WESTERN SYDNEY UNIVERSITY

August 2024 Newsletter

GREENHOUSE RESEARCH EDUCATION AND TRAINING FACILITY

From the Facility Manager

In this newsletter, I am thrilled to share the significant progress we've made throughout 2024. Our dedicated onsite team have been working tirelessly to deliver a highly functional facility for both research and academic users.

Since January, our focus has been on planting and managing our summer season crops within the facility. This effort has been complemented by the steady utilisation of our facilities for teaching and research purposes. Additionally, we have welcomed visits from industry representatives and potential collaborators, highlighting the broad interest in our work.

A notable achievement this year was our continued contribution to the Hawkesbury Show. We provided multiple crates of fresh produce, which were met with enthusiastic feedback from visitors at the Western Sydney University stand. Our produce remains a standout attraction each year.

Looking ahead, we are on track to finish the year strongly, fulfilling our academic and research objectives and delivering exceptional value to our clientele at Western Sydney University.

Thank you for your ongoing support and dedication.

Goran Lopaticki
Facility Manager

Recent Activities

New Crops In!

This year, our research compartments, which are part of the CRC-funded Smart Glass Film Project, have been buzzing with activity. Since mid-January, we've nurtured our first seasonal cucumber crops, which have reached the end of life. The team has thoroughly cleaned and decontaminated the growing space, and have planted the next crop.

Our teaching space sees a more colourful vegetable crop with two varieties of capsicum and a spicy chilli variety in. They've already provided a vital learning tool for students enrolled in Autumn semester subjects HORT7002 Greenhouse Control Systems and HORT7003 Greenhouse Crop Production.

We have provided a new strawberry crop for our pollination research trials, utilising both native bees and various fly species,

The research group seeks to better understand how native pollinators can help the protected cropping industry.

Donation Milestone

Since opening in 2017, our facility has produced a diverse array of crops, yielding an impressive amount of fresh produce. While a portion of our harvest supports teaching and research, we often have a significant surplus.
From the very start, we've been dedicated to ensuring this excess produce doesn't go to waste. Excess produce is donated to Foodbank, a crucial national program that combats hunger and provides food security for those in need.

We're proud to share that by the end of 2023, we had donated over 120,000 kg (120 tonnes) of produce to Foodbank. With their distribution centre located in the Western Sydney Region, we're able to provide some of the freshest produce to those who need it most. As we move through 2024, we look forward to continuing this fantastic partnership and making a positive impact in our community.

Recent Activities

Green Waste Initiative

We're excited to announce a new collaborative initiative between our Facility management team and the Infrastructure and Commercial team: the introduction of a secure green compost bin. This initiative aims to streamline the management of waste produced from our glasshouse operations.
Growing fruiting crops year-round generates a significant amount of green waste, including leaf clippings, plant shoots, and aborted fruit. Instead of sending this clean vegetative waste to landfill, it will now be delivered to a facility where it will be turned into compostable products. This new composting system complements our existing waste management processes, which include co-mingled recyclables and general waste. We're proud to take this step towards enhancing sustainability in our facility.

Facility Facts

Good Bugs

Ever wonder how we manage greenhouse pests in our facility? To minimise the need for chemical applications, we use beneficial insects to control any pest introductions.
In partnership with Bugs For Bugs and Biological Services, we've developed a proactive program to release beneficial insects into our growing spaces. This helps ensure our vegetable crops remain healthy and pest-free.
This integrated pest management strategy is widely adopted in the industry and is a crucial component of successful greenhouse crop production.

Research

Films of the Future

In line with our ongoing commitment to support research objectives at Western, our onsite technical team began installing next-generation smart films as part of the $3.5 million Future Food Systems CRC grant at Western Sydney University. Collaborating with CRC clients LLEAF and Innofocus, our researchers trialled these highly engineered films to save energy and enhance crop production.

The technical team played a crucial role in this project by measuring, cutting, and installing the engineered films on each glass panel within the research spaces allocated to this project.

This extensive task involved both internal and external film installations, and the team skinned over 1,000 individual glass panels across 1,400 square meters.

The works are now complete, setting the stage for several years of research to evaluate the effectiveness of these smart films in the growing industry. We were excited about the potential of this innovative technology to transform agricultural practices and contribute to more sustainable food production systems.

