

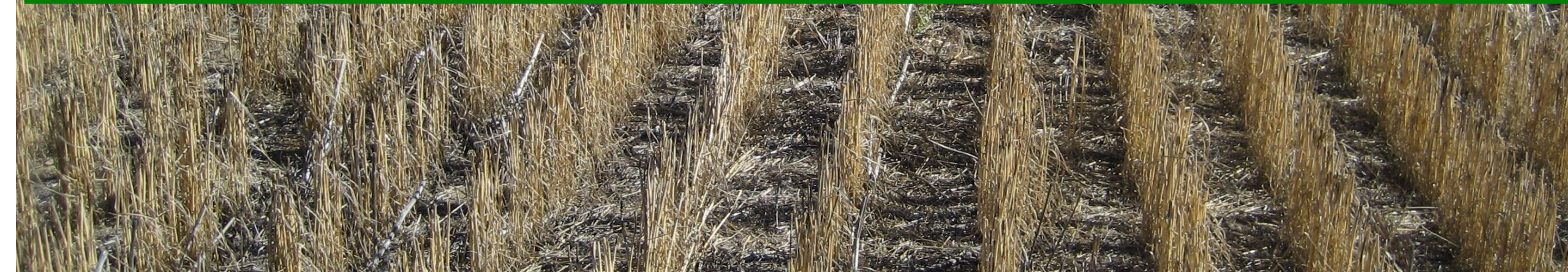
BioFurrow Concept: Building on the benefits using Near-Row (On-row) Sowing

Margaret Roper

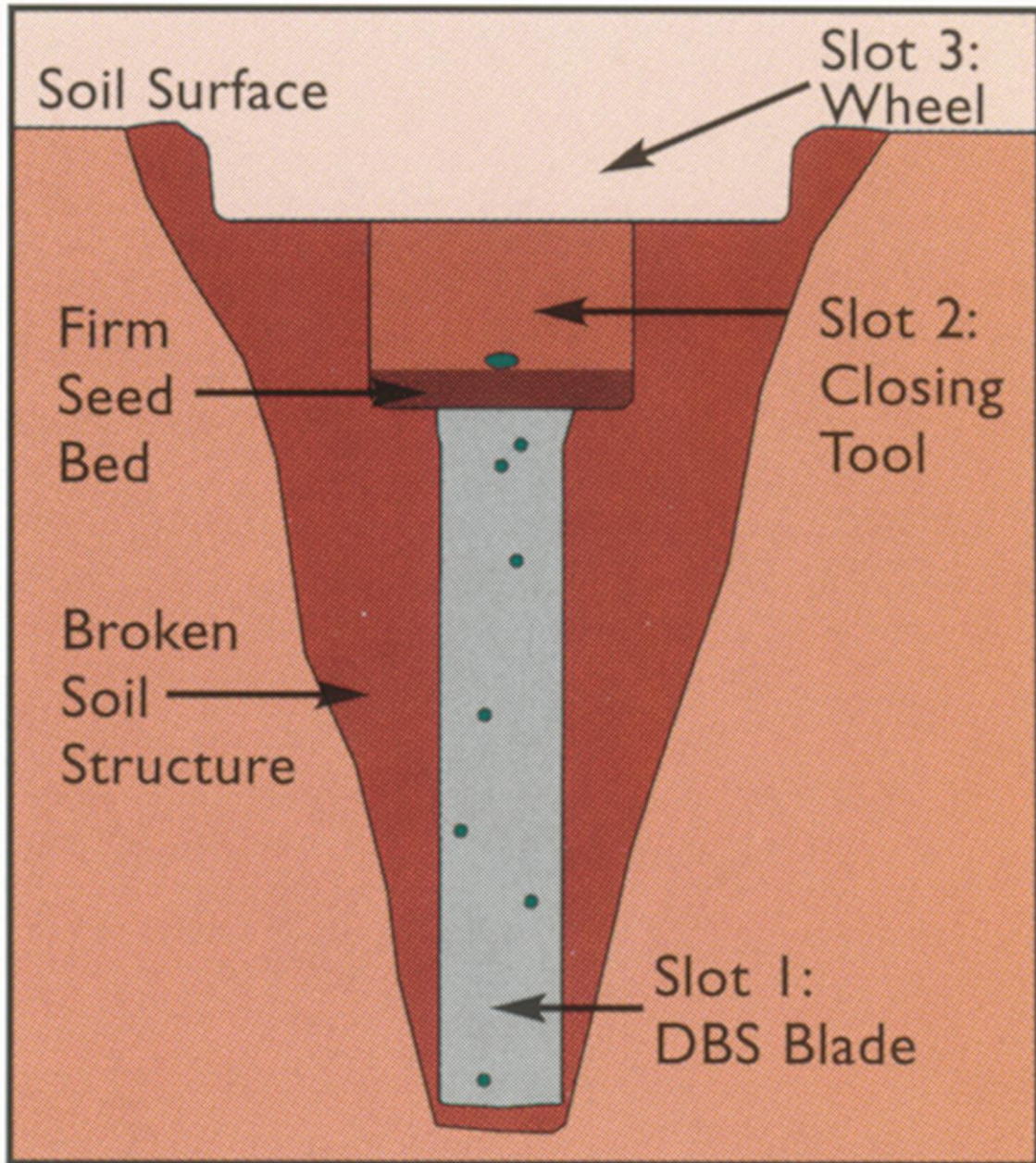


Purpose of the presentation is to describe

- What a **BioFurrow** is, its properties and how the **DBS** helps create this
- How **near-row sowing** may take advantage of some of these properties to produce healthy crops



