Yunru Chloe Lai

Soil and Crop Modeller

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Academic Qualifications

2015–2021 **Ph.D. in Agricultural Science**, *The University of Queensland*, Australia.

2011–2014 **Bachelor of Environmental Management, Sustainable Development**, *The University of Queensland*, Australia, *GPA: 6.46/7*, First Class Honours *Grade: 7*.

Ph.D. Thesis

Title *Using within-field variability to assess the impact of soil sodicity on wheat yield in the northern grains-growing region of Australia*

Supervisors Dr. Yash Dang, Dr. Matthew Pringle, Prof. Neal Menzies & Prof. Peter Kopittke

Hons Thesis

Title *An integrated catchment-based approach to analyse the effects of land cover change on surface runoff using remote sensing and GIS*

Supervisor Prof. Stuart Phinn

Awards and Recognition

2024 Early Career Researcher Seed Grant, University of Southern Queensland

2023 Early Career Researcher Program, University of Southern Queensland

2022 Silver overall in International Soil Judging Competition, World Congress of Soil Science 2022, as a member of the Australian team

2022 Postgraduate award for excellence in soil science, Queensland Branch of Soil Science Australia

2021 Finalist of the Brian Chambers international award for early career researchers in crop nutrition, International Fertiliser Society

2021 Finalist of Cooperative Research Australia Early Career Research Competition, Collaborate Innovate 2021 Conference, *Return flights, accommodation and attendance valued at $3,000.*

2021 Winner (1st) of Individual Australian Soil Judging Competition, Joint Australian and New Zealand Soils Conference—Soils, investing in our future

2021 Capacity building grant, University of Southern Queensland

2019–Present Postdoctoral Fellowship, University of Southern Queensland, Australia

2017 Overall winner of the 2017 3-Minute Thesis at School of Agriculture and Food Sciences, The University of Queensland

2015–2019 Research Scholarship for Ph.D., Grains Research & Development Corporation (GRDC)

2011–2014 Dean's Commendation for Academic Excellence and for High Achievement

2012 Summer Research Scholarship, The University of Queensland

2006–2009 Singapore Ministry of Education Tuition and Stipend Scholarship

Technical & Language Skills

intermediate HTML, C#, Linux, DSSAT

Advanced APSIM, R, Git, LaTeX, Markdown, RShiny, ArcGIS, QGIS, ERDAS IMAGINE, ENVI, Microsoft Windows

Languages

Mandarin **Mothertongue**

English **Proficient** *IELTS scores 8.5: Listening 9, Reading 9, Writing 8, Speaking 7*

Experience

Academic & Research

2023–Present **Research Fellow (Soil and Crop Modelling)**, *Centre for Sustainable Agricultural Systems, University of Southern Queensland*, Toowoomba.

- Course coordinator and lecturer for AGR3304 Soil Science
  - Major course update with new teaching materials and assessment items developed
  - Improved student satisfaction from 3/5 to 4/5 in end of semester survey compared to previous offerings
- Data-driven soil constraint diagnosis and management decision-support tool development

2019–2022 **Postdoctoral Research Fellow (Soil and Crop Modelling)**, *Centre for Sustainable Agricultural Systems, University of Southern Queensland*, Toowoomba.

- identified key soil constraints priorities that need to be represented in existing decision support systems (DSS) through targeted workshops with grower groups
- improved scientific understanding in key processes in soil-plant relations
- incorporated the mechanistic and/or empirical understanding of such processes into DSS with relevant codes and module files developed. This includes:
  - linked lab-measured phosphorus values to conceptual pool of labile phosphorus in APSIM Classic
  - enabled nitrogen volatilisation in APSIM Next Generation
  - modelled the effects of water repellency on crop yield in sandy soils in Western Australia using WEIRDO in APSIM Next Generation
  - updated the Gypsy software from a Windows-based program to a web-based tool with major improvements on its functionalities
- conducted a scoping study for the development of a spatially explicit digital platform for the sugar industry to enable farm management optimisation to improve productivity and profitability while ensuring environmental sustainability.

2022 **Tutor**, *AGR2303 Agronomy, University of Southern Queensland*.

key tasks include:

- delivery of tutorials targeted on APSIM training;
- monitoring and moderating online discussion forum;
- updating tutorial simulations from APSIM classic to Next Gen.

