Near-Row (On-Row) Sowing

What is Near-Row (On-Row) Sowing?

Near-Row Sowing, sometimes referred to as On-Row Sowing, places the seed for a new crop into the biologically rich BioFurrow™, within 2 cm of the previous year's crop row. Near-row sowing gives the new season's crop immediate access to all biological and hydrological benefits built up in the previous season's **BioFurrow™** and provides newly emerged seedlings with enhanced soil water availability and microbial functionality, and access to left-over nutrients and soil amendments, not found in the more arid inter-row (Figure 3). Sowing adjacent to the old row rather than directly above avoids 'ripping-out' existing root pathways by knife blades. Hence the term 'Near-Row Sowing'.

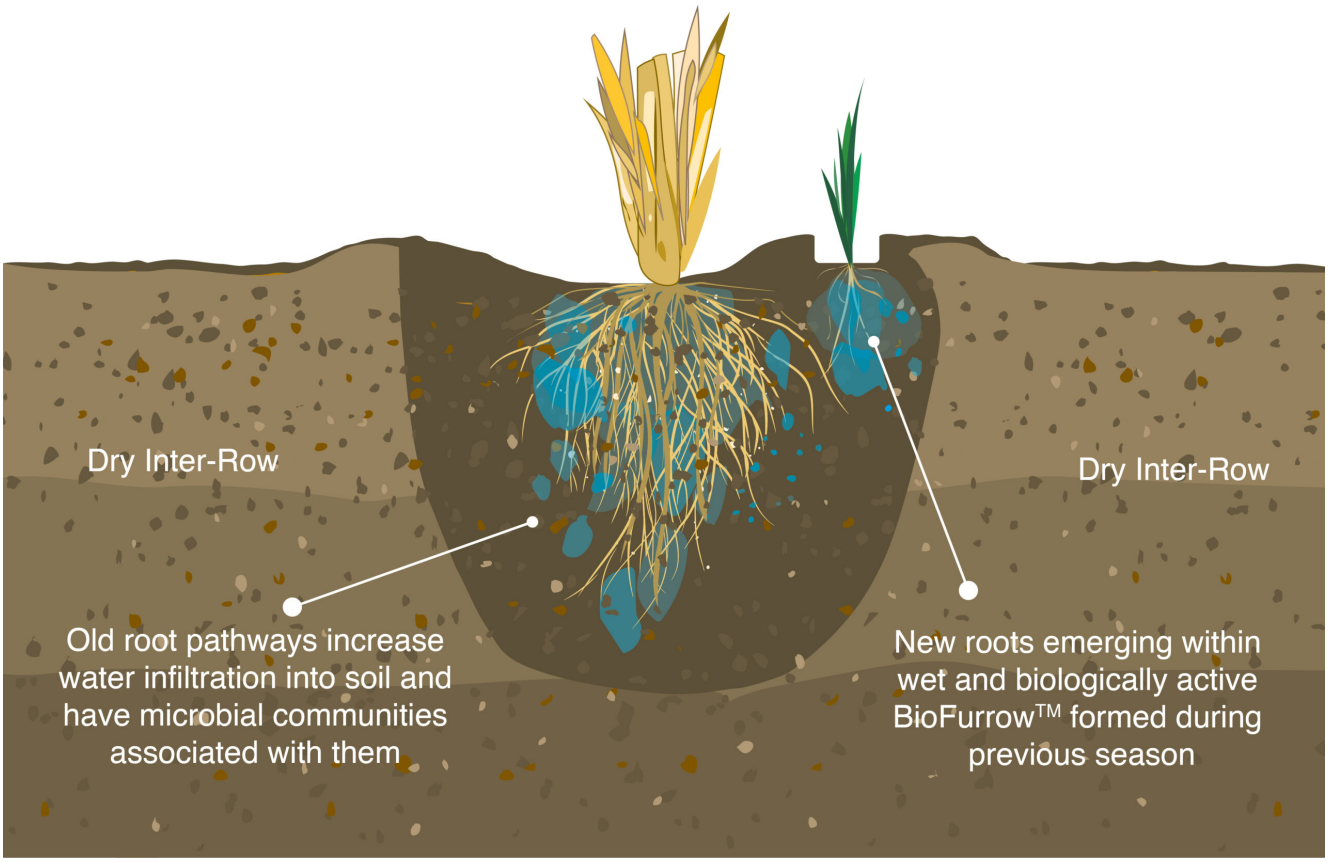

Figure 3 – Near-Row Sowing Concept.