DBS and the BioFurrow concept



Slot 3: Covering wheel - ***FORMS THE FURROW***

- Assists water harvesting,
- Contributes to soil water around seed
- Seed is covered by soil fines

Slot 2: Closing tool - ***FORMS THE SEED BED***

- Increased relative humidity promotes germination
- Water vapour in soil is the primary source of water for seed germination
- Relative humidity in this space will remain at 100% provided soil water contents are above wilting point

Slot 1: Vertical cultivation (DBS blade) and liquid fertilisers ***FORMS THE ROOT BED***

- Loosens soil for root development (sub-soil cultivation)
- Increases water content below the seed
- Water vapour rises into space around the seed
- **Air, water & nutrients for plant & microbial growth**

What is a BioFurrow?





- 1.0-2.0 t/ha of microbial biomass in soil
- more than 70% of microbes in top 10 cm
- most microbes are associated with plant roots

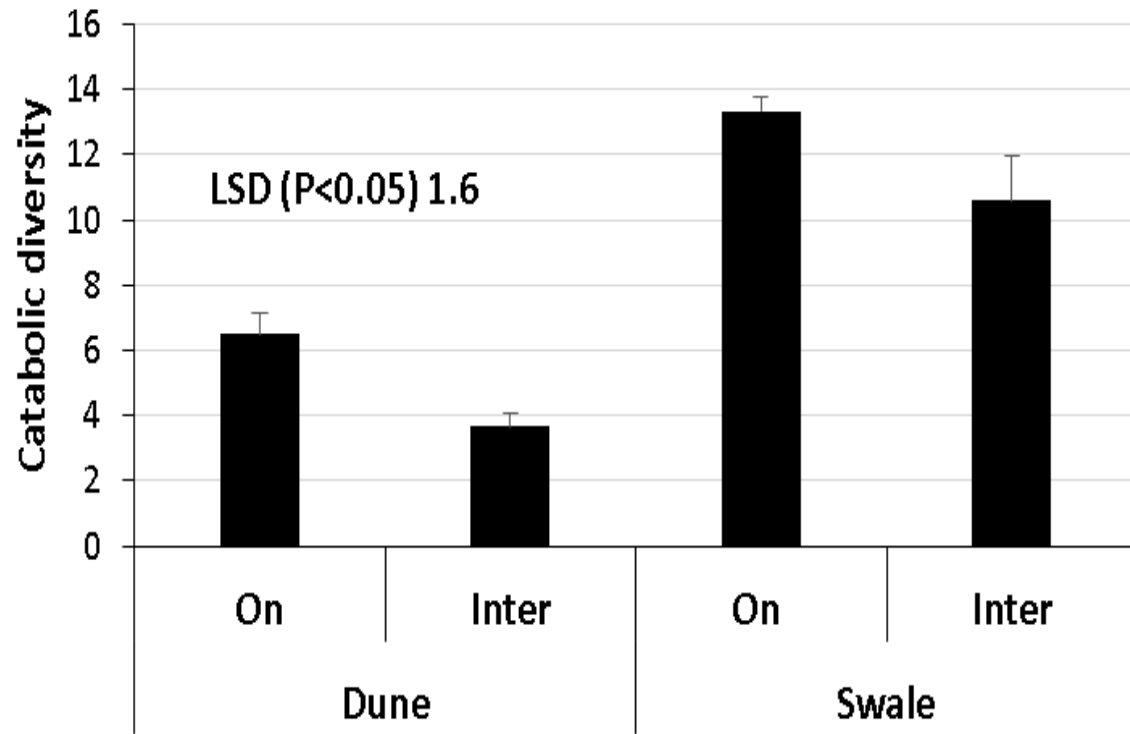
Roots are 'Biological hot spots'



- Microorganisms need food and water to survive and function in soil
- Growing plants provide constant source of readily available food for microbes around the roots
- In return, microbes supply nutrients to plants by
 - Transforming nutrients to available forms, e.g. N
 - Producing enzymes required for plant growth
 - Capturing nutrients away from the root via fungal hyphae
- **All these factors result in larger and more diverse populations in the root zone (furrow) than in the bulk soil (inter-row)**

