

<b>Institution: Royal Agricultural University</b>		
<b>Unit of Assessment: Panel 6 Agriculture, food and veterinary sciences</b>		
<b>Title of case study:</b> Entrepreneurship and innovation research impacts agriculture and the rural economy.		
<b>Period when the underpinning research was undertaken: 2013-2020</b>		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Louise Manning	Director of Knowledge Exchange and Professor of Food Supply	2009-2016; 2019 to date.
Inge Hill	Senior Lecturer in Business Strategy. RAU NICRE lead Elizabeth Creek Chair in Rural Policy and Strategy	July 2020 to date full-time (before part-time, since 2019)
Tom MacMillan	Professor of Production of Animal Health and Welfare	2018 to date
David Main	Head of Innovation/Research Support	2018 to date
Lisa Williams van Dijk		2018 to date
<b>Period when the claimed impact occurred:</b> 2013-2021		
<b>Is this case study continued from a case study submitted in 2014? Y/N No</b>		
<b>1. Summary of the impact</b> (indicative maximum 100 words)		
<p>This case study relates to the application of entrepreneurship and innovation research within the agricultural sector, with specific emphasis on the adoption of technology, driving social impact and implementing new methods of farming and land management practice. This research was a catalyst for the development centres of innovation translation and enterprise, including Farm491, the UK's leading agri-technology incubator and accelerator. Since its opening in 2016, Farm491 has directly supported more than 190 businesses, and helped to create 111 new jobs among its members and supported them in raising over £32.8 million in funding to bring innovation to commercialisation. The case study includes examples of local, national and international socio-economic impact.</p>		
<b>2. Underpinning research</b> (indicative maximum 500 words)		
<p>The underpinning research for this case study identified how to nurture the ideation, productization and commercialisation of new ideas and technologies alongside talent development in agriculture and the rural economy. Using the new knowledge, the RAU established the Rural Innovation Centre (RIC) in 2015 for innovation translation, Farm491 in 2016 as an agri-technology incubator and accelerator, and became a partner in the Research England-funded <i>National Innovation Centre for Rural Enterprise</i> (NICRE). Since 2015, there has been a synergetic relationship involving RAU research-focussed staff, students and these centres.</p> <p>The underpinning research has three strands- 1) ecopreneurial education; 2) removal of barriers to innovation, and, 3) artisan and farmer entrepreneurial collaborations.</p> <p>The first strand [1,4] sought to understand how ecopreneurial education could be harnessed to develop enterprise and innovation within the land-based sector. This pedagogic research identified the methods and tools that could be employed within the curriculum of a land-based university to train the ecopreneur of the future.</p>		

Entrepreneurship and particularly ecopreneurship are essential to drive the sustainable transitions needed in agriculture, the rural economy and wider food supply chains, to meet the challenges of climate change, ecological degradation and the human health crisis. One impact of this research has been an exceptional track-record of 578 RAU student enterprise participants and 91 start-ups.

The second strand researched barriers to the diffusion of innovation and technology adoption [2,3] – essential to deliver effective change in developed and emergent economies. The RAU has been undertaking research in this area since 2012 through the *Knowledge Exchange and Diffusion of Innovation* model (KEDI) which demonstrates how an innovation ecosystem can promote self-development and ideation, and group and network dynamics, in order to develop ideas and enable scale-up and commercialisation. It was this research that led directly to the establishment of these new centres at the RAU, where research academics, as well as students at every level, can work with innovators, in a seamless campus or ‘living-land-lab’. While found in other industries, this approach is rare in the context of agriculture and the rural economy. Central to this ecopreneurial innovation and the drive for sustainable development is the combination of real-life environments, relevant activities, and multi-actor engagement. To overcome barriers to uptake of innovation, research academics carried out work on farmer-led innovation through multi actor-innovation networks [7].

The third strand researched artisan and farmer entrepreneurial and welfare collaborations and how these could be applied to the land-based sector [5, 6]. We were part of a global project that examined, using the ideas behind social and natural capital, how collaborative social groups (a key element of the KEDI model) could significantly influence sustainability and deliver individual and public benefits, improve well-being and natural capital, and provide platforms for wider progress towards sustainability.

