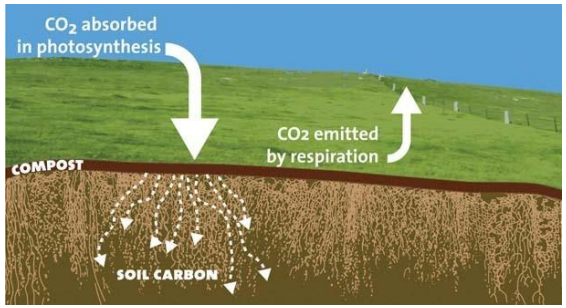
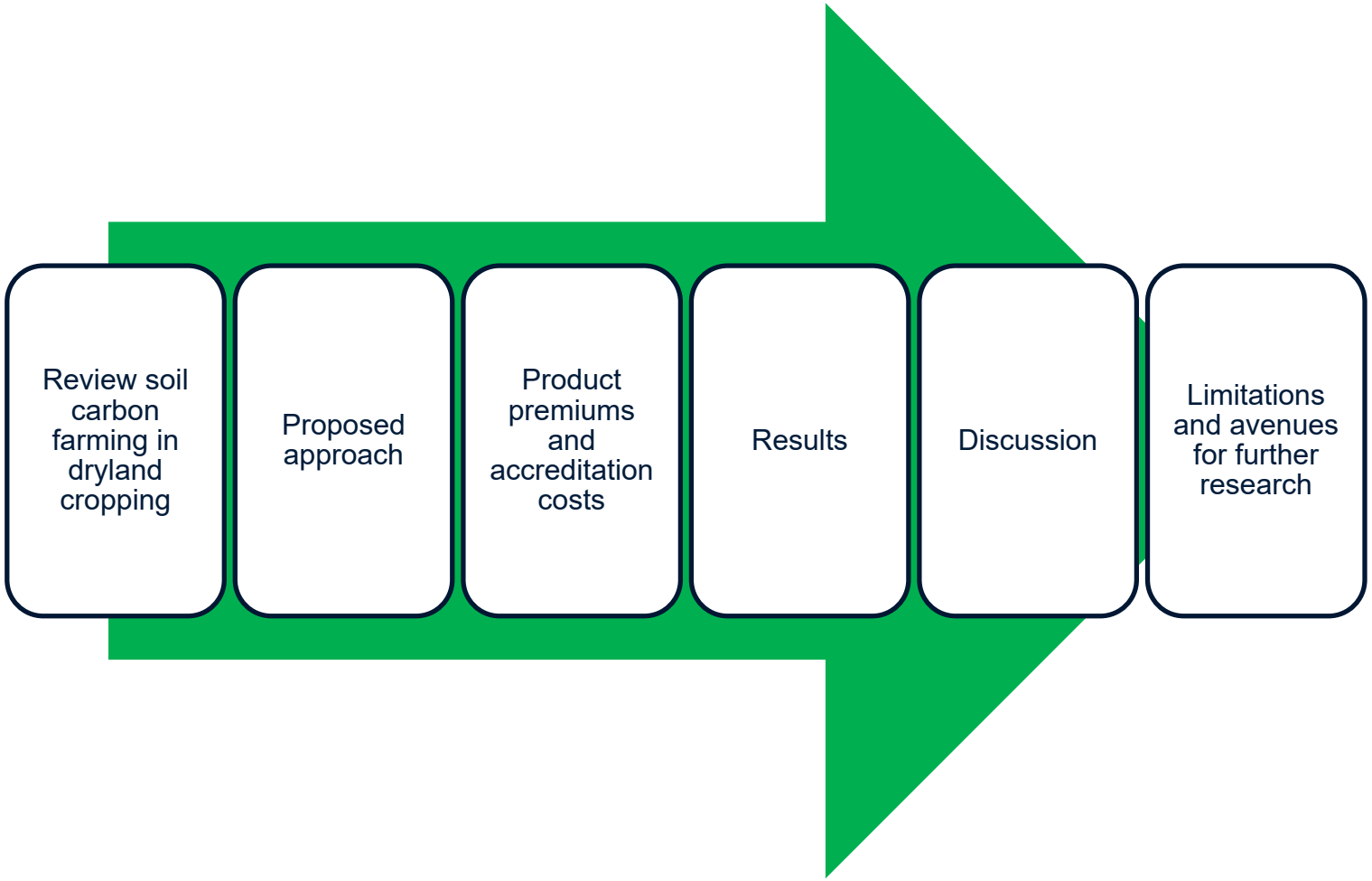