Some growers have noticed that crop plants sown on or near stubble rows from previous seasons often perform better than those sown in the inter-row and a few have devised methods to achieve this including 1) sowing at an angle (approx. 15°) to the previous year to intersect old rows or 2) developing equipment to accurately seed near old rows.
Recent research (see below) has quantified the benefits of Near-Row Sowing, validating these farmer observations.

Near-Row Sowing increases the soil water content around the emerging seedling and increases crop yields in some years:

Crop roots from previous seasons are preserved under no-till and minimum tillage systems, and these act as pathways for water entry into soils. This is particularly important in water repellent soils because water infiltration down old root pathways by-passes repellent surface soil layers, wetting up sub-soils and promoting plant growth (Figure 4).

Figure 4 – Blue dye (1%) in water traces the flow of water through water repellent soil. Old roots from previous season

(shown in the inter-row) behave as pathways for water entry especially in repellent soils. Therefore, seeding next to these old root pathways (i.e. near-row sowing) allows new seedlings to access additional water especially in dry seasons. Photo credit M. Roper et al. (CSIRO; GRDC project CSP00139)

Enhancing the BioFurrow using Near-Row Sowing (Download PDF)

Ausfacts – Volume 27 Issue 2 June 2022 (Download PDF)

Roper et al. 2013 (Download PDF)

Seeding a new crop in the previous year's BioFurrow™ next to

old root pathways can increase crop emergence compared with those sown on the inter-row (Figure 5) and in some years significant increases in crop yields have been observed (Figure 6).

