

PHD STUDENT PRESENTATIONS **SESSION**

Darren West Turning data into decisions: getting your sensors to pay their way

University of Tasmania

Xiangyu Liu Microbial responses to soil compaction as a measure of soil
resilience in sugarcane cropping system

Griffith University

Md Zahangir Hossain Biochar and nutrient interactions in soil

University of Newcastle

TURNING DATA INTO DECISIONS: GETTING YOUR SENSORS TO PAY THEIR WAY

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SOIL  **CRC**
Performance through collaboration

THE LANDSCAPE:

- Food security:- Global challenge
- Strong Australian agricultural industry:
 - around 3% of GDP in 2016-17⁺
- Water intensive industry:
 - Agriculture uses 62% of water nationally
 - 91% of that is used for irrigation in 2016-17^{*}
- Improved irrigation practice needs a good understanding of the soil



+ Source: World bank, 2019

* Source: Australian Bureau of Statistics, 2019

THE APPROACH:

- Avoiding the need for expensive and time-consuming soil analysis
- Installing off-the-shelf soil sensor technology in a range of soils and climates
- Using techniques similar to those used for predicting weather patterns and ocean flows
- Using data from the sensor to learn about the soil it is installed in
- Keen to discuss any soil moisture data sets that may be able to be shared with me



THE OUTCOMES:

- Decision support tools, not just data
- Adaptive, easy to use technology that can incorporate change
- Increased adoption of precision irrigation practices
- Increased water usage efficiency/reduced costs
- Determination of soil parameters that can be used for further data modelling (e.g. APSIM, etc.)



THANK YOU

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MICROBIAL RESPONSES TO SOIL COMPACTION AS A MEASURE OF SOIL RESILIENCE IN SUGARCANE CROPPING SYSTEM

