2023 SCRI Annual Report

Cornell Cooperative Extension - Lake Ontario Fruit Program | Extension Activities 2023

Summary:

In January of 2023, a series of 3 virtual nationwide meetings was conducted by the PACMAN Research and Extension team to update growers about the current state of precision crop load management of apples. At the end of February and early March, CCE LOF conducted 3 Ag-tech sessions in person in Rochester, NY, and one statewide virtual session. More than 450 people in total attended the PACMAN virtual meetups and the 4 Ag-tech sessions offered by CCE LOF during the winter months of 2023. CCE LOF carried out one pruning severity study on 'Honeycrisp', compared and validated the use of two thinning prediction models (FSDM and the FGRM) on 'Honeycrisp' and 'Gala' with grower collaborators, and worked with several companies who are developing rovers or drones to count flowers and fruitlets (Pometa, Orchard Robotics, Vivid, and Outfield). In July, CCE LOF conducted a very successful fruit summer tour in Wayne County where several digital technologies were featured to more than 250 tour participants. In the 2023 growing season and in a few more orchards in the Lake Ontario Fruit region and at Cornell AgriTech in Geneva, the research, development, and first adoption of several digital technologies has been taking place to help improve the accuracy and labor efficiency of precision crop load management.

Cornell research and extension team: T.L. Robinson (Cornell AgriTech), L. Gonzalez (Cornell AgriTech), S. Howden (Cornell AgriTech), Kathy Campo (Cornell AgriTech), M. Miranda Sazo (CCE LOF), C. Kahlke (CCE LOF), L. Tee (CCE LOF), and D. Acquilano (CCE LOF).

Activities:

January 2023

- In early January 2023, a series of 3 virtual nationwide meetings was conducted by the PACMAN Research and Extension team to update growers about the current state of precision crop load management of apples.
    - PACMAN Virtual Briefings:
        - How can PACMAN help you make more money was conducted on January 12 (100 participants).
        - Innovative new technologies to implement PACMAN (Part 1) was conducted on January 19 (80 participants).
        - Innovative new technologies to implement PACMAN (Part 2) & How is your adoption going was conducted on Jan. 26 (90 participants).

February-March 2023

- On February 27-28, and March 3, 2023, we planned/coordinated/and delivered 3 ag-tech sessions in total (2 in person at RIT Conference Center, Rochester, and 1 virtual).
    - Session 1 (Feb. 27, 2023):
        - Introduced Precision Farming, Implementation, and Adoption of Ag-tech solutions. Invited Dr. Terry Bates to talk about 'Cornell's Efficient Vineyard Project: Experiences with Ag Technology in Grape Production'.

- Invited several CEOs across the nation and asked them to introduce Ag-technologies of TODAY via short lightning talks. Invited companies/speakers were: (1) Orchard Robotics – Charles Wu, (2) Vine-View – Matthew Staid, (3) Agri-Trak – Jason Hill, (4) LaGasse – Ross Gansz, and (5) FloraPulse – Michael Santiago
- Invited Cornell faculties and asked them to talk about promising Ag-Technologies for the FUTURE. Invited faculties were Dr. Yu Jiang, Dr. Awais Khan, Dr. Lynn Sosnoskie, and Dr. Katie Gold.
  - Session 2 (Feb. 28):
    - We organized a show-and-tell session to learn about the Washington experience for Research, Development, and Adoption of Ag-Technologies. The following talk titles/speakers presented at the Cornell conference:
    - 'The Orchard of the Future: Automation Efforts in WA' - Dr. Ines Hanrahan.
    - 'Old Farm, New Technologies, and Learning the Value of Orchard Data' – Dr. Erick Smith.
    - This session finished with a roundtable discussion about the current stage and the future for the Adoption of Ag-technologies in the WNY Fruit Industry. We invited Dr. Terence Robinson to serve as moderator and invited 3 WNY fruit growers/early adopters of digital technologies.
    - On February 29, we hosted Dr. Hanrahan, conducted a tour of orchards, and introduced her to several growers (lunch meeting).