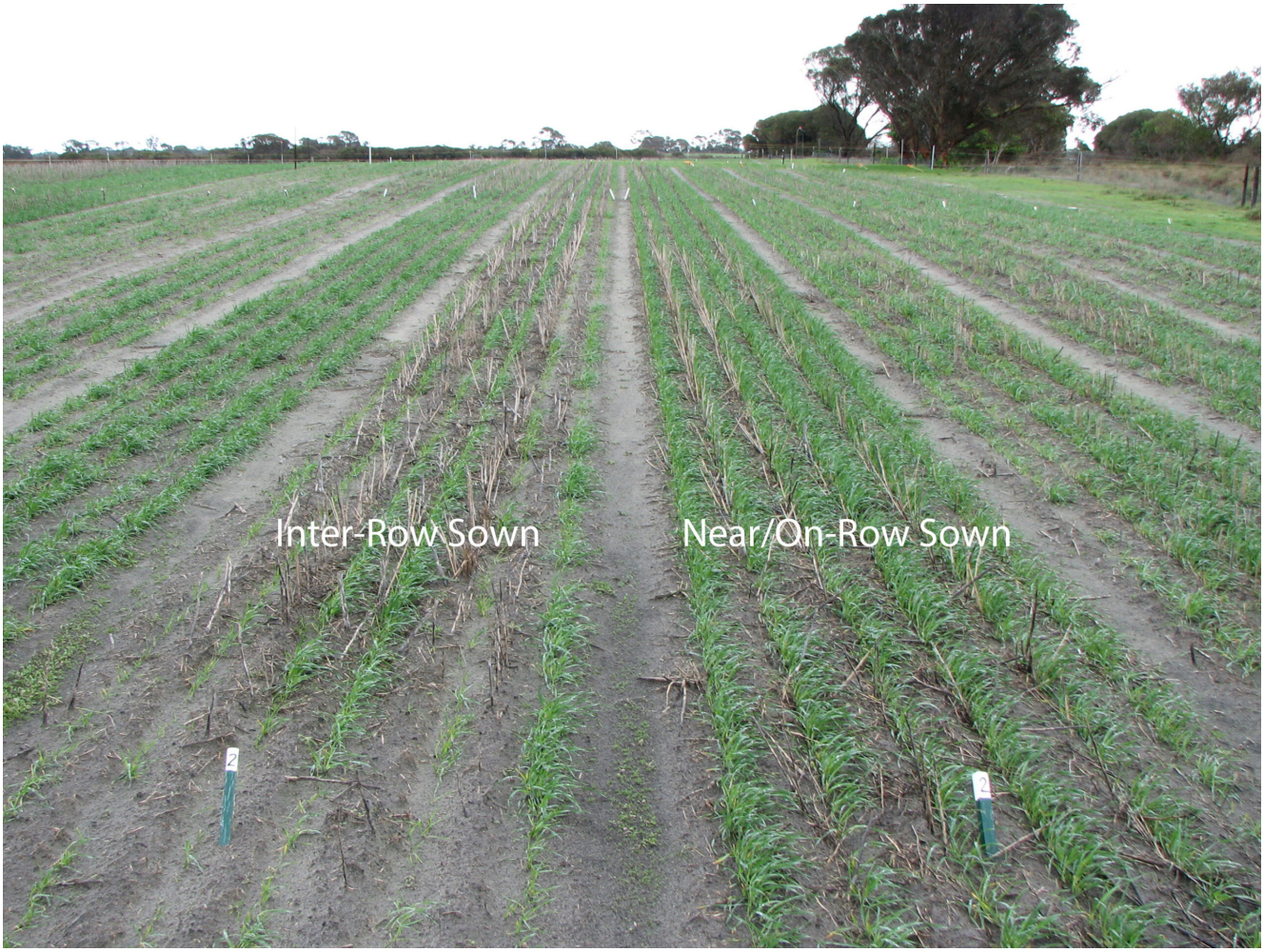

Figure 5 – Crop emergence of barley crop (21 days after sowing) on a severely repellent sandy soil at Wanilla, South Australia. Plants sown Near-row (RHS) averaged 92 plants /m^2 compared with 70 plants /m^2 when sown on the Inter-row (LHS). Photo credit T. Blacker (SARDI; GRDC project DAW00244)