Soil carbon and dry land cropping systems

Economic opportunities for carbon farming in dryland broad-acre cropping

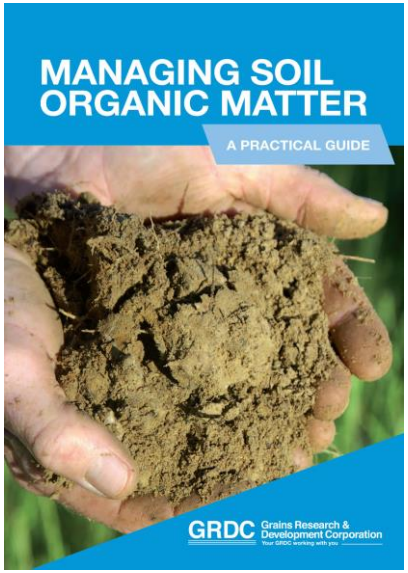
January 2023

Agenda


Review soil carbon farming in dryland cropping
Proposed approach
Product premiums and accreditation costs
Results
Discussion
Limitations and avenues for further research

Review soil carbon farming in dryland cropping

Assessed and tabled methods to build soil carbon in a broad acre setting



Key management recommendations:

- Address soil constraints
- Nitrogen balance – overcompensating N for higher growth
- Legumes for organic N (addition of chickpeas)
- Break and cover crops

Farrell, M., Vadakattu, G. and McDonald, L.M. (2021) Addressing the rundown of Nitrogen and Soil Organic Carbon. GRDC online

Proposed approach

A partial budget assessing emissions, gross margin incorporating product premiums

DCRA Zoom meeting (20 December 2022)

- B Wheat, chickpea, wheat, cotton, field pea
- 1 Cotton/millet alternating every summer
- 2 Wheat, chickpea, millet, cotton, chickpea and canola
- 3 Chickpeas, rye/clover, cotton, millet, wheat, and canola

Working model outputs from SOCRATES (Soil C sequestration - UQ) and PICCC (Emissions - UoM) drawn upon and referenced.

