



# Soil Management

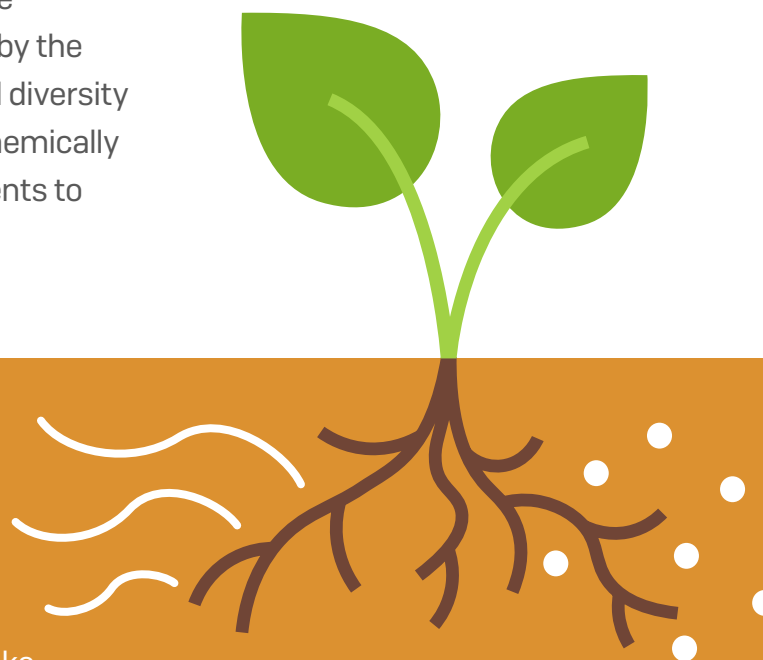
**WHY • WHEN • HOW**

# Maximising Crop Efficiency

Typically less than 5-10% of applied phosphorus is directly available to the treated crop, the rest is retained by the soil. Between 50% and 75% of the nitrogen applied to the field is not used by the plant and is lost by leaching into the soil. Beneficial soil microorganisms are able to improve soil fertility by metabolising both phosphorus and nitrogen whilst significantly increasing their plant availability.

A crop's ability to extract these resources is directly affected by the levels of microbial activity and diversity in the soil. This acts to both chemically alter and release locked nutrients to make them plant available.

SMART ROTATIONS seeks to offer advice in land management. After correct application the microbial activity in soil is increased and leads to enhanced crop efficiency at extracting soil-bound fertilisers.



## Mycorrhizal Fungi

- 700x Increase in root size
- Release phosphorus
- Increase water uptake
- Enhance nitrogen uptake
- Increase micro element uptake

## Beneficial Bacteria

- Fix nitrogen
- Solubilise phosphorus
- Produce natural plant hormones
- Contribute to organic matter



Smart Rotations Mycorrhizal fungi products are sold as granules for application through micro applicators



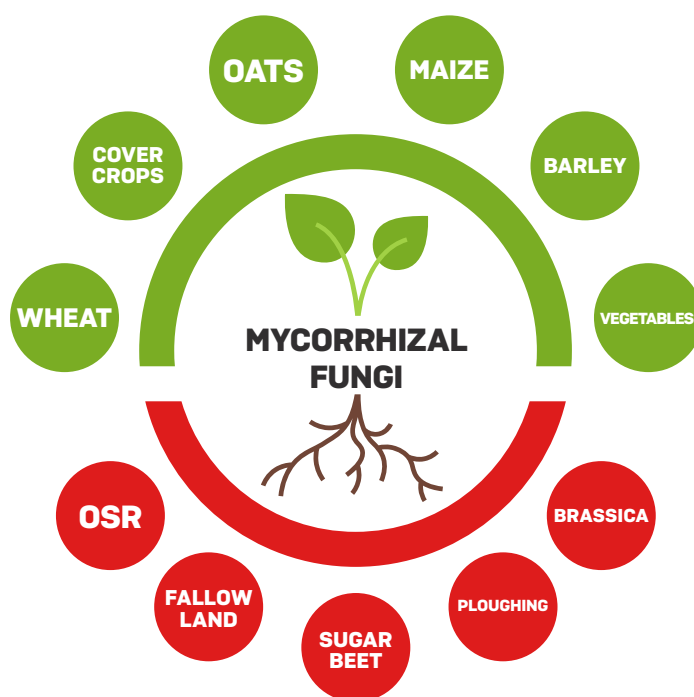
Smart Rotations Bacterial products are sold as liquids for spray application directly to ground

Maximised crop efficiency requires that the foundation of microbial communities is built up over the complete rotation programme.

Three mycorrhizal fungi products are available: SR1 Cereals (MPN >150k /L), SR1 Field Vegetables and Pulses (MPN >300k /L) and SR2 for treating Cover Crops and Leys (MPN >100k /L).