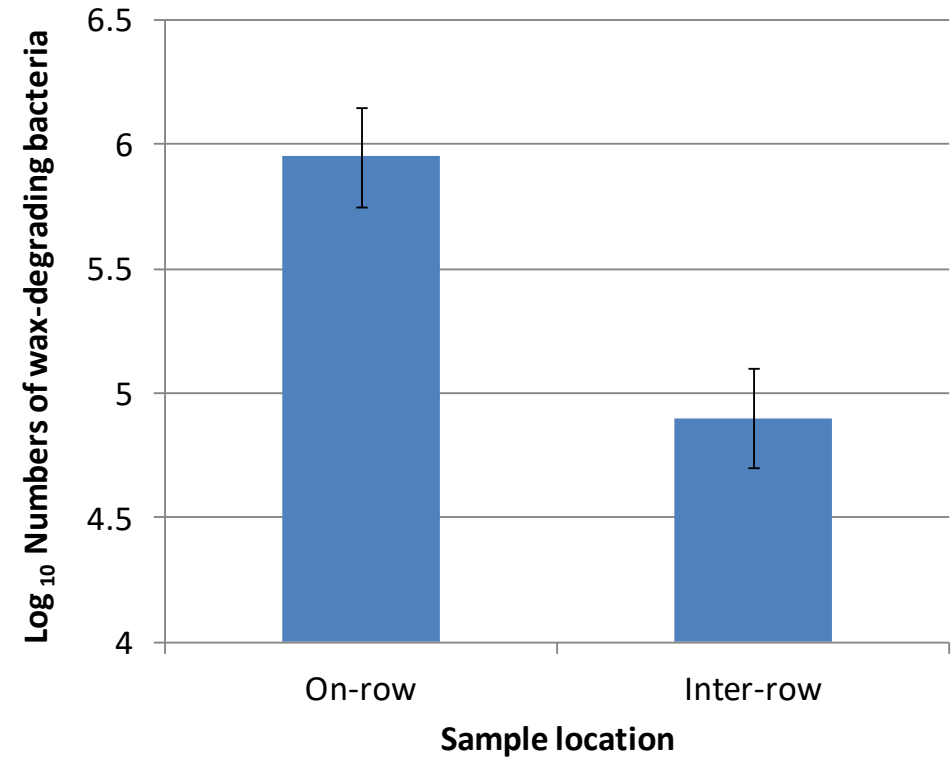
More microorganisms in the BioFurrow

Karoonda early sowing 2015



Gupta VVSR et al. (2018) ASDS Proceedings, Adelaide

Numbers of wax degrading bacteria
March 2015



Roper, Ward et al.

BioFurrow benefits crops on water repellent sandy soils
where surface soil layer prevents water flow to non-repellent (wettable) sub-soil



Root systems within BioFurrow are pathways for Water

No-till - prior to seeding
Infiltration down old rows
April 2011



Cultivated - prior to seeding
No pathways for water movement
April 2011



No till preserves bio-pores formed by roots that act as pathways for water infiltration.

Roper et al. (2013) Soil & Tillage Research 126:143-150.