Product premiums and carbon accreditation costs

Assumed that farms gain accreditation via ISO14064-2:2019

ISO 14064

Climate Active Carbon Neutral PRODUCT

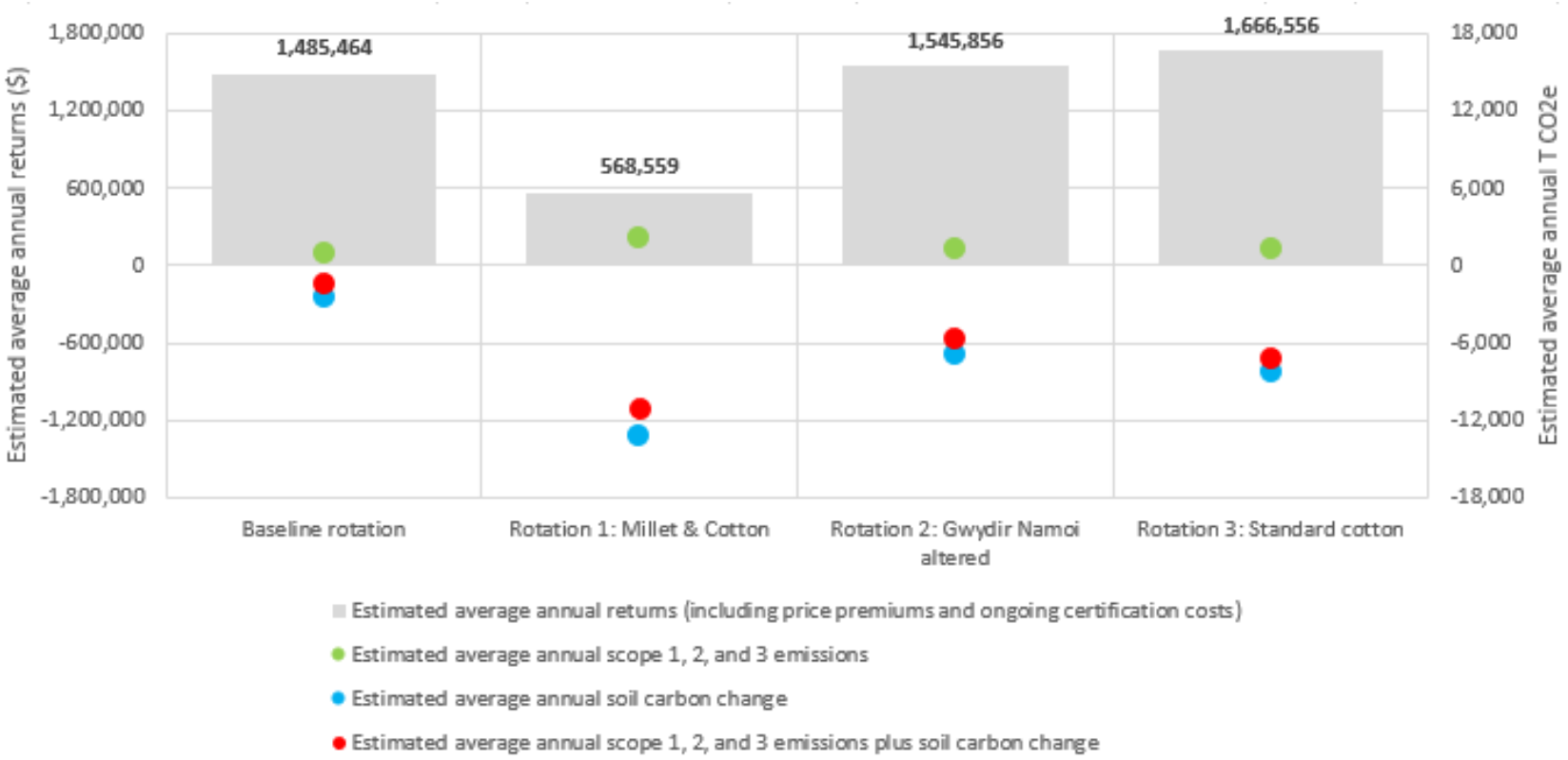
CarbonCount Measurement and Certification

BCarbon Working lands for climate solutions

CARBON FRIENDLY

Economic assumptions for farm carbon certification is consistent with Welsh & Antille (2022) as part of the cross-sectoral MPfN final report. All commodities will attract a 1% premium for participation.

Results



Rotation 1, 2 and 3 all improved the average annual scope 1, 2 and 3 emissions plus soil carbon change compared to the baseline. Rotation 1 shows a reduced gross margin compared to the baseline, while rotations 2 & 3 improved slightly.

Discussion 1/3

- Commodity prices yet to be sensitivity tested (i.e., chickpea/cotton prices)
- The N balance between mining soil carbon and creating excessive N2O emissions and impacts on GM/emissions is not yet understood (Farrell., et. al. 2021)
- On farm vegetation: How many Ha's to offset farming inputs?
- ISO14064:2-2019: Counting above-ground biomass, rather than annual change could be a game-changer.
- Higher frequency cropping: Apparent lower yields (Fritch & Wyllie 2015) but more carbon, which has a productivity benefit not accounted for here.