  - Session 3 (March 3):
    - It was a virtual session to discuss promising ag-vision technologies. We invited Mike Basedow to help co-host this session.
    - Promising Ag-vision technologies to Evaluate Fruit Thinning Decisions and Estimate Yields prior to Harvest – What Is Possible TODAY and in the FUTURE.
    - We invited the following companies and CEOs: Pometa (CEOs Dave Brown and Patrick Plonski), VIVID Technologies (CEO Jenny Lemieux), and Orchard Robotics (CEO Charles Wu).
    - The Ag-tech information gathered from the Q&A session was used for a Fruit Quarterly article published in the summer issue of 2023.

Field activities from April to September 2023

- From April to Sept. 2023, we continued working with several companies who are developing rovers or drones to count buds/fruit and established a multi-purpose on-farm trial with a Wayne County collaborator (to test several technologies and conduct ground-truth evaluations):
  - The precision crop load management applied research work continued, with a pruning to set bud loads experiment and fruitlet and fruit scans with new technology provided by the startup companies.
  - We conducted from May to August a thinning prediction comparison of two models (FSDM and the FGRM) at the Wayne on-farm site.
  - Pometa, Orchard Robotics, Outfield, Vivid, Agri-track technologies were featured at the summer tour on July 28, 2023 (200 participants)
- More than 200 participants attended the tour where several digital technologies were featured and an update about the SCRI project was presented by Dr. Robinson.

Publications:

Peer-Review Research Articles:

Gonzalez Nieto, L.; Wallis, A.; Clements, J.; Miranda Sazo, M.; Kahlke, C.; Kon, T.M.; Robinson, T.L. 2023. 'Evaluation of Computer Vision Systems and Applications to Estimate Trunk Cross-Sectional area, Flower Cluster Number, Thinning Efficacy and Yield of Apple'. *Horticulturae* 2023, 9, 880. **https://doi.org/10.3390/horticulturae9080880**

Extension/Outreach Articles:

Jiang, Y., Wallis, A., Clements, J., Miranda Sazo, M., Kahlke, C., Lewis, K., Basedow, M., and T.L. Robinson. 2023. Digital technologies for precision apple crop load management (PACMAN) Part II: An overview of digital technologies currently available for PACMAN. Fruit Quarterly. Vol. 31(2): 19-23.

Wallis, A., Clements, J., Miranda Sazo, M., Kahlke, C., Lewis, K., Kon, T., Jiang, Y., Robinson, T. 2023. Digital Technologies for Precision Apple Crop Load Management (PACMAN) Part I: Experiences with Tools for Predicting Fruit Set Based on the Fruit Growth Rate Model. Fruit Quarterly. Vol. 31(1): 8-13

CCE LOF newsletter publications:

M. Miranda Sazo and J.v. Zoeren. 2023. "Advances in fruit production technology – announcing two technology sessions that will cover ag-technology solutions for WNY: Available today, tomorrow, and for the future". Lake Ontario Fruit Newsletter 2023 (1): 4.

M. Miranda Sazo. 2023. "Ines Hanrahan will be speaking about ag-technologies and main barriers for adoption at the WNY fruit conference". Lake Ontario Fruit Newsletter 2023 (1): 5.

M. Miranda Sazo. 2023. "Erick Smith: Distinguished tree fruit scientist and fruit consultant will be speaking at the 2023 WNY fruit conference in Rochester". Lake Ontario Fruit Newsletter 2023 (2): 3.

M. Miranda Sazo and M. Basedow. 2023. "Promising ag-vision technologies highlighted at the CCE statewide virtual apple conference – What is possible today and, in the future". Lake Ontario Fruit Newsletter 2023 (4): 10-12.

FIGURES:

Figure 1. Cornell research and CCE LOF extension teams have researched, developed, and conducted several educational activities to facilitate the early adoption of new digital technologies in the LOF fruit region. We have closely interacted with scientists, key innovative growers, industry representatives, Ag-tech industry partners, and entrepreneurs.

Figure 2. 2022 CCE LOF tour summer fruit tour conducted in Orleans County on August 16, 2022 (180-200 participants).

Figure 3. 2023 WNY Fruit Grower tour conducted in collaboration with industry partners and consultants in Wayne County on July 28, 2023 (250-275 participants).