Root systems within the BioFurrow are pathways for Water

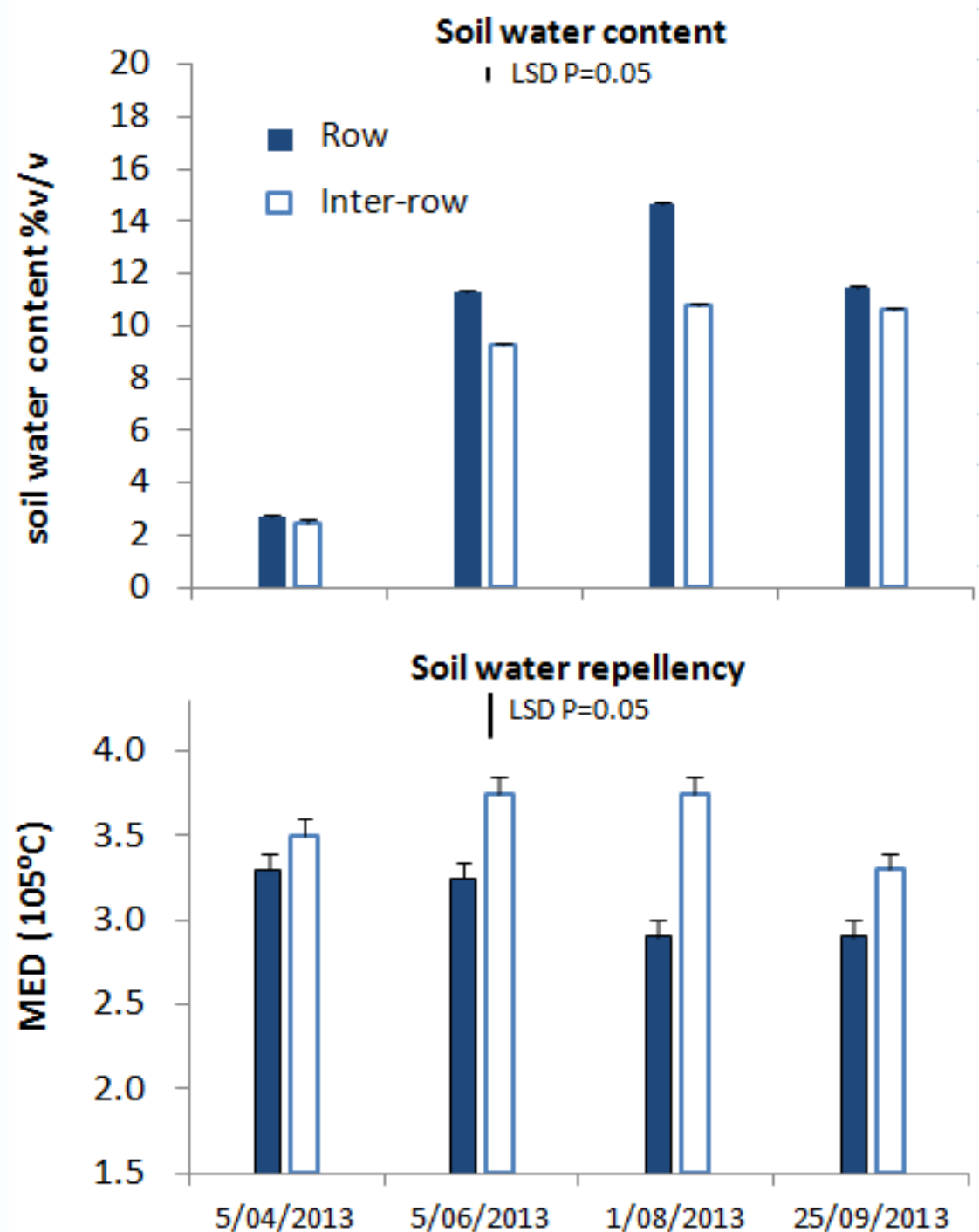


July 2011:
(Wheat seeded May)

Roper et al. (2013)
Soil & Tillage Research
126:143-150.

Higher Soil water contents in furrow than inter-row favour:

- Plant growth
- Soil microbial communities
- and
- Reduce repellency in water repellent soils