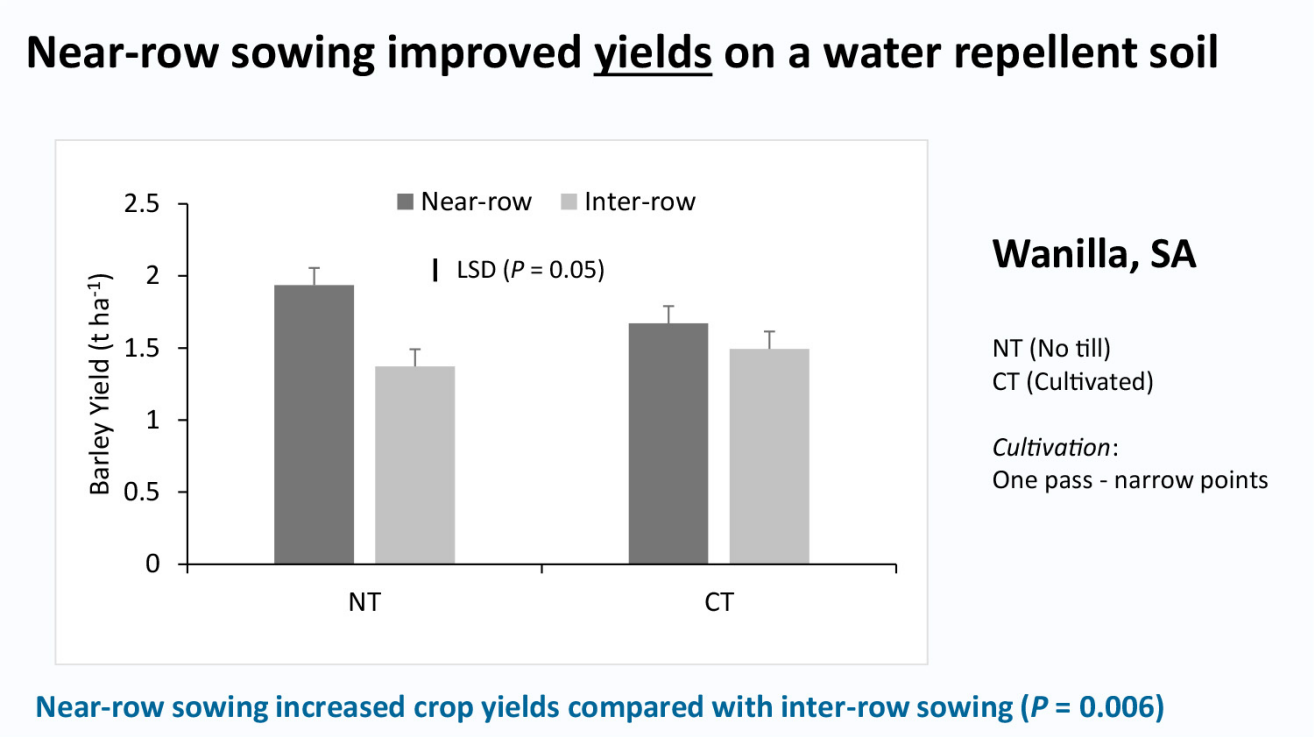

Figure 6 – Near-row sowing at Wanilla, South Australia, increased grain yields by 26% under no tillage (NT), but not after cultivation (CT) which disrupted root pathways for water flow. Reference: M. Roper et al. 2022 Soil Research 60, 360-372 (GRDC project DAW00244)

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Apart from increased water supply, sowing a new crop next to the previous year's crop row provides access to left-over nutrients and amendments, (e.g. calcium carbonate to modify pH) (Figure 7) all of which may contribute to increased grain yields. Soils with low pH can be slow to respond to lime treatment and therefore, seeding a new crop into the previous year's BioFurrow™ where targeted liquid lime treatment commenced a year earlier, has the potential to increase the availability of plant nutrients (due to a more favourable pH) compared with the untreated and more acidic inter-row.

Changing the soil pH and $CaCO_3$ mobility with $CaCO_3$ (0.0015mm)

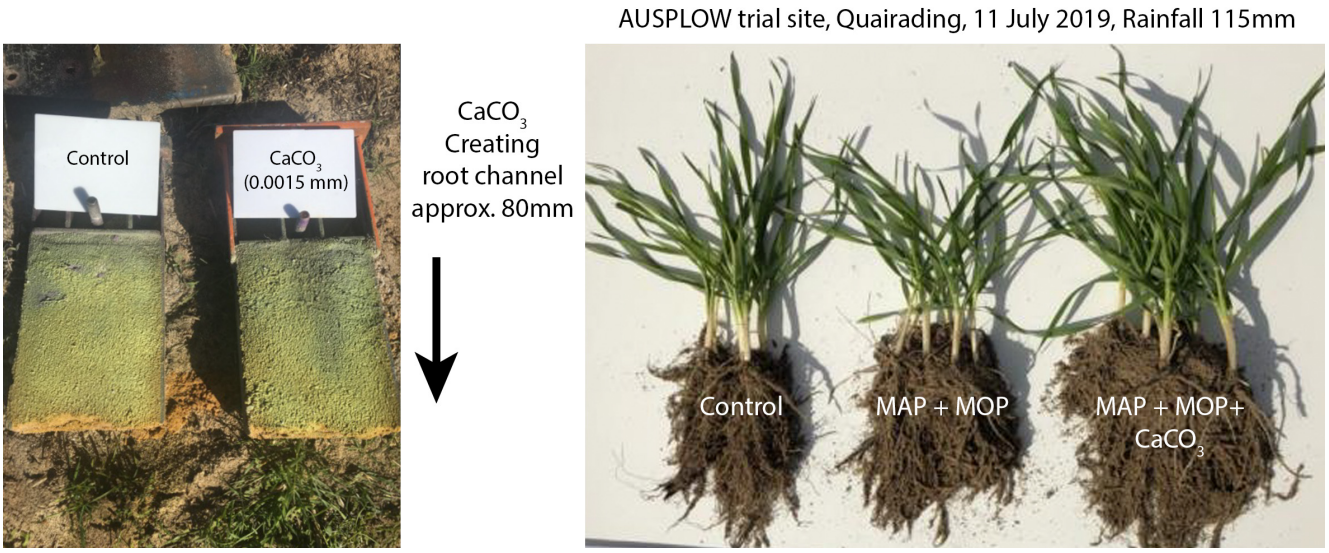

Figure 7 – Calcium carbonate ($CaCO_3$) with 0.0015 mm size particles moves through the soil more quickly than lime containing larger particle sizes.