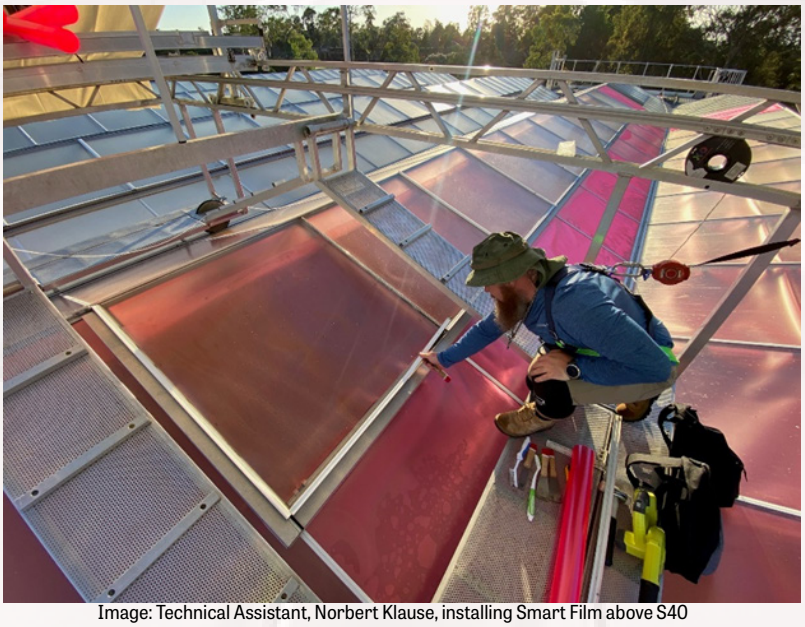


Image: Technical Assistant, Norbert Klause, installing Smart Film above S40

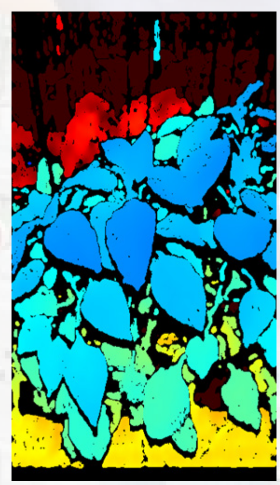
Researcher Focus

Namal Jayasuriya

PhD student Namal Jayasuriya has been studying methodologies of monitoring the growth of tall commercial-scale protected crops using machine vision and deep learning. As the first student of this new FFSCRC-funded project, he has developed a methodology for image based automated plant height estimation to be used in lieu of current manual measurements. He has developed a prototype image data collection platform, using a single stereo vision camera, and validated under different light films used in the National Vegetable Protected Cropping Centre. This work is now published in Computers and Electronics in Agriculture journal, https://doi.org/10.1016/j.compag.2024.108669

Impact

Phenotyping research has been mostly limited to research purpose data collections which comes with many restrictions for automation, and small plants have been targeted in protected crop facilities. Vertically supported tall crops in glass houses with natural light have their own space and lighting restrictions for image-based crop monitoring. Namal's research starts to address these limitations, opening paths for future researchers in this field.



Supervisors

Professor Oula Ghannnoum (Hawkesbury Institute for the Environment)
Associate Professor Yi Guo (School of Computer, Data and Mathematical Sciences)
Professor Wen Hu (School of Computer Science and Engineering, University of New South Wales)

Equipment

Intel Realsense D415 IR based Stereo vision camera with a custom camera mount on a protype image data collection platform.

Recent Publications

He, X., Solis, C. A., Chavan, S. G., Maier, C., Wang, Y., Liang, W., ... & Chen, Z. H. (2023). Novel transcriptome networks are associated with adaptation of capsicum fruit development to a light-blocking glasshouse film. Frontiers in Plant Science, 14, 1280314.

Jayasuriya, N., Guo, Y., Hu, W., & Ghannoum, O. (2024). Image based Crop Monitoring Technologies in Protected Horticulture: A Review. ArXiv (Cornell University). https://doi.org/10.48550/arxiv.2401.13928

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Lin, T., Maier, C. R., Liang, W., Klause, N., He, J., Tissue, D. T., Lan, Y.-C., Subbu Sethuvenkatraman, Goldsworthy, M., & Chen, Z.-H. (2024). A light-blocking greenhouse film differentially impacts climate control energy use and capsicum production. Frontiers in Energy Research, 12. https://doi.org/10.3389/fenrg.2024.1360536

Maier, C. R., Chavan, S. G., Klause, N., Liang, W., Cazzonelli, C. I., Chen, Z. H., & Tissue, D. T. (2023). Light blocking film in a glasshouse impacts Capsicum annuum L. yield differentially across planting season. Frontiers in Plant Science, 14, 1277037.