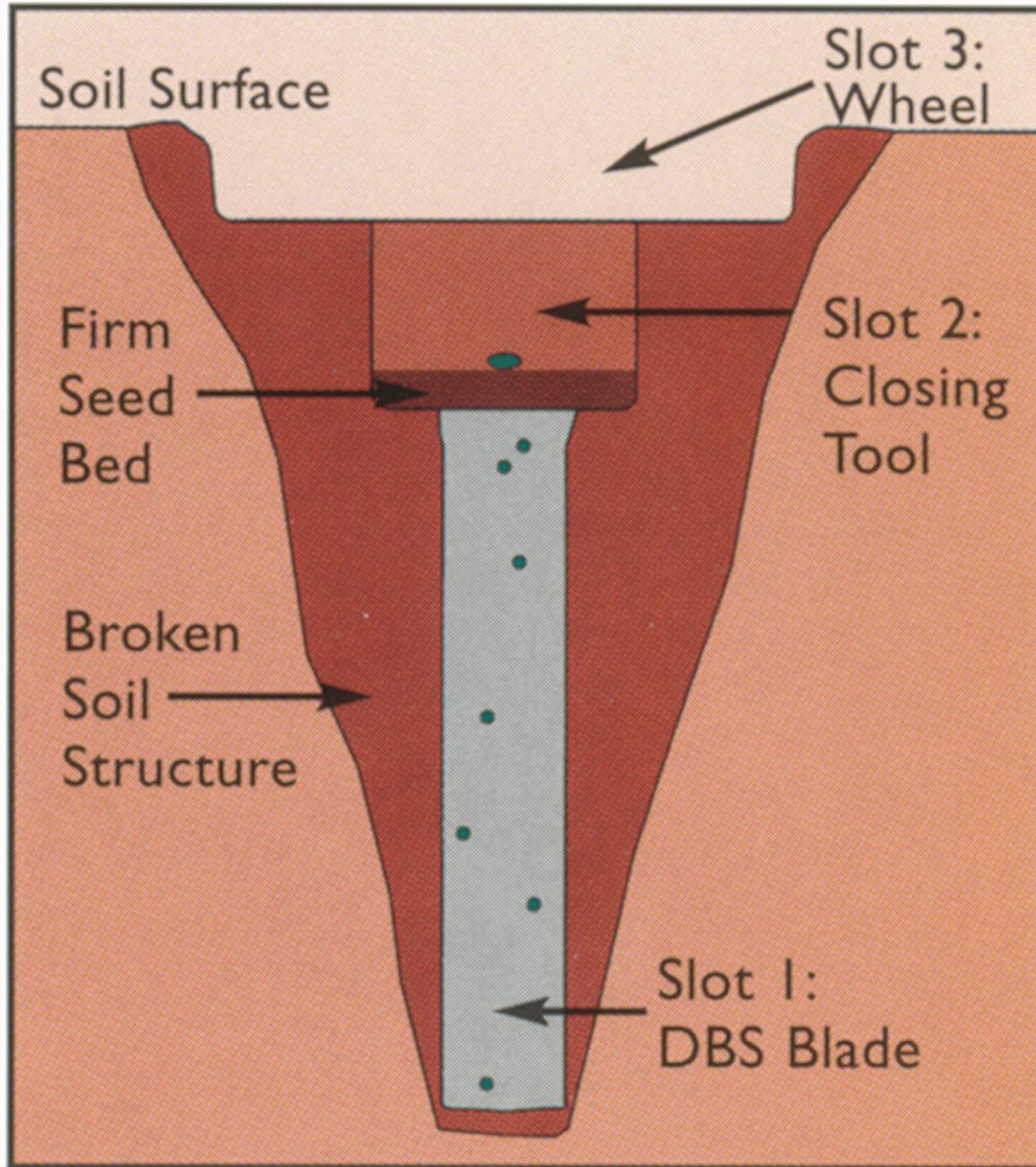
Capitalising on the BioFurrow

How can we retain the benefits of the BioFurrow for the new crop in the following season?

NEAR-ROW (ON-ROW) SOWING

(Seeding next to last years' furrow)

- *Helps maintain soil water*
- *Increases the size of microbial communities*
 - *Enhances crop nutrition*
 - *Wax degradation (reduced repellency)*
 - *Disease suppression*
- *Fewer weeds*



Plant emergence in near-row sown crops double that in the inter-row



Crops sown near-row (on-row) more vigorous than in inter-row



Near-row (On-row) sowing increased crop yields



On row

Inter-row

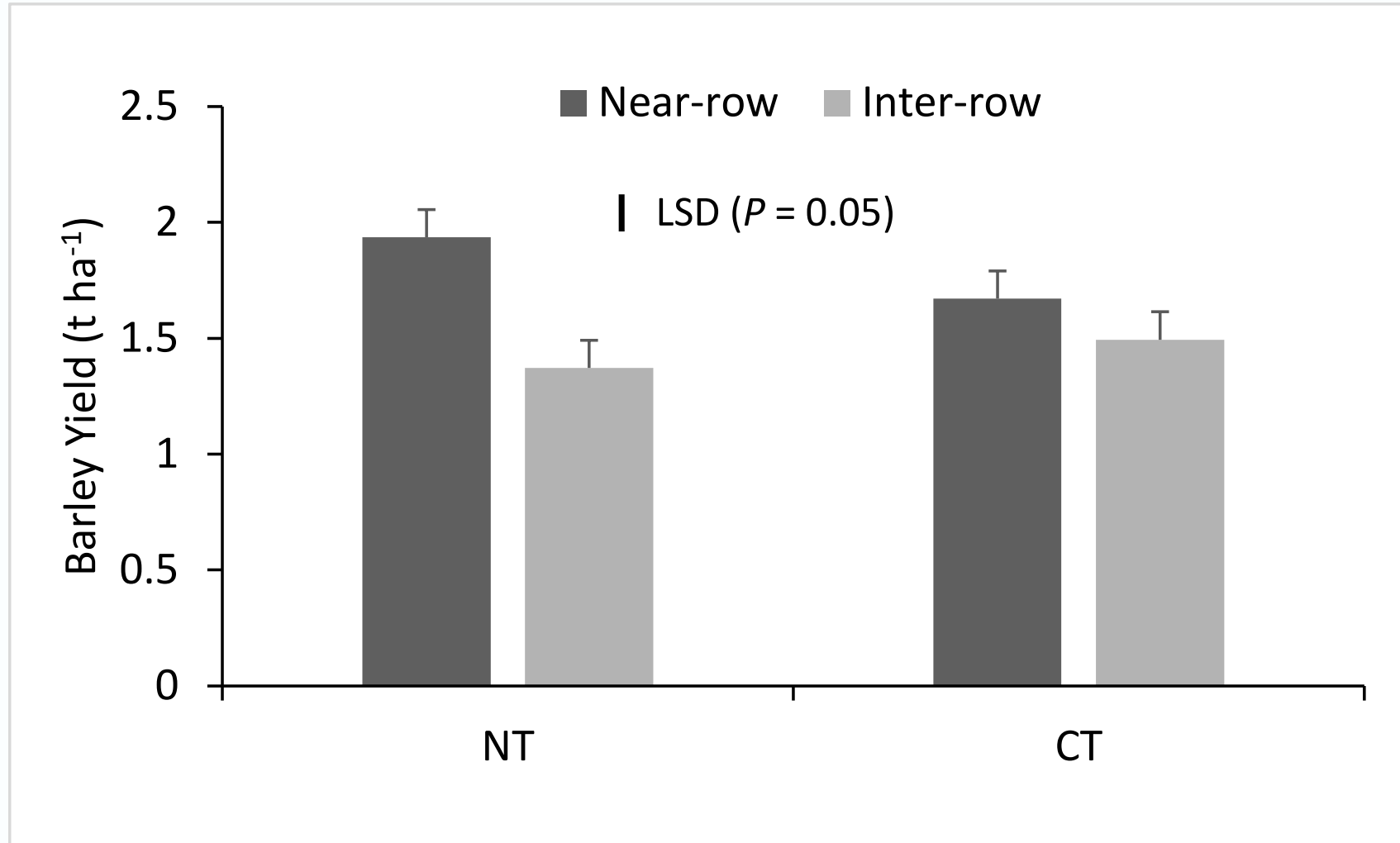
Canola (2010), Cereal (2009)