Photo on LHS shows a pH indicator sprayed on the surface of an acidic soil (yellow). Where $CaCO_3$ (0.0015 mm) was applied, the pH below the application point increased (green zone) and this extended to approximately 80 mm depth.

Photo on RHS. Plants which received $CaCO_3$ (0.0015 mm) were more vigorous both above and below ground than controls without $CaCO_3$. An ideal soil pH increases the availability of nutrients to plants. (Photo credit: Dave Seagreen)

PH in Furrow Dave Seagreen (Download PDF)

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What are the implications for crop

diseases and weed infestation under Near-Row Sowing compared with inter-row sowing?

Sowing crops next to an old crop row raises the question: Does the practice of Near-Row Sowing increase the risk of disease in subsequent crops?
Disease prediction tools such as PredictaB do suggest an increased disease risk. However, farmer experience and field experiments have shown that, under Near-Row Sowing, larger and more diverse populations of beneficial microorganisms in the previously established BioFurrow™ suppress root pathogens and reduce root disease expression, sometimes by up to 50% compared with inter-row sown crops. The risks and expression of above-ground diseases under Near-Row Sowing are less clear and need more research.

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Near-Row Sowing has been shown to reduce competition from weeds, especially on water repellent soils because the inter-row remains dry and weed seeds do not germinate (Figure 8).

