service (SMS), benefiting farmers who may not have consistent internet access. Additionally, by developing simple, adaptable models, NEWA enables smaller farms or those with limited tech experience to use climate data effectively for crop management, pest control, and risk reduction tailored to their specific conditions. The integration of advanced technologies, such as microclimate modeling and remote sensing, will enhance the precision and utility of NEWA's forecasts, enabling users to make data-driven decisions that optimize crop management and pest control.

In conclusion, NEWA's growth and adaptability, coupled with its emphasis on innovation and education, position it as a critical resource for both current agricultural professionals and the next generation of farmers and researchers. By continuing to integrate new technologies and foster equitable access, NEWA will remain a cornerstone of agricultural decision support and sustainability.

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Acknowledgments: Support for developing this publication was partly funded from core funding provided to Cornell's University NYSIPM by the New York Department of Agriculture and Markets (NYSDAM), the Network of Environmental and Weather Applications (NEWA) at NYSIPM, USDA-NIFA-EIP Award #2024-70006-43573. The authors wish to thank the regional NEWA coordinators at participating land grant institutions.

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DOI: https://doi.org/10.71162/aetr.489569