Canola seeded on last years'

- Row yielded 1.5 t/ha
- Inter-row yielded 0.2 t/ha

Steve Waters (Calingiri)

Near-row sowing improved yields on a water repellent soil



Wanilla, SA

NT (No till)

CT (Cultivated)

Cultivation:

One pass - narrow points

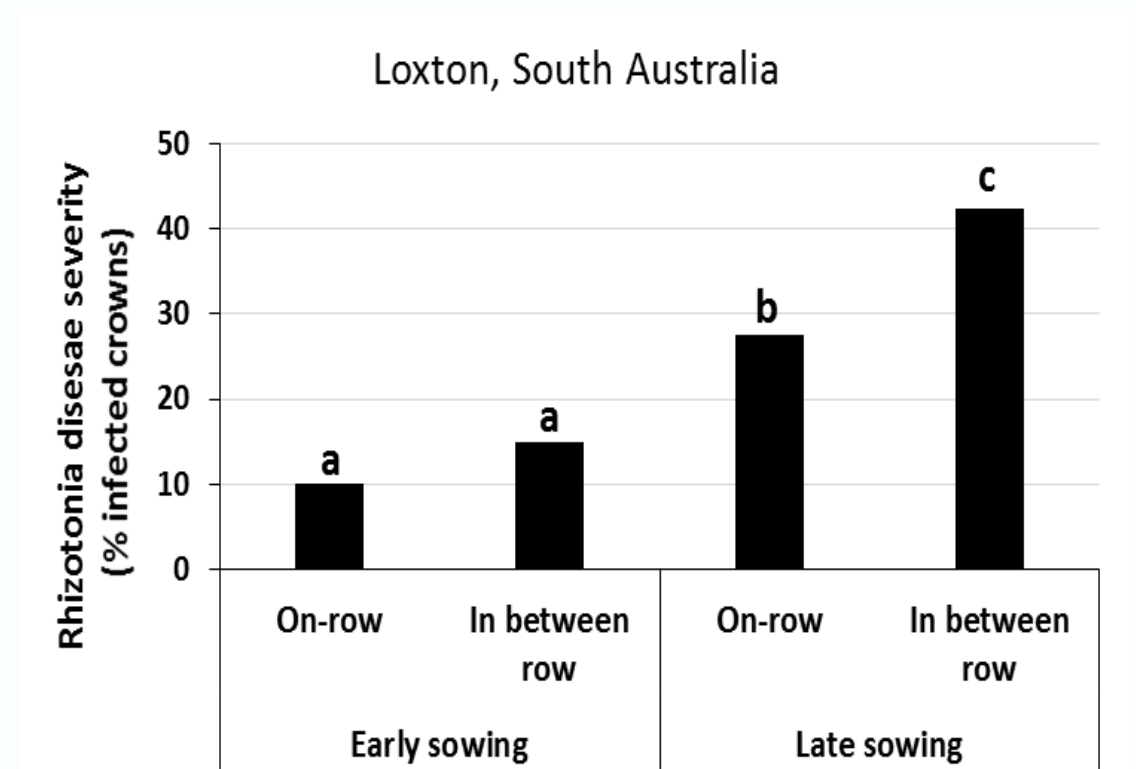
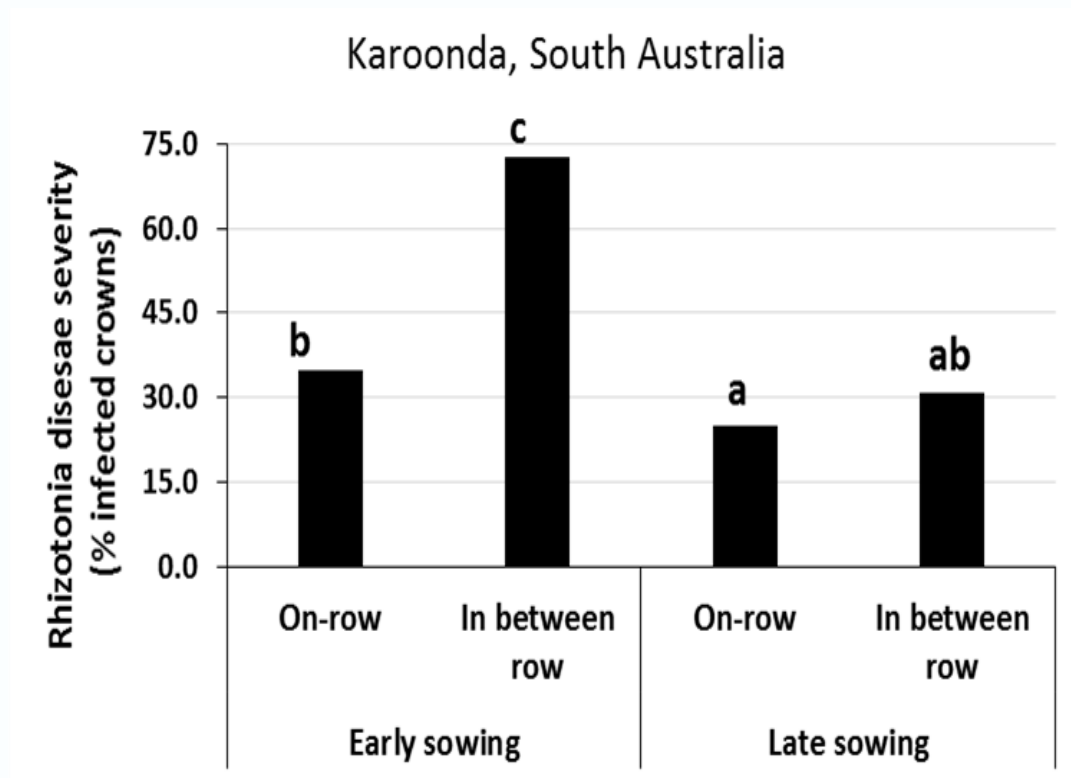
Roper et al. (2022)

