



VG16083: PROTECTED CROPPING – REVIEW OF RESEARCH AND IDENTIFICATION OF R&D GAPS FOR LEVIED VEGETABLES

FACILITATORS

Project VG16083 was completed by Colo Consulting.

INTRODUCTION

Australia has a modest but growing protected cropping industry, with estimates of vegetable production varying between 498 hectares and 1,300 hectares. Cucumber, zucchini, capsicum, eggplant, lettuce, Asian greens and herbs are among the vegetables produced in this environment, with tomatoes by far the most dominant crop. Soilless growing media is also dominating the sector.

At its most basic, protected cropping is the use of glass or polythene to improve conditions for the crop grown inside the structure, but the higher end of the sector includes the use of sophisticated equipment to help growers reliably meet high-volume contracts and quality measures.

ABOUT THE PROJECT

Focusing on four broad areas including productivity, technology, plant protection and environment, the project *Protected cropping – Review of research and identification of R&D gaps for levied vegetables* (VG16083) investigated the issues specific to protected cropping, current R&D in the sector, and the relevance of international R&D to the Australian industry.

MAJOR FINDINGS

Reviewing about 100 pieces of research, a clear gap emerged in relation to the very high solar radiation loads experienced in Australia in summer – it is often double that of Northern Hemisphere countries, where most of the international research is conducted. Given this, research is required to properly understand the effect of solar radiation loads on protected cropping systems. This should apply to low-tech, medium-tech and high-tech protective structures to be relevant.

Studies also have the potential to examine six key areas including light levels and conditions, root zone management, biostimulants, pollination, real-time monitoring of plant conditions, and biological suppression of root pathogens.

“Light quality has a huge impact on crop development as it will control things like leaf development, flower initiation and fruit set,” Project Lead Dr Kelvin Montagu said.

“To deliver improved farm productivity and profitability, the six research gaps need to be integrated.”

At the top end, the most relevant R&D areas exist in atmospheric manipulation, robotics and automation, and energy. Much of this knowledge will be imported, but it is vital to create linkages with existing Australian R&D projects – such as addressing the high radiation loads through smart glass technologies or supplementary lighting – to develop technology relevant to local conditions.

This includes Western Australia’s Edith Cowan University and

its advanced glazing system for solar energy harvesting and radiation control, while Swinburne University in Melbourne is leading project VG15038 – *Investigating novel glass technologies and photovoltaics in protected cropping*. This project will trial smart glass that can adjust light intensity and spectrum in addition to semi-transparent photovoltaic glass. This glass could simultaneously generate electricity and allow the rest of the light to pass through to the crop.

CONCLUSION

Australia has a reliance on international hydroponic and protected cropping literature, with the report revealing that Australia contributes a small amount of research – less than five per cent – to the protected cropping world literature.

“But what you really need, to access the 95 per cent that Australia doesn’t do, is a group of researchers that are well connected internationally and can bring in that knowledge and adapt it to local conditions,” Dr Montagu said.

A substantial body of Australian research exists, however the review recommended that it needs to be repackaged to be relevant for protected cropping through the levy-funded Soil Wealth/Integrated Crop Protection project, the National Vegetable Extension Network and VegPRO training pathways. This may require additional resources to develop technical extension materials.

Scope exists for further R&D in the use of LED lighting, promoting rhizobacteria in hydroponic systems, and the unique Australian issue of pollination due to a lack of bumble bees in the environment. Given the vast diversity and range of growing conditions in Australia, it was impractical to adopt a one-size-fits-all approach.

“The big opportunity lies not in one specific technology, but the integration of our understanding about everything from how the temperature of the root system impacts on fruiting through to how the light levels impact plant development,” Dr Montagu said.

“When you bring those things together, and monitor the plant and the environment and link them all together using crop models, then you really start to be able to optimise the environment and the management of the crop for productivity.”

Environmental impacts, such as water usage, greenhouse gas emissions and nutrient management, should also be reviewed as the industry matures.

ACKNOWLEDGEMENTS

This project is a strategic levy investment under the Hort Innovation Vegetable Fund.

VG16083 was funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.