*Our ongoing research examines evolving models of entrepreneurial universities as anchor institutions that can generate within the agricultural sector new forms of knowledge, problem-solving skills and types of learner opportunities. This provides a catalyst for driving widening participation and diversity in the agricultural industry through supporting students, fledgling entrepreneurs or industry specialists who can nurture talent. As a body of knowledge our research has created new and innovative networks for driving entrepreneurship and innovation in the agricultural sector.*

### 3. References to the research (indicative maximum of six references)

- [1] Manning, L., Smith, R., Conley, G., and Halsey, L. (2020). Ecopreneurial education and support: developing the innovators of today and tomorrow. *Sustainability*, 12(21), 9228. <https://doi.org/10.3390/su12219228>
- [2] Manning, L., (2013) A knowledge exchange and diffusion of innovation (KEDI) model for primary production, *British Food Journal*, 115(4), 614-631 <https://doi.org/10.1108/00070701311317883>
- [3] Adenle, A.A., Manning, L. and Azadi, H. (2017), Agribusiness innovation: A pathway to sustainable economic growth in Africa, *Trends in Food Science and Technology*, 59, 88-104 <https://doi.org/10.1016/j.tifs.2016.11.008>(researched and written when Dr Manning was at RAU)
- [4] Smith, R. Conley, G. Manning, L (2020). “Documenting the role of UK Agricultural Colleges in propagating the ‘farming-dyslexia-entrepreneurship nexus’”, in Pavey, B., Alexander-Passe, N. and Meehan, M. (Eds) *Entrepreneurship, Dyslexia and Education*, Abingdon, Routledge.
- [5] Hill I.R. (2021), Spotlight on UK artisan entrepreneurs' situated collaborations: through the lens of entrepreneurial capitals and their conversion, *International Journal of Entrepreneurial Behavior & Research*, Vol. 27 No. 1, pp. 99-121, <https://doi.org/10.1108/IJEBR-11-2019-0642>
- [6] Pretty, J., Attwood, S., Bawden, R., Van den Berg, H., Bharucha, Z., Dixon, J., MacMillan, T, ...Yang, P. (2020). Assessment of the growth in social groups for sustainable agriculture and land management. *Global Sustainability*, 3, E23. <https://doi.org/doi:10.1017/sus.2020.19>
- [7] Bard, Alison M., Main, D., Roe, E. Hasse, A. Whay, H.R. and Reyner, K.K. To change or not to change? (2019) Veterinarian and farmer perceptions of relational factors influencing the enactment of veterinary advice on dairy farms in the United Kingdom, *Journal of Dairy Science*, Volume 102, Issue 11, 10379 – 10394, <https://doi.org/10.3168/jds.2019-16364>.

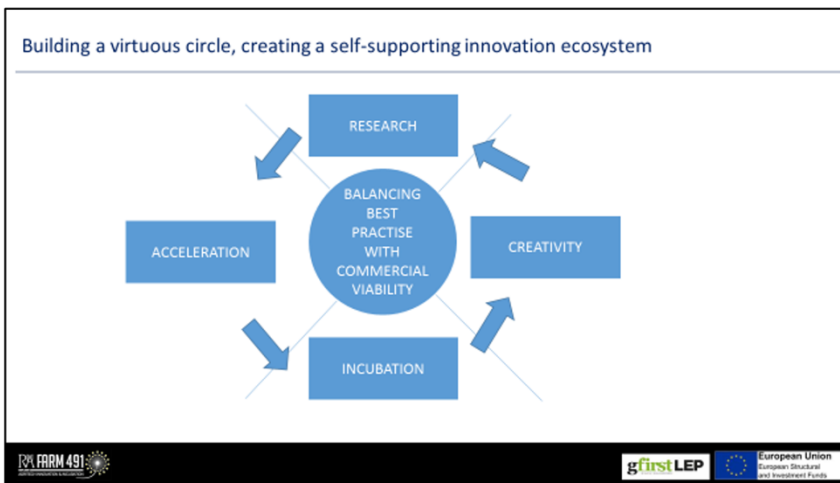
#### 4. Details of the impact (indicative maximum 750 words)

##### ***Incubator business development and diffusion of innovation***

Through our research in *Knowledge Exchange and Diffusion of Innovation* (KEDI) the university was able to secure significant funding through [GFirstLEP](#) [1] the EU ERDF and the John Oldacre Trust for a series of initiatives to support the development of innovation in the land-based sector. In 2015, the Rural Innovation Centre was established at Harnhill Farm, including five studio-workshops for incubator start-ups. Examples of now successful companies that started in these workshops include:

- [Multibox](#) – used the space to create a prototype insect farm in order to develop best practice and how the technology could be scaled to deliver a stepchange in the novel protein sector.
- [CopperNose](#) – company started by an RAU alumnus to produce beef jerky.
- [MagGrow](#) – this [award-winning](#) company developed magnets to reduce spray drift in pesticide and fertiliser application [2].
- [Soil Fixer](#) – promotes the use of bio-char in agriculture.