Near-row sowing reduces weeds on water repellents soils

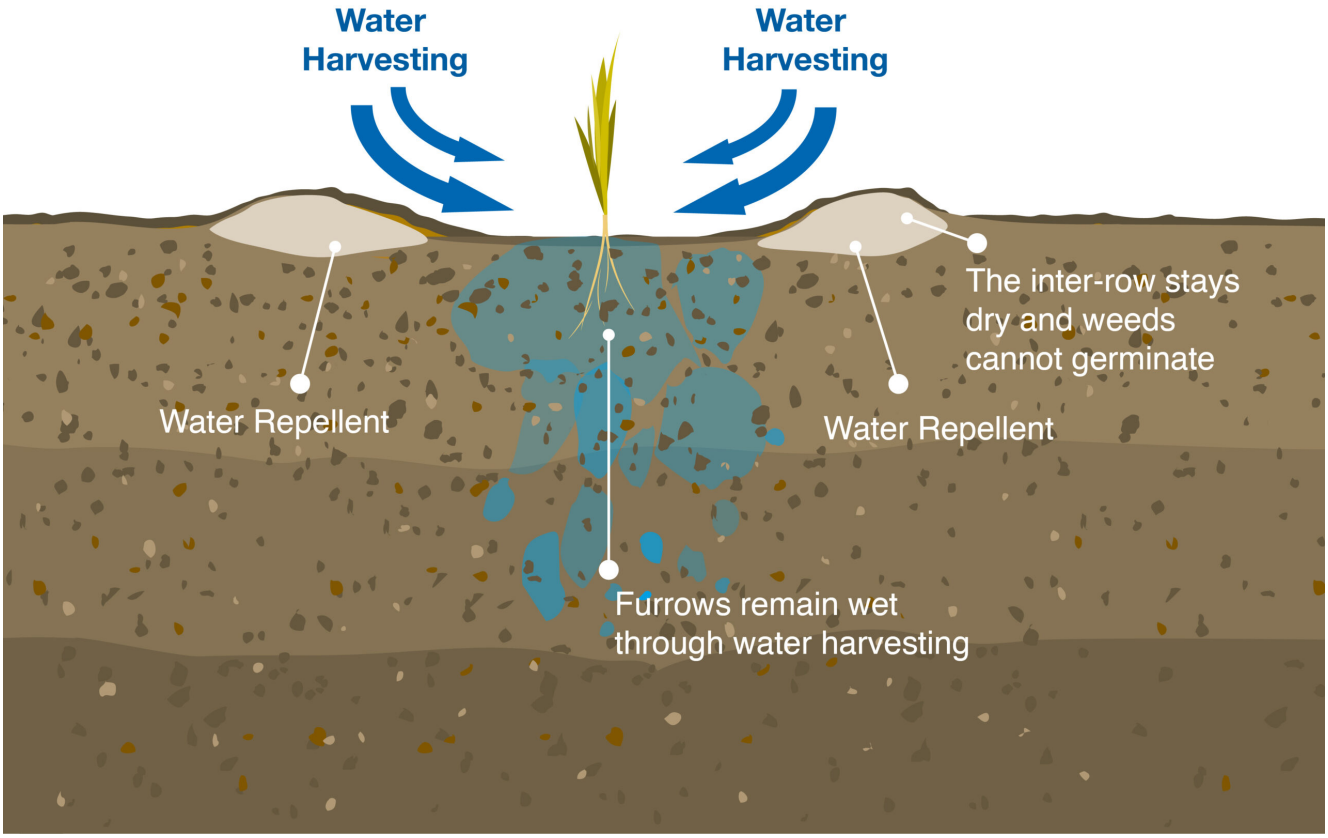


Figure 8 – Near-row sowing reduces competition from weeds (especially on water repellent soils). Drawing: M. Roper et al. (CSIRO; GRDC project DAW00244)

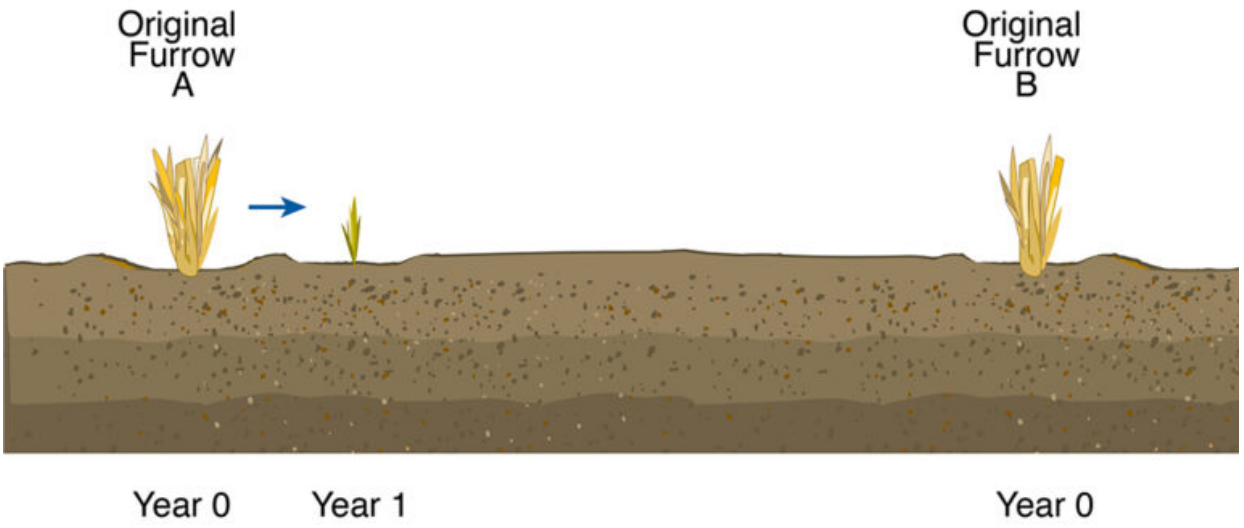
Getting the edge on improving crop productivity on Southern sandy soils
(Download PDF)

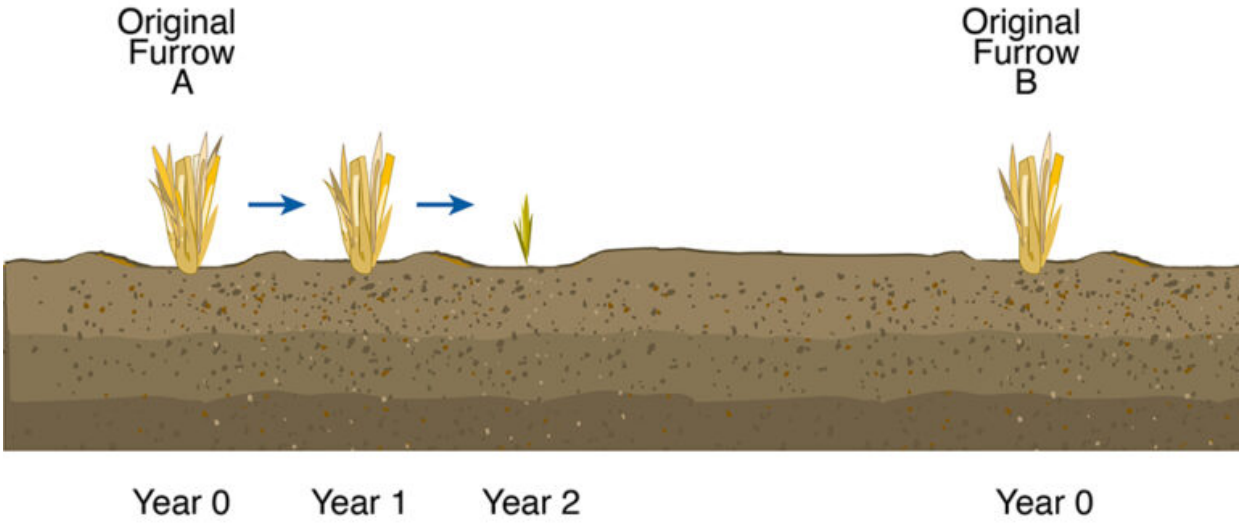
Patterns of near-row sowing:

There are two patterns by which Near-Row Sowing can be achieved:

a) Moving incrementally by 1-2 cm per year in one direction
b) Alternating back and forth by 1-2 cm on either side of a central point.

Pattern (a) aims to spread, over time, the benefits of the BioFurrow™ across the entire paddock (Figure 9a). However, little is known about the longevity of the BioFurrow™ in any one position and it may simply be a sideways movement of the BioFurrow™ with little retention of benefits in each position beyond 1 or 2 years.


Original Furrow A
Original Furrow B
Year 0
Year 1
Year 0


Original Furrow A
Original Furrow B
Year 0
Year 1
Year 2
Year 0

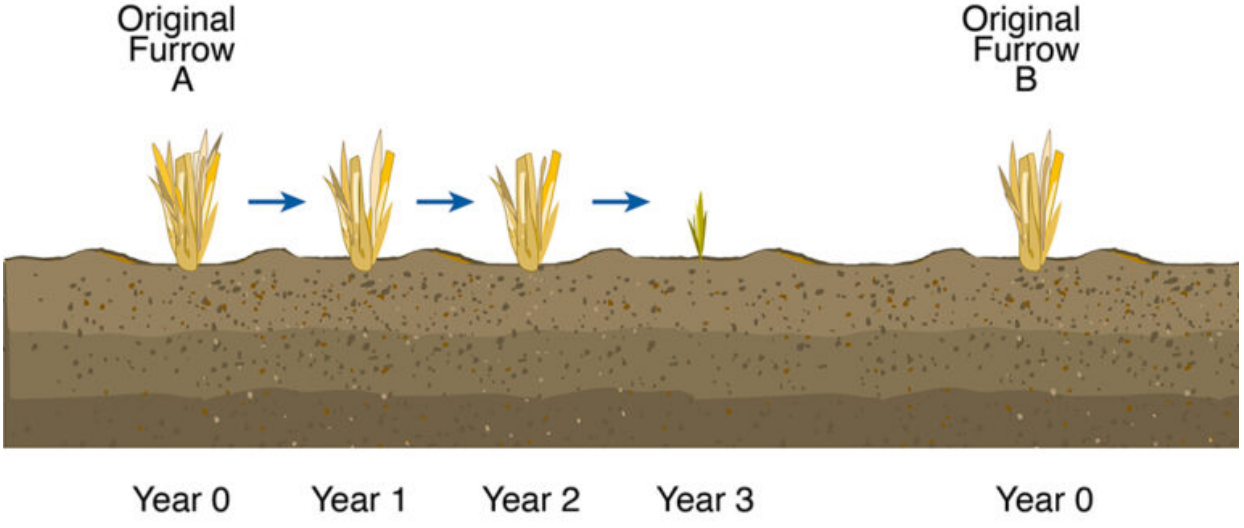
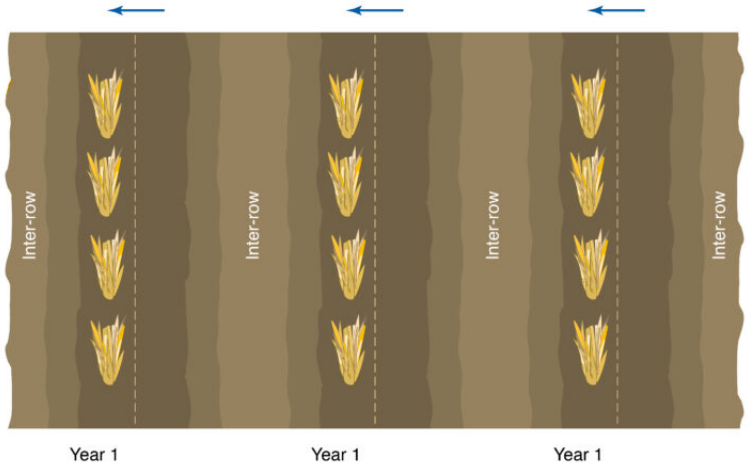
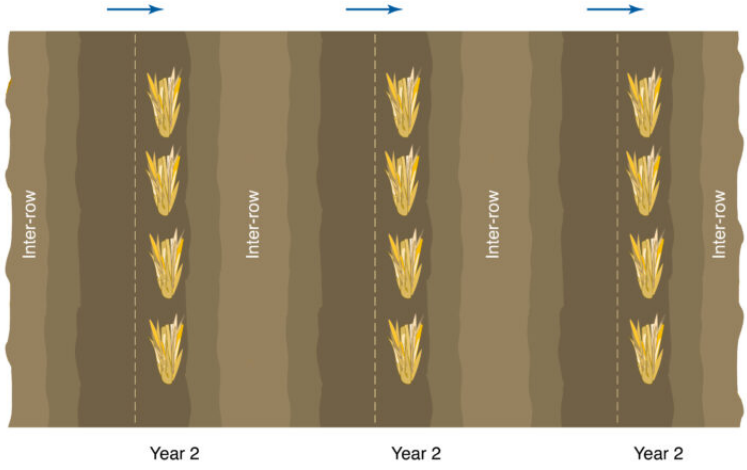