2022 **Tutor**, *AGR3304 Soil Science, University of Southern Queensland*.

key tasks include:

- delivery of workshops to enhance students' understanding on lecture topics through facilitated discussions and exercises;
- monitoring and moderating online discussion forum.

2020 **Discussion Forum Moderator**, *AGR3304 Soil Science, University of Southern Queensland*.

Actively prompting indepth thinking and discussion by students on key themes in soil science and agricultural science through:

- affirming instances of information evaluation, synthesis and conceptualisation
- providing alternative perspectives to encourage systems thinking on wicked problems
- challenging their assumptions in discussion threads

2017–2019 **Casual Academic (Practical Demonstrator)**, *School of Agriculture and Food Sciences, The University of Queensland*.

- Assisted in the preparation for experiments and guided students to the successful completion of relevant laboratory and glass house experiments required for course LAND3005—Soil Plant Relationships.
- As a student ambassador in various events including Open Day, Experience Science, Future Experiences in Agriculture, Science and Technology (FEAST), Sunflower competition, and the University Network for Tropical Agriculture (UNTA) meeting
  - helped to ensure international senior academics an enjoyable visit to UQ
  - provided relevant advice and information to current and prospective students
  - promoted agriculture and soil sciences, and the vibrant university life and culture

2017–2019 **Agricultural Science and Environmental Management Tutor**, *Emmanuel College, The University of Queensland*.

- Designed program-focused tutorials rather than course-focused tutorials to:
  - provide advices and feedbacks to students on their courses and assessments
  - challenge and extend their understanding of the fields of study by linking course contents to current discussions and movements in literature and in relevant industries
- Adopted an integrated approach to:
  - demonstrate course relevance within the program structure
  - highlight practical skills in professional environment

2013 **Research Intern**, *Strategic Tillage Project, Department of Environment and Sciences & Department of Agriculture, Fisheries and Forestry*, Toowoomba.

14-week industrial placement on the impact of different tillage practices on arbuscular mycorrhizal fungal colonization and root lesion nematodes in Queensland, Australia

- actively involved in scientific research and activities such as field day
- produced quality report, diagrams and charts for the project
- acquired practical skills including soil and plant sampling, soil science and biological laboratory techniques, data management and analysis using Excel and GenStat

2012–2013 **Research Intern**, *School of Earth and Environmental Sciences, The University of Queensland*.

8-week research scholarship on Transit-Oriented Development in Footscray, Victoria

- transcribed interviews
- produced quality research report

Public Service & Volunteer

2022–Present **Founding president**, *Agriculture and Environment Society, University of Southern Queensland*, Toowoomba.

UniSQ Coach for the Soil Judging Competition at 10th Australian Soil Judging Competition in Ballarat, Victoria in 2022

2013 **Youth Energy Squad Project**, *Centre for Education and Training in Renewable Energy, Energy Efficiency and Green Technology (CETREE& GT), Universiti Sains Malaysia*, Malaysia.

6-week community development program

- organized Science Camps in different Malaysian states to educate secondary students on renewable energies and green technologies and to raise their environmental awareness
- conducted and facilitated workshops and interactive classes to youths, focusing on students from schools, colleges and universities
- participated in local university's activities and took part in and facilitated integration activities and cultural-sharing events

2008 **Yunnan Overseas Community Outreach Program**, *Temasek Junior College*, Singapore.

Leadership development program to encourage youth activism and appreciation for diversity

- underwent rigorous training in service learning through regular meetings and workshops
- organised year-long fund-raising activities for a financially challenged village school in Yunnan China
- planned and executed a 14-day expedition based on the needs of the overseas beneficiary, including tree-planting, student engagement activities and physical work in playground-building

Achievement

- Built a playground and bought desks and chairs for a local primary school with fund raised.

Research Grants

Principal investigator

2023–2025 **Knowledge-guided machine-learning optimisation of soil constraint management**, *CRC for High Performance Soils*, Partners: University of Southern Queensland, Burdekin Productivity Services, West Midlands Group, Riverine Plains Inc., Mallee Sustainable Farming, **$300,000**.