This was followed by the construction of the £4.2m Alliston Centre on the University Campus, which houses the [Cirencester Growth Hub](#) and [Farm 491](#), funded by the RAU and GFirstLEP. The Growth Hub focusses around local rural businesses, and since opening in July 2018, it has directly supported more than 250 local businesses and is providing professional workspace to 36 SMEs.



*Farm491 innovation ecosystem, based around the [Knowledge Exchange and Diffusion of Innovation model \(KEDI\)](#) (Source [Farm491 Interim Project Evaluation Report](#))*

Farm491 also occupies the Alliston Centre and is the leading UK-based Agri-tech incubator [3]. Opened in July 2017, it is highly successful in facilitating inter-business

exchange relationships through a unique set of 1-2-1 support, peer networking and expert workshops, enabling businesses to gain from the facilitated ideas exchange. Today, Farm491 supports 70 active members with a total of 192 companies having received support throughout the project from the start in 2016 to date. Farm491 has helped establish four grant funded research collaborations in the last three years, created new employment opportunities and enabled members to bring their ideas to the market and raise a total of £32.8 million in funding.

Embedded within this purpose is the [mission of Farm491](#) in the delivery of the European Regional Development Fund (ERDF) co-funded “Inspiring Agri-tech Innovation” (IAI) programme [4]. Farm491 and RAU academics worked with GFirstLEP on the [Gloucestershire Agri-food and Rural Economy](#) Report, which resulted in advanced agri-technology being embedded into the draft [Gloucestershire Local Industrial Strategy](#) (2019, 46-50).

Farm491 has been active in hosting official delegations and outreach events that embrace agri-tech innovations. These have included:

- Liuzhou City Government Delegation (Guangxi Province, September 2019) to view agri-tech innovation
- New Zealand agri-tech mission (September 2019)
- Foreign, Commonwealth and Development Office-sponsored inward investment delegation visit from Kuwait in February 2020 with a specific focus on food security, with a follow-up on conference on food security [5]

- Hosting webinars with the Embassy of the Kingdom of the Netherlands on [Climate Smart Agriculture](#) and [Animal Welfare](#).

Building on research on farmer led-innovation we established the Farmer-Led Innovation Network (FLIN) to understand, learn from and 'power up' farmer-led research and innovation initiatives.

#### ***Innovation in the rural economy.***

As a result of our research into entrepreneurial collaborations and collaborative social groups, we are a founder member of the [National Innovation Centre for Rural Enterprise](#), established in 2020. NICRE champions innovation and enterprise in rural areas, fostering resilient and sustainable communities and removing barriers to rural productivity. As part of a consortium of four universities, together we have been able to achieve greater leverage, and to place land-based education and enterprise at the core of the initiative. Through our research on innovation we have been able to directly influence government policy, contributing via Farm491 to the development of UKRI's pioneering [Series A investor partnership for SMEs](#), and informing DEFRA's [Farming Innovation Pathways](#) competition [6].

#### ***Student enterprise***

Our research into enterprise, entrepreneurship and diffusion of innovation has driven institutional impact in the land-based sector. Our student-focused [Enterprise and Entrepreneurship Programme](#), resulted in the RAU being named an Institute of Enterprise and Entrepreneurs "Centre of Excellence" in 2019, and in 2020 being shortlisted as "outstanding entrepreneurial university of the year"[7]. The RAU currently has two student focused social enterprise projects: [Cotswold Hills Wine](#) and [Muddy Wellies Ale](#) [8]. These provide students with the opportunity to develop their enterprise and entrepreneurial skills, whilst proceeds go into a First Steps fund to support students to start their own businesses [9]. Of the 148 applications since 2013, the Enterprise Programme has funded 97 to develop their concept further and 69 innovators have launched their businesses after leaving the university. The RAU's student business planning competition "The Grand Idea" has had 13 entrepreneurial winners to date (8 women and 5 men), 10 of whom are heading up businesses today.

