Regenerative Agriculture Impacts & Opportunities

Wiyanda Naufal Aflah[1]
Willem Vervoort[1], Floris van Ogtrop[1], Justin Borevitz[2]
[1]School of Life & Environmental Science, The University of Sydney, New South Wales, Australia
[2]Research School of Biology, Australian National University, Australian Capital Territory, Australia

Current Conditions of Agriculture

- Uses approximately **72% of the world's freshwater**
  - Covering **one-third of the global land area**

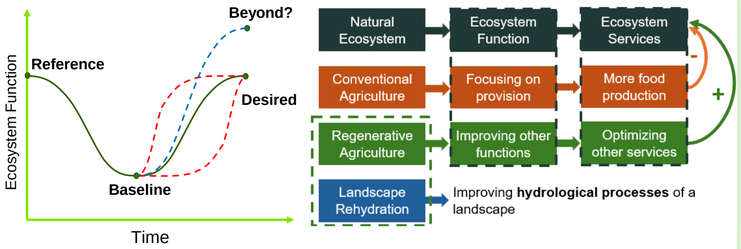
Common Conventional Agriculture
Reliant on substantial energy, water, and chemical inputs

- One of the **primary transgressors** of our earth's planetary boundary limits [1]
- Causing **80% of the worldwide deforestation** [1]
- Contributes to **climate change** and **landscape degradation**
- Desertification, erosion, pollution, and waterlogging are **associated with unsustainable practices**

A shift towards **Regenerative Agricultural practices** is imperative to restore the landscape

What is Regenerative Agriculture (RA)?

Any system that enhances the farm and broader **ecosystem function** → as a universal term for agricultural movements[2] [3]

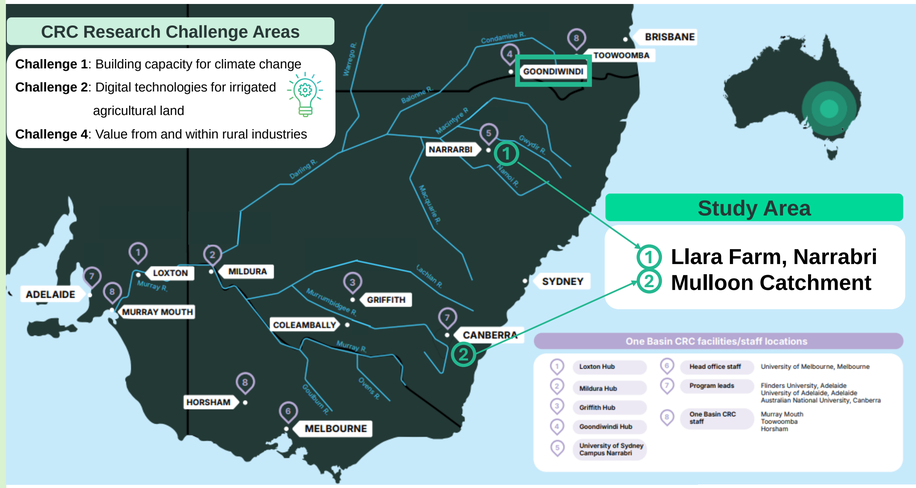


Aim and Objectives

Analyzing the **quantitative changes** in the catchment **water balance** due to the scaling up of regenerative agriculture (RA) practices across the landscape using computational modelling

Literature Review → Model Representation → Modelling Framework → Scenario-based Simulations

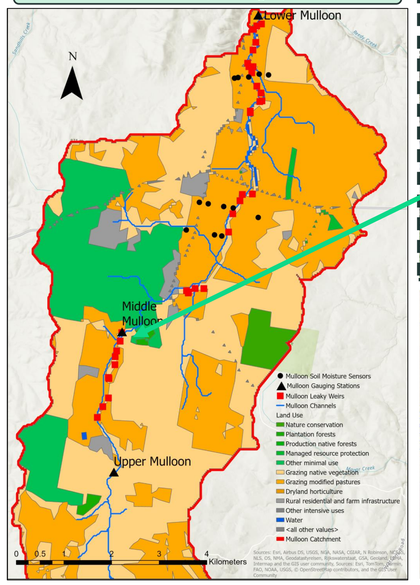
One Basin CRC Map



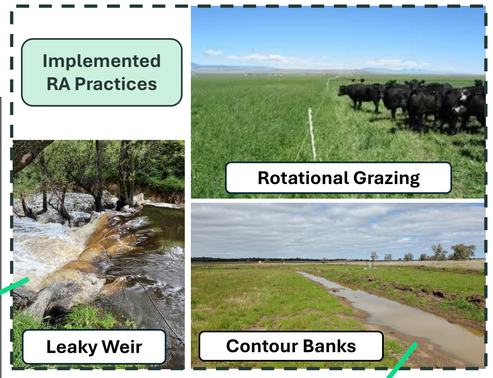
PhD Research Project Study Locations

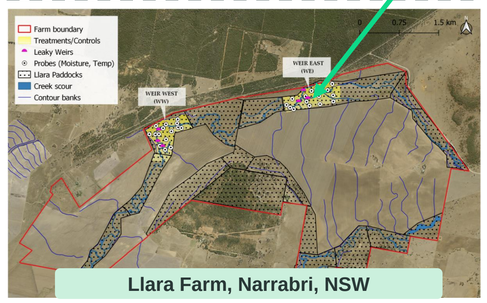
Mulloon Institute
For environment, farming and society.