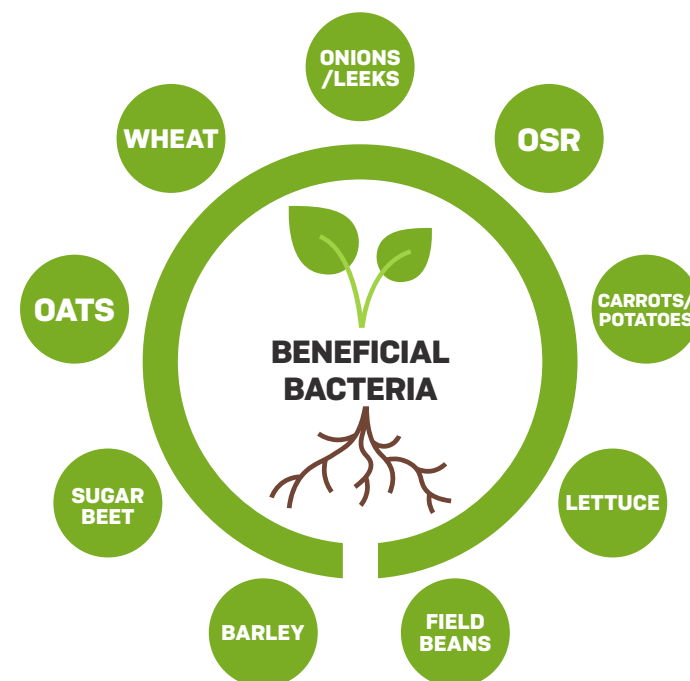
Beneficial consortia of bacteria formulated for specific crop types. The SR3 Bacteria range currently comprises products for Wheat (Winter & Spring), OSR, Oats, Sugar Beet & Spinach, Lettuce, Onions & Leeks, Carrots & Potatoes.