*This impact case study collectively shows how the University has developed its research outputs to focus on the development of innovation ecosystems that drive commercialisation of innovation to support transition to sustainable agriculture using agri-technology at both the local and global scale. These initiatives have a global reach in promoting agri-tech solutions and sustainable food production.*

#### **5. Sources to corroborate the impact** (indicative maximum of 10 references)

[1] The research undertaken at the RAU directly influenced the [Gfirst LEP Strategic Economic Plan](#) for Gloucestershire March 2014, establishing 'Growth Hubs' around University campuses in the county (p. 46-51). In the SEP 2.0 (2018), seven key investments were listed with £101,696m of inward government investment, two of which were linked to the RAU – the establishment of new [Growth Hubs](#), and the creation of Farm491 on the Cirencester Campus and at Harnhill through a £2.92m [funding package](#). Subsequent investment of £1m in 2018 at Hartpury University's "Tech to Plate" facility complemented Farm491 as a technology application and training centre. Investment in Farm491 was seen 'as a nationally important centre for agri-tech'. A further £550k was awarded to the RAU by the [European Structural and Investment Fund](#) (p. 39) to 'deliver a bespoke programme of research and innovation programme of outreach and support activities for local existing and start-up agri-tech businesses and those seeking to diversify into agri-tech' (p.39) The draft [Gloucestershire Local Industrial Strategy](#) recognises agri-tech at the heart of innovation, 'utilising agri-tech to create a healthy circular economy in food and farming that is good for the planet builds natural capital and will reduce food-related illness, making Gloucestershire the first in the world to do so (p. 7). The CEO of GFirstLEP, wrote (letter 01/03/2021) 'Farm491 has enabled the creation of a vibrant innovation ecosystem which sits at the heart of Gloucestershire's aspiration to take a leading role in the promotion of advanced agri-technology that drives inward investment and prosperity in the county. Agri-technology sits at the heart of our local industrial strategy, and Farm491 plays a pivotal role.'

[2] Maggrow is a strong example of how a small Irish company has in three years achieved exponential growth. In July 2018, Maggrow based its crop science team in new workshops at Harnhill and joined Farm491. By 2020, the firm had spent €10m on the science behind magnet-controlled spraying and secured a [further €7m](#) of investment. It is now an international company, with trade awards from UK, Ireland, California and New Zealand.

[3] [Farm491](#) was conceived in 2016 and moved into the Alliston Centre in 2018. In the four years, it has gained a membership of 135 companies and with inward investment of £32.8m and employed 111 new staff, or 303 including the founders; for a list of [current members](#). (Source: Farm491 Interim Project Evaluation Report).

[4] A further 57 companies have been supported through the ERDF project 'Inspiring Agri-tech Innovation'. (Source: Farm491 Evaluation Report 2021). In the evolving GFirst LEP Local Industrial Strategy, the success of Farm 491 has been an important element in the inclusion of agri-tech, as one of key element of the industrial strategy. One example of success from the IAI programme is [Breedr](#), a precision livestock app, whose founders attended the first workshop in 2018, and have now raised £6m and have hired 35 employees and commented 'Farm491 had been a key part of supporting the business through the founding phase which led to the raise of £2m in Jan 2019. We see them as a key part of the future of Agritech in the UK and look forward to continuing to work together'.

[5] An example of this activity was the [Kuwait Science Inward Visit](#) to the UK, organised by the FCDO. Farm491 / RAU was chosen to represent the UK's leading centre for agri-tech and sustainable agriculture. This has been followed up by presentations at Research Round Table Workshop in March 2021.

[6] Letter from DEFRA to Professor Tom Macmillan dated 11/02/2021. 'We are very grateful for all your input into the design of the R&D Innovation package already, and we have drawn on these valuable insights again in the process of shaping the Farming Innovation Pathways competition.'

[7] The published feedback report of the IoEE (2019), noted, 'There is strong evidence of an enterprise eco-system ... mapping the core elements of the ecosystem and creating a clear pathway for students engaging in their entrepreneurial journey. This is fully supported by the close links to the LEP, Growth Hub and a variety of other external stakeholders. RAU is committed to embedding enterprise education across the university and indeed many of the staff involved in the visit were business owners themselves or have been involved in the running of an SME.'

[8] Muddy Wellies Ale is sold in 40 independent shops plus 3 Gloucestershire Waitrose stores while Cotswold Hills Wine is in 130 outlets across Southern England, including 87 Mid-Countries Co-Op stores. Both brands have won a series of awards. The social enterprise has voluntary student teams who have access to all areas of the project from pruning the vines to sales, marketing and new product development. In addition, the social enterprises are used as live business case studies in a number of taught modules.

[9] Two examples are [Pre-O](#), designed to help farmers achieve a higher price for their pre-organic produce and Vermtek Pest Control. [Vermtek](#) is now a national pest control business, with clients Airbus UK, CBRE, HMP, MOD, the NHS and Serco. One of the judges of the competition commented 'The RAU has enterprise and entrepreneurship in its DNA. I've been inspired and privileged to watch that characteristic bloom in its students. Some of the most exciting ideas I've seen recently have come in disciplines like agri-tech and food security, areas where so many of today's graduates will go on to benefit society.'