Xiangyu Liu

Supervisors: Professor Chengrong Chen

Professor Lukas Van Zwieten

Dr Mehran Rezaei Rashti

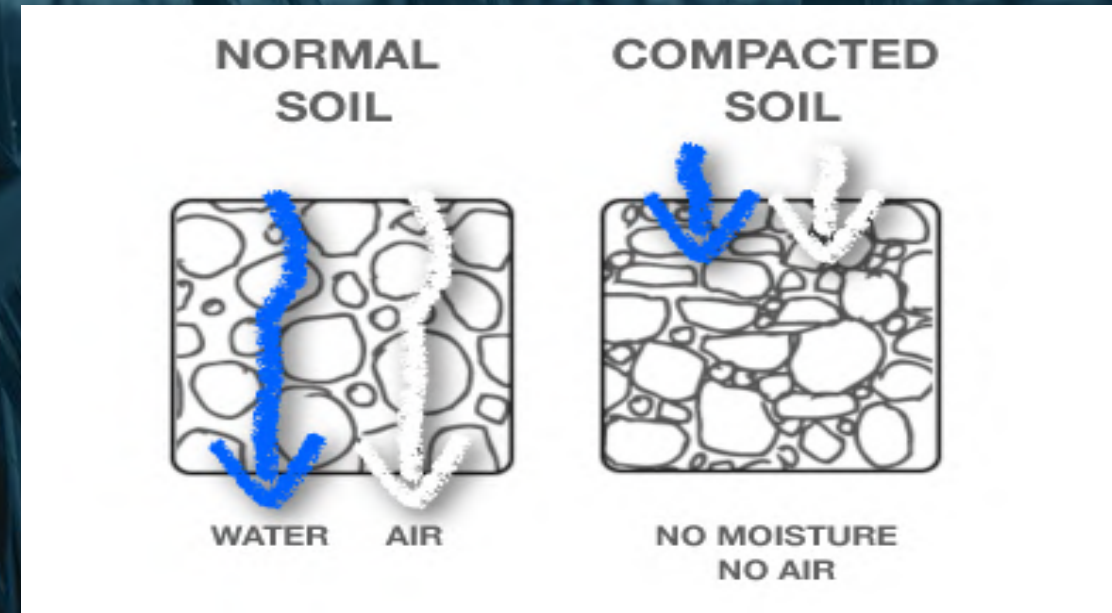


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April 2019

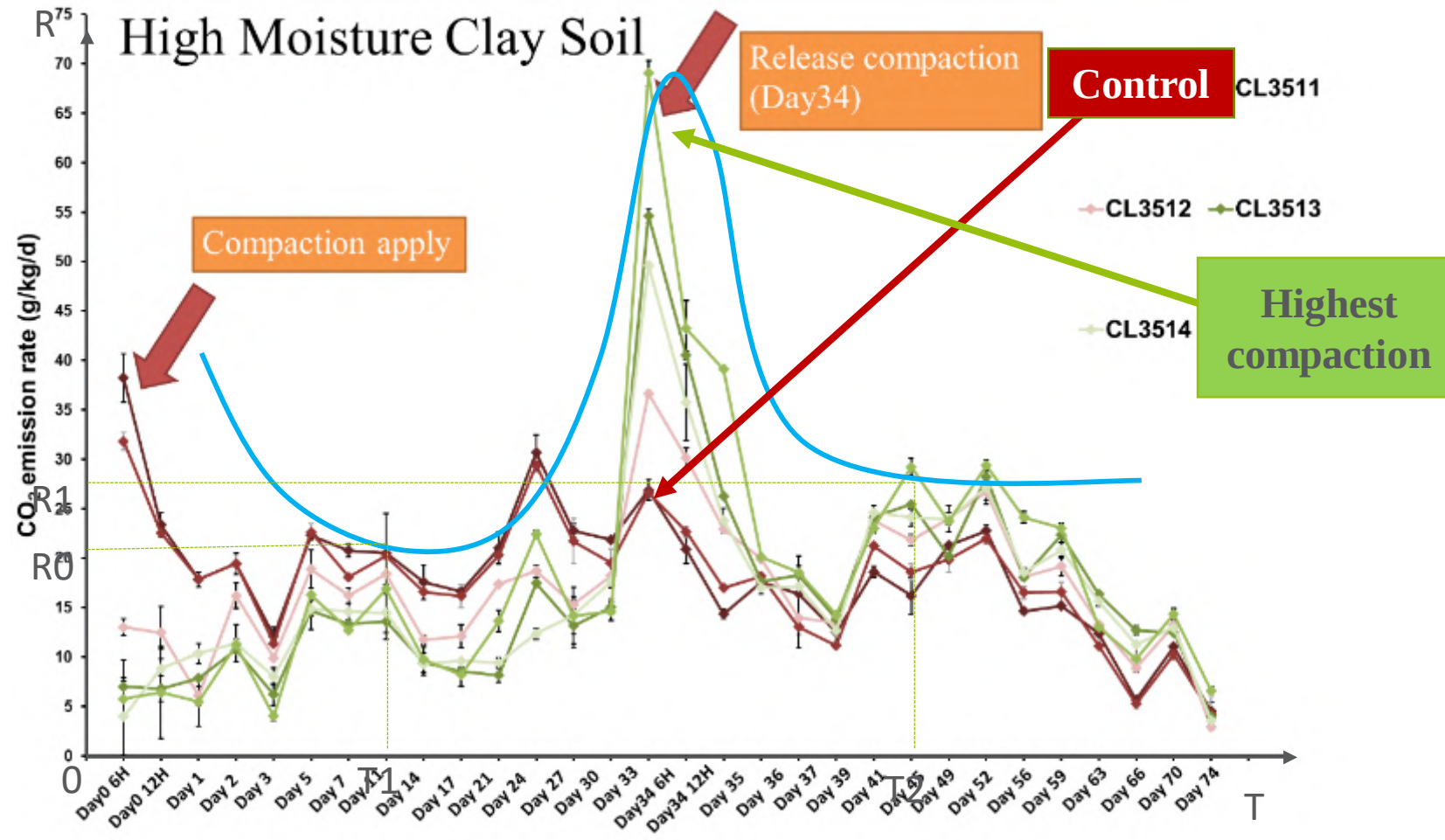


SOIL COMPACTION

- Soil compaction is one of the main problems associated with agricultural industries: **worldwide 68 million hectares** of land are estimated to be compacted due to vehicular traffic alone (Hamza and Anderson 2005).
- In Australia, the decreased agricultural production due to soil compaction has a price tag of approximately **AUD \$850 million per year** (Walsh 2002).



THE RESPONSES OF SOIL MICROBE TOWARD ENVIRONMENTAL DISTURBANCES



REFERENCE

HAMZA, M. AND W. ANDERSON (2005). "SOIL COMPACTION IN CROPPING SYSTEMS: A REVIEW OF THE NATURE, CAUSES AND POSSIBLE SOLUTIONS." SOIL AND TILLAGE RESEARCH 82(2): 121-145.

WALSH, P. (2002). "NEW METHOD YIELDS A WORM'S EYE VIEW." FARMING AHEAD 132: 16-18.

THANKS FOR YOUR TIME!