Original Furrow A
Original Furrow B
Year 0
Year 1
Year 2
Year 3
Year 0

Figure 9a – Patterns of near-row sowing: (a) Each year the new furrow is shifted in the same direction by 1- 2 cm from the previous year. Drawing: M. Roper (Ausplow)

Pattern (b) concentrates the benefits of the BioFurrow™ over one central point where it can be maintained in perpetuity (Figure 9b). Reinforcing the BioFurrow™ in the same location each year may be particularly useful in fragile sandy soils where organic matter is less stable than in loamy soils. Loamy soils contain clays known to stabilise and protect organic matter.

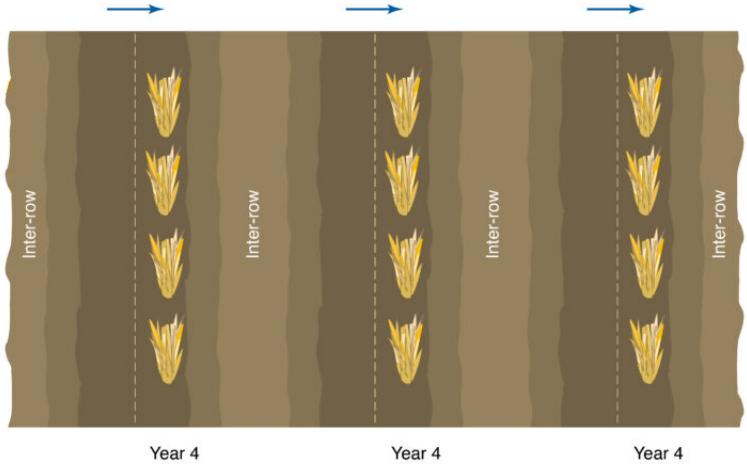


Year 1 Year 1 Year 1



Year 2 Year 2 Year 2

Year 3 Year 3 Year 3



Year 4 Year 4 Year 4

Figure 9b – Patterns of near-row sowing: (b) Each year the new furrow alternates back and forth by 1- 2 cm on either side of a central point (dashed line) leaving the inter-row untouched. Drawing: M. Roper (Ausplow)

Near-Row Sowing into a biologically active BioFurrow™, through the DBS seeding system, is an exciting concept for delivering productive, healthy crops with high quality grain.