2023–2023 **Pipeline for quantification of climate risk on crop productivity of dominant soil types in Queensland, under future climate change scenarios**, *The Earth Observation Hub, SmartSat CRC Queensland Earth Observation Node: Mobility Scheme*, Secondment to NGIS, **$54,900**.

2021–2022 **A conceptual framework for the modelling of sodicity constraints to crops**, *University of Southern Queensland*, Capacity building grant, **$14,731.35**.

Chief investigator

2023–2028 **Evaluating novel approaches for drought resilience through capitalizing on an established network of long-term trials**, *Future Drought Fund*, CRC for High Performance Soils led consortium, **$3,935,493**.

2021–2023 **Diagnosis frameworks for multiple and complex soil constraints**, *CRC for High Performance Soils*, Partners: University of Southern Queensland, Birchip Cropping Group, Burdekin Productivity Services, West Midlands Group, Riverine Plains Inc., **$295,850.00**.

2021–2022 **Scoping studies for an integrative digital platform for sustainable sugarcane crop management**, *Sugar Research Australia*, **$47,420.00**.
8-week scoping study.

PhD Supervision

2023 **Understanding impacts of microplastics on soil structure and composition, and plant performance**, University of Southern Queensland, *Student:* Yoonjung Seo, *Supervisors:* Pingan Song, Guangnan Chen, **Yunru Lai**

2021 **Modelling and diagnosis of multiple soil constraints across Australian farming systems**, University of Southern Queensland, *Student:* Suman Gajurel, *Supervisors:* Keith Pembleton, Craig Lobsey, **Yunru Lai**

Publications

Peer-reviewed academic journal articles

Gajurel, S., **Lai, Y.R.**, Lobsey, C., & Pembleton, K. G. 2024. A cost-effective approach to estimate plant available water capacity. *Geoderma*, 442, 116794. doi: 10.1016/j.geoderma.2024.116794.

Lai, Y.R., Orton, T. G., Pringle, M. J., Menzies, N. W., & Dang, Y. P. 2020. Increment averaged kriging: a comparison with depth-harmonized mapping of soil exchangeable sodium percentage in a cropping region of eastern Australia. *Geoderma*, 363, 114151. doi: 10.1016/j.geoderma.2019.114151.

Lai, Y.R., Pringle, M.J., Kopittke, P.M., Menzies, N.W., Orton, T.G., & Dang, Y.P., 2018. An empirical model for prediction of wheat yield, using time-integrated Landsat NDVI. *International Journal of Applied Earth Observation and Geoinformation*, 72, 99–108. doi:10.1016/j.jag.2018.07.013.

Dang, Y.P., Balzer, A., Crawford, M., Rincon-Florez, V., Liu, H., Melland, A.R., Antille, D., Kodur, S., Bell, M.J., Whish, J.P.M., **Lai, Y.**, Seymour, N., Carvalhais, L.C., Schenk, P., 2018. Strategic tillage in conservation agricultural systems of north-eastern Australia: why, where, when and how? *Environmental Science and Pollution Research*, 25 (2), 1000–1015. doi: 10.1007/s11356-017-8937-1.

Industry publications

Lai, Y.R. (Lai, C), Pembleton K.G., Robinson N.J., Clarendon S.D.V., van Zwieten, L., Ojeda J.J, & Horton B.J., 2022. Improving the representation of soil productivity/constraints in existing decision support systems and modelling platforms [Project 4.3.002]. *Cooperative Research Centre for High Performance Soils*.

Academic presentations

Conferences

Oral presentations

Lai, Y.R., Ojeda, J.J., & Pembleton, K.G., 2021. *Simulating nitrogen loss due to ammonia volatilisation after urea fertiliser application in APSIM.* 22nd World Congress of Soil Science—Crossing boundaries, changing society, Glasgow, UK, 31 July–5 August 2022.

Lai, Y.R., Pringle, M.J., Orton, T.G., Kopittke, P.M., Menzies, N.W., & Dang, Y.P., 2021. *Quantifying wheat yield losses due to soil sodicity under different climate conditions in north-eastern Australia.* Joint Australian and New Zealand Soils Conference—Soils, investing in our future. Cairns, Queensland, Australia, 27 June–2 July. **Soil Science Australia Bursary $500.**

Lai, Y.R., 2016. *Using multi-year remote sensing to assess impact of soil sodicity on wheat yield.* Joint Australian and New Zealand Soils Conference—Soil, a Balancing Act Downunder. Queenstown, New Zealand, 12–16 December.