Soil Research 60: 360-372.

Near-row sowing increased crop yields compared with inter-row sowing ($P = 0.006$)

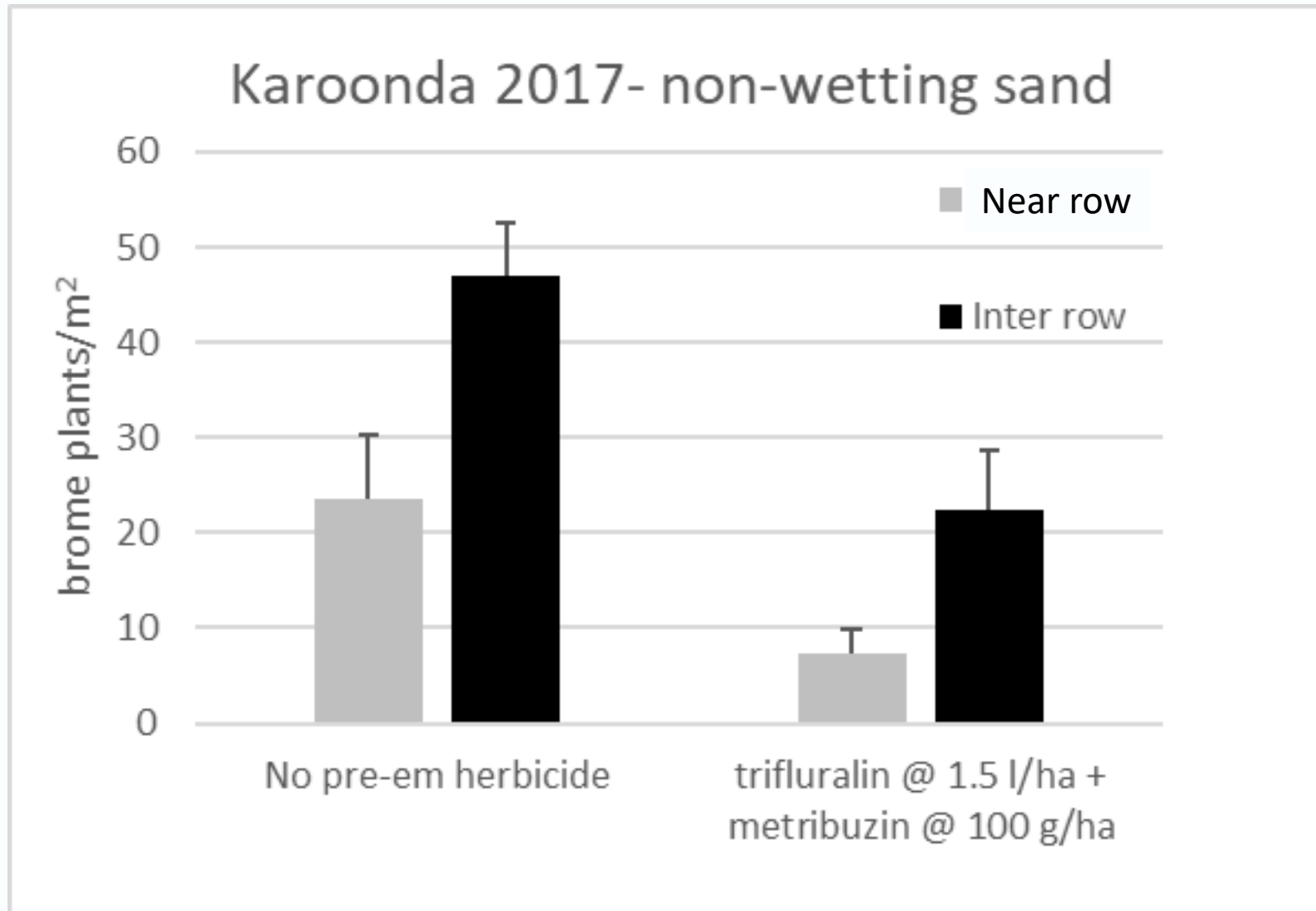
Microorganisms in the BioFurrow suppress crop diseases