BIOCHAR AND NUTRIENT INTERACTIONS IN SOIL

Md Zahangir Hossain
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3 April 2019



Performance through collaboration

BIOCHAR

1

Condensed charcoal like material resistant to decomposition

- C storage
 - C sequestration
 - C source (energy/fuel)

2

Materials of high surface and high porosity

- Sorption of pollutants
 - Water holding capacity
 - Improves soil tilth (structure & drainage)

3

Capture of macro and micro nutrients

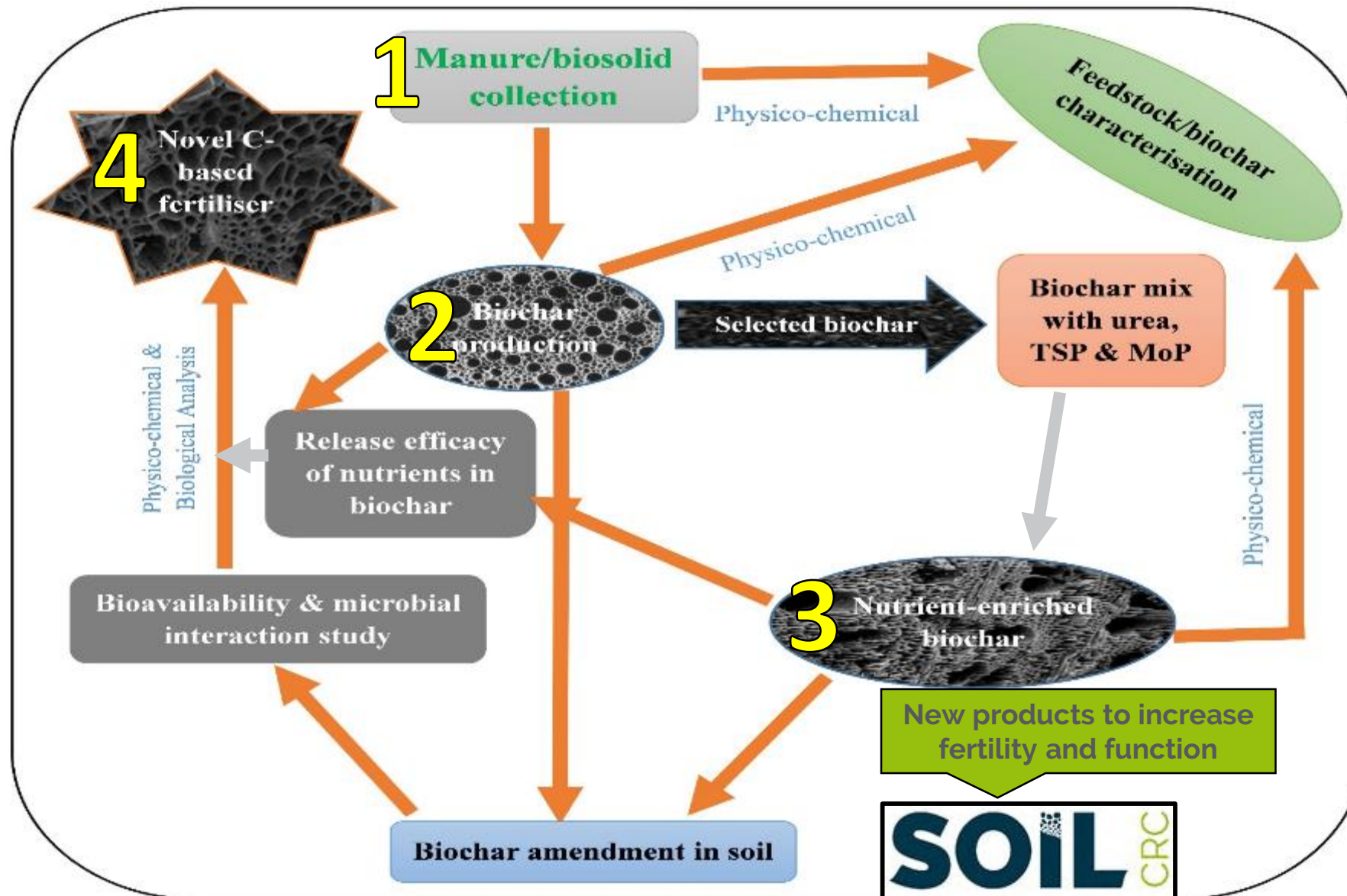
- Soil benefits (nutrients)
 - Improves crop yields (liming effects)
 - May be a source of PTE & other elements

Lopez-capel et al (2016)

OBJECTIVES OF THIS PROJECT

No.	Objective	Soil CRC Milestone
1	synthesis and characterise of biochar	3.1.3 synthesis of innovative fertilizer products
2	nutrient enrichment of selected biochar	
3	determine the nutrient releasing efficiency of biochar	3.1.4 test and validate innovative fertilizer products
4	evaluate the targetted bioavailability of nutrients	

RESEARCH FRAMEWORK



EXPECTED OUTPUT

- Identification of targetted biochar feedstocks
- Synthesis of nutrient enriched biochar
- Development of Carbon-based novel fertilizer products



Biosolid + Urea

ORAL AND POSTER PRESENTATION



AUSTRALIA NEW ZEALAND BIOCHAR CONFERENCE 2018



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