Mulloon Catchment, Bungendore, NSW



Implemented RA Practices





Llara Farm, Narrabri, NSW

Impacts and Outputs

1. Improve modelling approach of RA in landscape scale
2. Determine long-term hydrological impacts of RA in a changing climate
3. Assist in water management of Murray-Darling Basin

Regenerative Agriculture (RA) Practices [3]

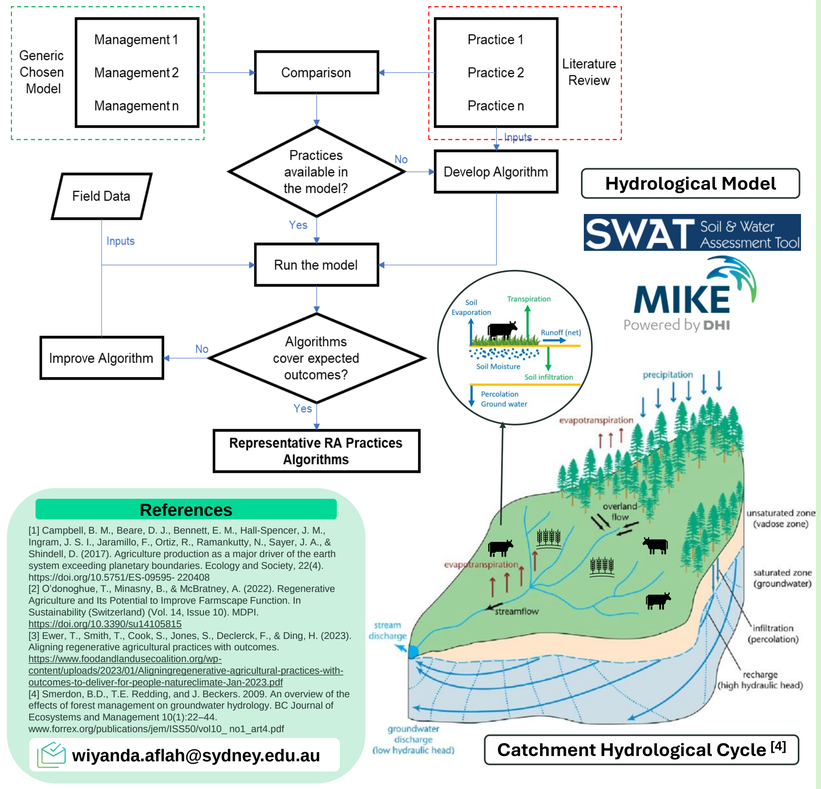
Practices	Description
Agroforestry	Inclusion of trees (woody plants) sequentially or simultaneously on the same agricultural field
Cover crops	Plants (non-woody) planted simultaneously or sequentially with a productive crop in the same field, only to cover soil
Crop rotation	Growing series of different productive crops on the same field
Intercropping	Multiple productive crops cultivated simultaneously on the same field
Conservation tillage	Minimising or removing soil disturbance and machinery
Embedded natural infrastructure	Nature-based or green infrastructure implemented on the agricultural field (Contour bank, leaky weir, terracing, etc.)
Organic agriculture	Removing the use of any synthetic pesticides or fertilizers
Organic amendments	Implementation of organic fertilizers (Mulching, stubble, etc.)
Holistically managed grazing	Managing the intensity of grazing on the rangeland
Integrated crop-livestock systems	Integration of livestock with crops in the same agricultural field


Agroforestry


Cover crops


Mulching

How to represent RA practices in a model?



References
[1] Campbell, B. M., Beare, D. J., Bennett, E. M., Hall-Spencer, J. M., Ingram, J. S. I., Jaramillo, F., Ortiz, R., Ramankutty, N., Sayer, J. A., & Shindell, D. (2017). Agriculture production as a major driver of the earth system exceeding planetary boundaries. Ecology and Society, 22(4). https://doi.org/10.5751/ES-09595-220408
[2] O'donoghue, T., Minasny, B., & McBratney, A. (2022). Regenerative Agriculture and Its Potential to Improve Farmscape Function. In Sustainability (Switzerland) (Vol. 14, Issue 10). MDPI. https://doi.org/10.3390/su14105815
[3] Ewer, T., Smith, T., Cook, S., Jones, S., Declerck, F., & Ding, H. (2023). Aligning regenerative agricultural practices with outcomes. https://www.foodandlandusecoalition.org/wp-content/uploads/2023/01/Aligningregenerative-agricultural-practices-with-outcomes-to-deliver-for-people-natureclimate-Jan-2023.pdf
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wiyanda.aflah@sydney.edu.au