Even though Predicta B testing suggested a greater disease risk



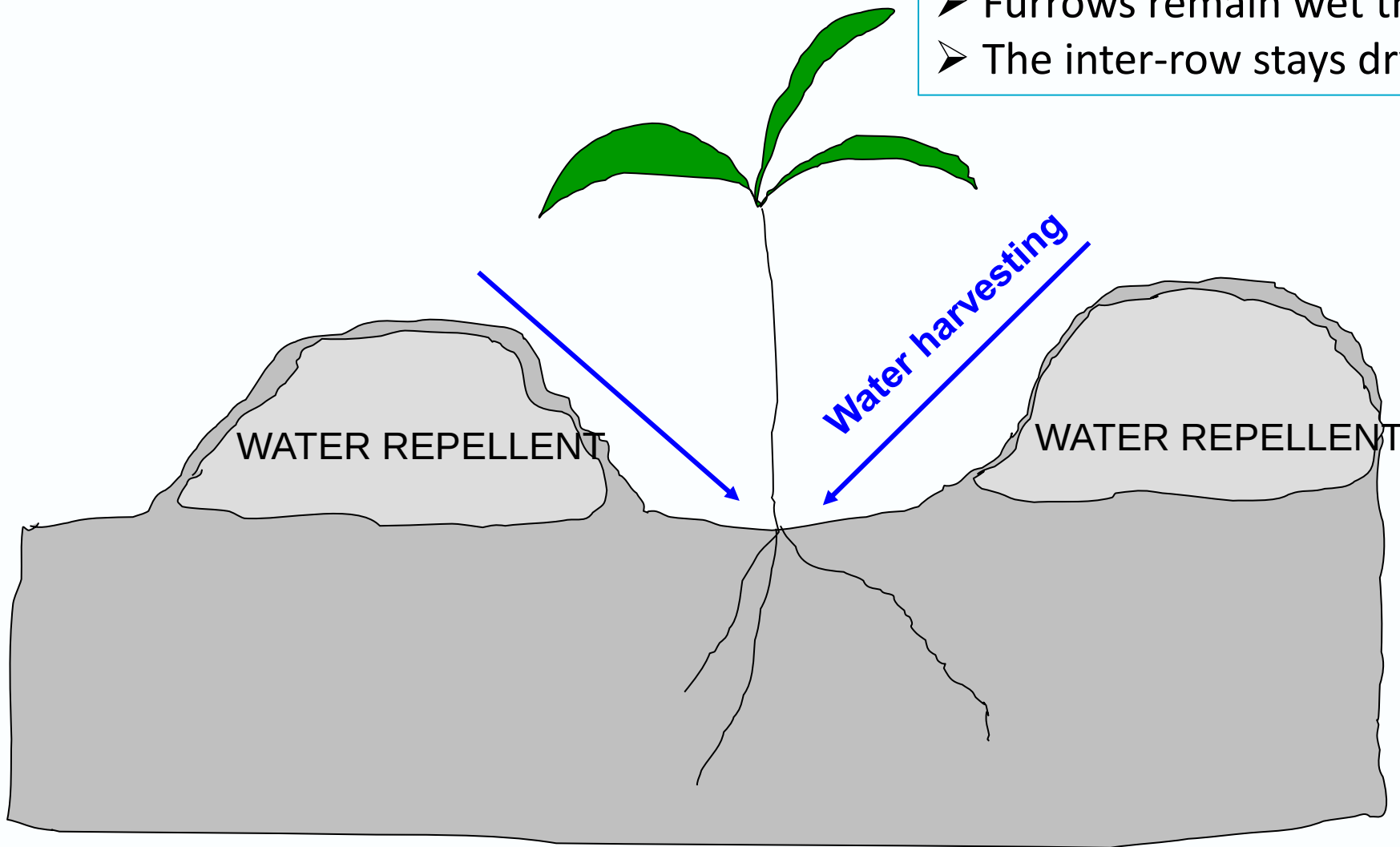
Crown rot (fusarium) and Take all infection weren't found

Near-row sowing reduces weeds on water repellent soils



Near-row sowing reduces weeds on water repellent soils

- Furrows remain wet through water harvesting
- The inter-row stays dry and weeds cannot germinate



Benefits of near-row seeding into the BioFurrow relative to inter-row sowing

- Larger & more diverse microbial communities
- More water available to new crop (in repellent soils)
- Improved crop establishment
- Repellency declines during the season
- Improved yields in some years
- Greater disease risk but less disease incidence and severity
- Fewer weeds



FIELD TRIALS FUNDED BY:



An aerial photograph of a large agricultural field. The field is filled with rows of young, green plants, likely corn, planted in a precise grid pattern. The rows are separated by light brown, tilled soil. The perspective is from a high angle, looking down at the field, which stretches out towards the horizon. The lighting is bright, casting soft shadows between the rows of plants.

AUSPLOW