Md Mazadul Islam, He, J., Yong, M., Babla, M., Liang, W., Li, L., Bose, J., Donovan-Mak, M., Huda, S., Tissue, D., Ahmed, T., & Chen, Z.-H. (2024). Reduced fertigation input sustains yield and physiological performance for improved economic returns and cleaner production of greenhouse eggplant. Scientia Horticulturae, 331, 113097–113097. https://doi.org/10.1016/j.scienta.2024.113097

Samaranayake, P. et al. (2023). Optimal Cooling Strategy for Energy Management Using Multi-Temperature Acquisition Points in a Protected Cropping Facility. In: Fukushige, S., Kobayashi, H., Yamasue, E., Hara, K. (eds) EcoDesign for Sustainable Products, Services and Social Systems I. Springer, Singapore. https://doi.org/10.1007/978-981-99-3818-6_33

Samaranayake, P. et al. (2023). Optimal Cooling Strategy for Energy Management Using Multi-Temperature Acquisition Points in a Protected Cropping Facility. In: Fukushige, S., Kobayashi, H., Yamasue, E., Hara, K. (eds) EcoDesign for Sustainable Products, Services and Social Systems I. Springer, Singapore. https://doi.org/10.1007/978-981-99-3818-6_33

Shrestha, S., & Pankaj Kumar Yadav. (2023). Comparative Analysis of Different Potassium Treatments on the Foliar Nutrient Composition of Hydroponically Grown Eggplant (Solanum melongena) in High-Tech Greenhouse. Research Square (Research Square). https://doi.org/10.21203/rs.3.rs-3640353/v1

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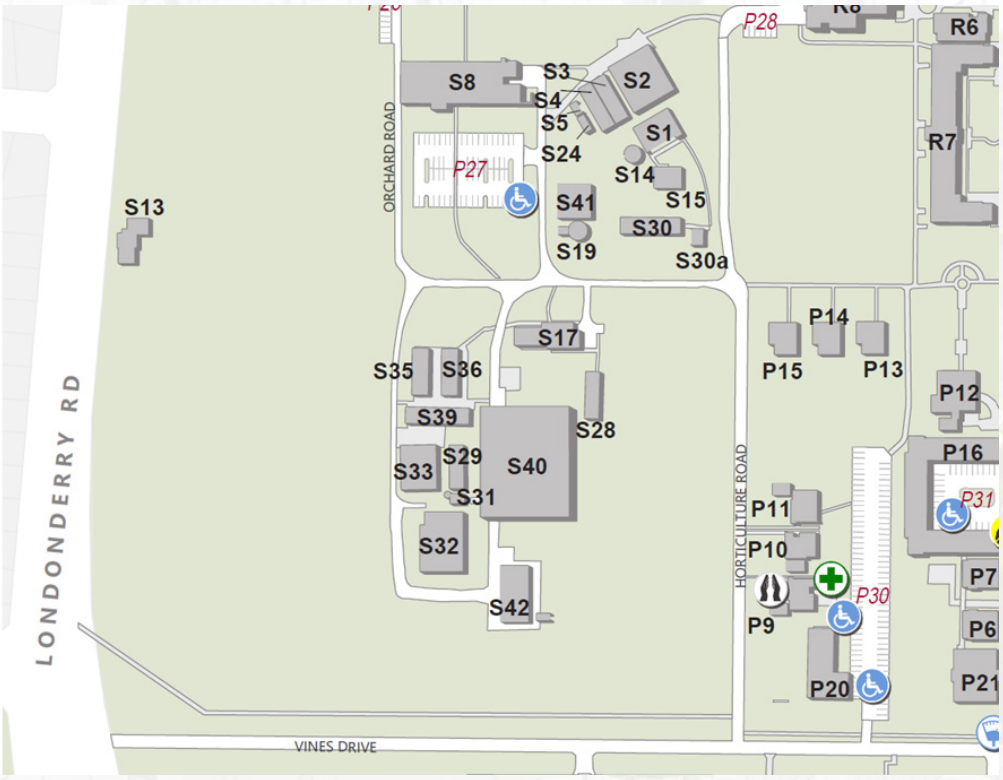

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