

AGRI-ROBOTICS: THE FUTURE OF FARMING?

Research at the University of Lincoln has created insights on the use of robotics in harvesting and the implications for the future of agricultural workforces that have ramifications for policy decisions in the UK and in the European Union.

University of Lincoln research has:

- Demonstrated that robotics can be used effectively to identify and locate harvest-ready commercial crops, saving time and ensuring both quality and sustainability
- When integrated with human workers, shown that robotic platforms can reduce labour costs by up to 30% in the labour-intensive soft fruit sector
- Developed frameworks to help build understanding of the socio-economic factors affecting the workforce in the new agri-robotics operational paradigm



The global agri-food sector is facing unprecedented challenges. The needs of growing populations demand more intensified food production. Climate change calls for more sustainable farming methods. And, in the UK and elsewhere, there are serious shortfalls in agricultural labour, caused by Brexit, the global Covid-19 pandemic and more. Whilst there is no single panacea, agricultural robotics and autonomous systems provide vital and emerging opportunities to transform the future of farming.

Through dedicated institutes, the University of Lincoln leads large-scale research projects, bringing together sector-leading experts – in robotics, food manufacturing, artificial intelligence, environmental sustainability and more – and attracting funding of £18.9million since 2016. The research addresses key challenges including the integration of robotic technologies into complex agricultural systems, understanding the impacts on agricultural workforces, and the deployment of novel platforms to harvest crops, measure and react to biological diversity.

CROP HARVESTING

Crop harvesting has historically been a heavily manual process, but the traditional labour market is under threat. Researchers at Lincoln have explored how the use of robotics can help to combat this likely loss of labour and at the same time enhance sustainability and productivity for both broccoli and berry harvesting.

The **3D vision system for the robotic harvesting of broccoli** uses low cost sensors to detect both the size and location of broccoli heads in the field, generating a map that determine which heads are ready to harvest. Results confirm that low-cost 3D cameras can be used for high speed and robust image recognition in commercial crops in different farming conditions.

RASberry – Robotics and Autonomous Systems for Berry Production – consists of a dedicated fleet of mobile platforms that work intelligently alongside human workers, navigating safely around them. By anticipating the needs of the workers – such as transporting full trays of picked fruit and supplying pickers with empty ones – the RASberry system can reduce labour costs by up to 30%. At the same time, the use of smaller robotic systems reduces the field area needed for larger vehicles.

The UK fresh produce sector is work £1.6 billion annually, employing c20,000 permanent workers and nearly 70,000 seasonal ones. How can the sector evolve and adapt to changing demands and circumstances? Lincoln research is showing the way.

WORKFORCE INNOVATION

The use of robotics and artificial intelligence in agriculture brings significant benefits, but at the same time demands that farmers change their ways of working. Lincoln research has looked in detail at how robotics systems might be scaled across the agricultural sector and at the implications this brings to the workforce.

A crucial step in this transition is to understand the new agricultural robotic ecosystem and associated economic, ethical, legislative and social impacts. Lincoln research has created new models and frameworks, outlining the conditions, constraints and relationships between labour and technology input, that have contributed to the understanding of the new operational paradigm for agri-robotics.

POLICY RELEVANCE

Lincoln researchers advised the DEFRA/ BEIS Food Sector Council Agricultural Productivity Working Group, raising the profile and increasing understanding of robotics in the sector and informing the [DEFRA Future for Farming Report 2020 and the new UK Farming Transformation Fund](#). Alongside the National Farmers Union and Innovate UK Agri-EPI centre, researchers at Lincoln contributed to the [Accelerated Automation initiative](#), exploring ways to develop and scale emerging robotic technologies to mitigate serious short-and long-term shortfalls in farm labour. Lincoln research has also been cited in research commissioned by the [European Union AGRI Committee](#), underpinning understanding of the challenges facing the future farming workforce.

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