Poster presentations

Lai, Y.R., Ojeda, J.J., Wang, E., Clarendon, S., Bennett, JML, van Zwieten, L., & Pembleton, K.G., 2021. *Better quantification of plant-available phosphorus in the landscape through inverse-modelling.* 2021 IFS Agronomic Conference: Updating Evidence-Based Management of Crop Nutrition, Robinson College, Cambridge, UK, 9–10 December. **Finalist poster for the Brian Chambers Award.**

Lai, Y.R., Pringle, M.J., Orton, T.G., Kopittke, P.M., Menzies, N.W., & Dang, Y.P., 2019. *Quantifying forfeited wheat yield due to soil sodicity in the northern grain-growing region of Australia.* International Tropical Agriculture Conference, Brisbane, Australia, 11–13 November.

Lai, Y.R., Pringle, M.J., Orton, T.G., Kopittke, P.M., Menzies, N.W., & Dang, Y.P., 2018. *Quantifying forfeited wheat yield due to soil sodicity in high, moderate and low rainfall conditions in the northern grains region of Australia.* World Congress of Soil Sciences, Rio de Janeiro, Brazil, 12–17 August. **UQ Postgraduate Travel Award $2,500.**

Lai, Y.R., 2017. *An empirical model for wheat yield estimation using integrated NDVI Landsat imagery.* International Tropical Agriculture Conference, Brisbane, Australia, 20–22 November.

Invited talks & panels

Invited speaker

Pembleton, K.G., **Lai, Y.R.**, 2023. *Digital tool development for soil constraint management—where are we up to and where to next?* Soil CRC Participants Conference, Launceston, Tasmania, 29–31 August.

Invited speaker

Lai, Y.R., 2023. *Soil constraint management digital tool development.* APEC Workshop on Digital Agriculture Cooperation for Ensuring Food Security, Beijing, China, 24–25 July.

Invited speaker

Lai, Y.R., 2022. *Linking measurable and conceptual phosphorus pools assists APSIM initialisation.* APEC Virtual Workshop on Agricultural Technological Cooperation for Improving Green Agriculture and Food Productivity, Beijing, China, 24–25 November.

Panel

Industry-Research Collaboration in 2051: Voices from the future. Collaborate Innovate Conference Part 2, Canberra, Australia, 1 April, 2022.

Webinar

Pembleton, K.G. & **Lai, Y.R.**, 2020. *Enhancing the representation of soil constraints in decision support systems to facilitate integrated soil management.* Soil CRC Webinar Series, Toowoomba, Queensland, Australia, 10 September.

Fully funded speaker

Lai, Y.R., 2019. *Three-dimensional mapping of soil sodicity: a case study of northern grains-growing region of Australia.* APEC Workshop on Science and Technology Innovation and Cooperation for Sustainable and Inclusive Agricultural Development, Beijing, China, 24–25 July.

Lai, Y.R., 2018. *Wheat yield modelling using time-integrated NDVI.* APEC Workshop on Greater Cooperation on Scientific and Technological Innovation for Higher Added Value in Food Production Chain, Beijing, China, 18–19 October.

Professional Affiliations

2015–Present

Member of Soil Science Australia and the International Union of Soil Science
Actively participated in activities such as soil judging competition and World Science Festival Brisbane and Toowoomba.

2022–Present **Founder and president of Agriculture and Environment Society**, University of Southern Queensland

2017–2019 **Member of Environment Institute of Australia and New Zealand Inc.**

2018–2019 **Secretary of SAFS Researchers Society**, The University of Queensland
Responsibilities
- organised the 2019 writing and oral presentation workshop with other members of the committee
- organised the 2018 end-of-year celebration
- ensured effective organization of meetings and minute-taking
- maintained effective record-keeping and administration

Referees

Prof. Keith Pembleton **Professor (Plant Agricultural Science)**, *School of Agriculture and Environmental Science, University of Southern Queensland*.
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Dr. Yash Dang **Principal Research Fellow**, *School of Agriculture and Food Sciences, The University of Queensland*.
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