Nitrogen use, carbon balance, and on-farm vegetation require further scenario analysis to fully understand impacts on financial and GHG models.

Discussion 2/3

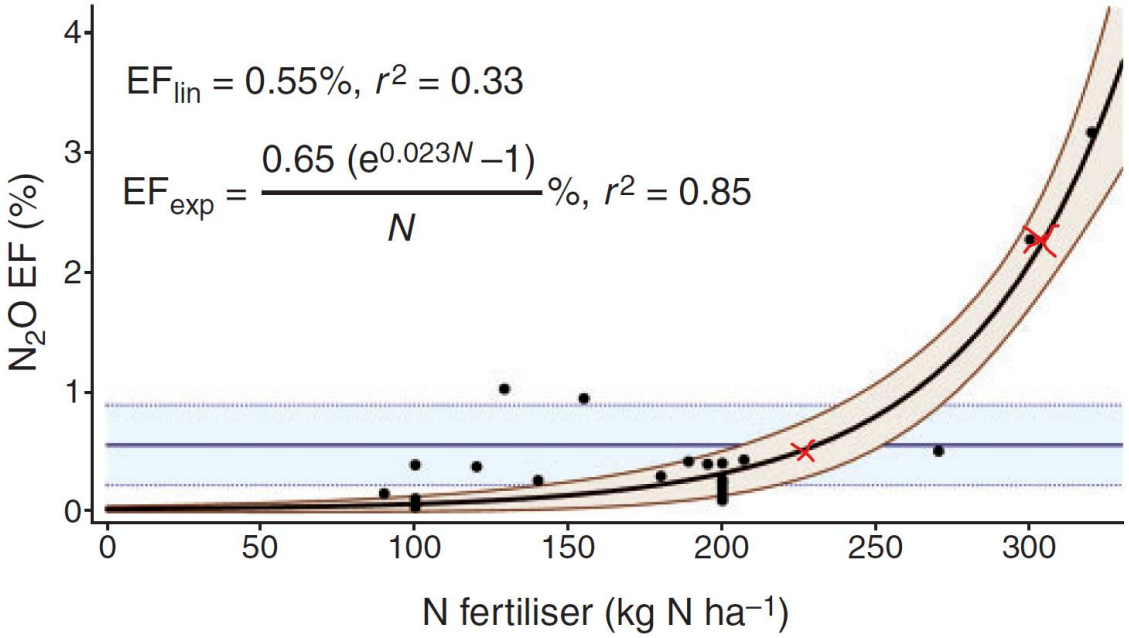


Fig. 1. Linear (EF_{lin}) and exponential (EF_{exp}) models (including 95%

NGGI (AUS) methodology differs from Global ISO 14064:2 GHG frameworks used by high-value trading partners, i.e. constant vs exponential equation. N-use per se is becoming more scrutinised by consumers globally.

Discussion 3/3

Climate Active

An Australian Government Initiative

What frameworks are out there? What environmental standards/protocols are applicable for cotton and supporting commodities? How much do they cost? What carbon (if any) trading platforms underpin them? What are the trading rules?

Limitations and avenues for further research

Limitations include:

- NGGI accounting vs LCA used in ISO
- Understanding model inputs to granular detail
- Soil carbon sequestration assumptions are coarse & rain-dependent, carbon transfer between depths is ambiguous
- No summer cropping options for SOCRATES
- Randomised time series for rain and temp creates yield uncertainties with cropping yield & carbon stores
- Native vegetation can be a major driver of Net CO2e farm status

Next steps: 

- Real case study examples
- Investigate the economics of other proposed recommendations by Farrell et. Al. (2021)
- Apply a DCF and sensitivity test key parameters under a changing climate
- Model assumptions of improved productivity from increased soil carbon and higher frequency cropping

Thank you

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