### CROPS IN A ROTATION THAT ENCOURAGE MYCORRHIZAL FUNGI



### CROPS & PRACTICES IN A ROTATION THAT DISCOURAGE MYCORRHIZAL FUNGI

### BENEFICIAL BACTERIA SUPPORT ALL CROPS IN ROTATIONS



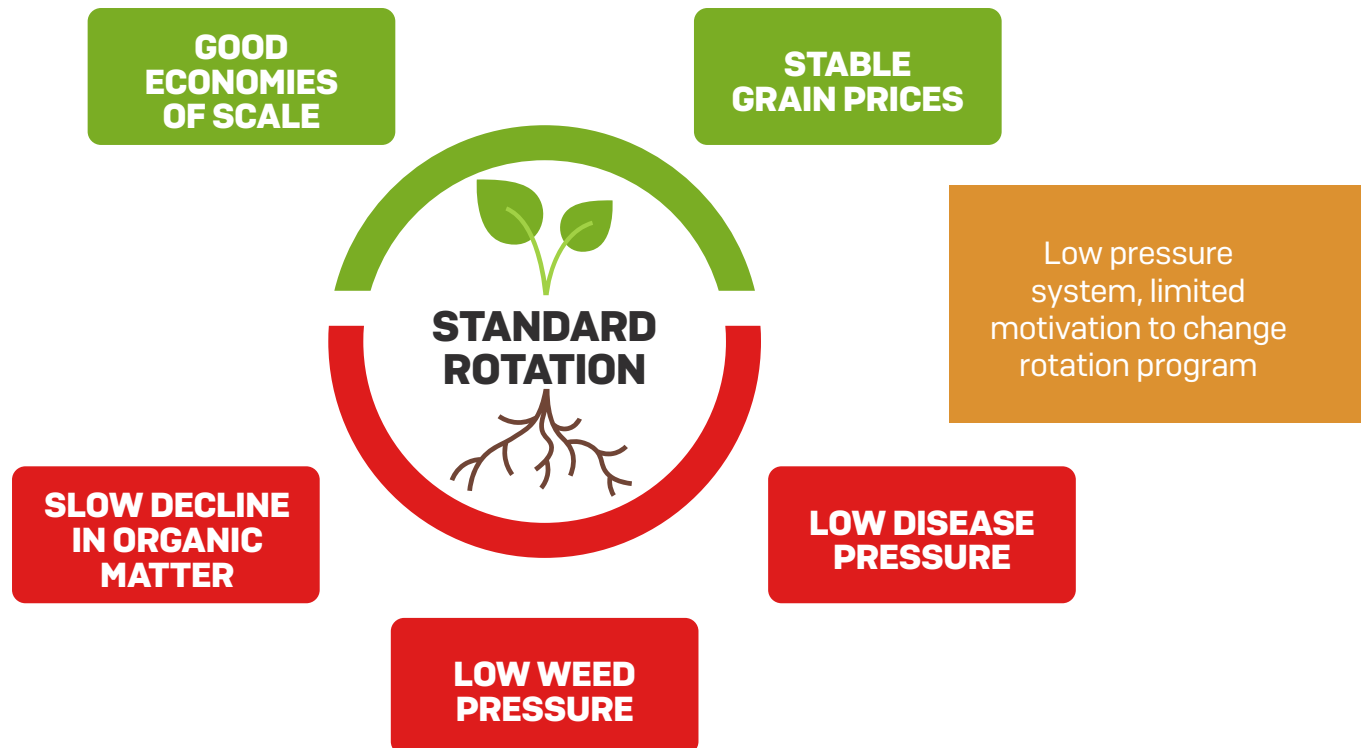
### TUNED BACTERIAL PRODUCTS DO NOT CURRENTLY EXIST FOR ALL CROP TYPES

# Standard Rotation

Rotation design is influenced by both positive and negative pressures, for example, the desire to explore new markets and increasing weed ingress.



## POSITIVE PRESSURES



## NEGATIVE PRESSURES

# Smart Rotation: Ploughing **EXAMPLE**

A common rotation that may come under increasing pressure for change post the reduction of pesticides and the adoption of a long term strategic view concerning the management of soil health as soil organic matter declines.

OCT – AUG

AUG – OCT

OCT – AUG

AUG – OCT

OCT – AUG

AUG – OCT



In this short rotation with fallow periods it would not be recommended to use mycorrhizal inoculants



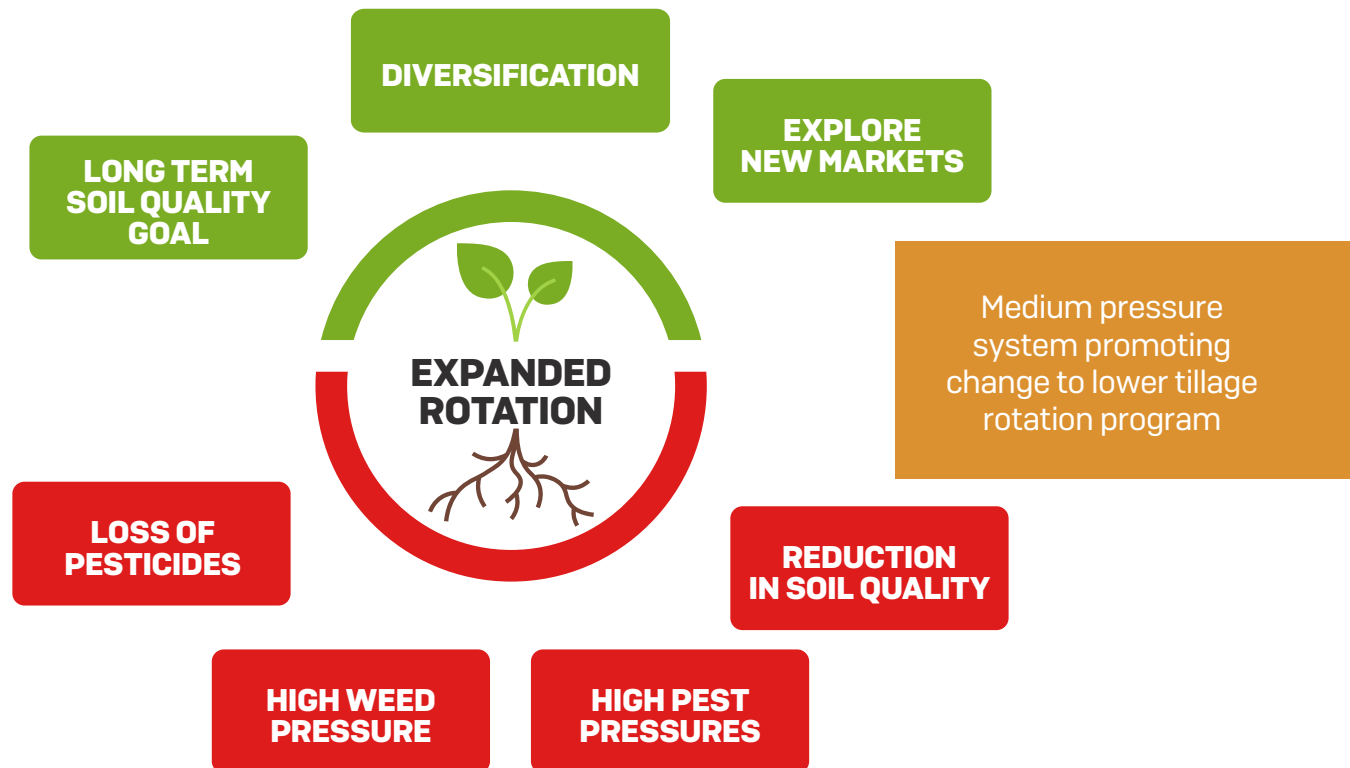
SR3 Liquid bacterial products can be deployed to aid early establishment and increase grain potential

# Expanded Rotation

As pressures build to move away from standard rotations options to proactively manage soil biology increase.



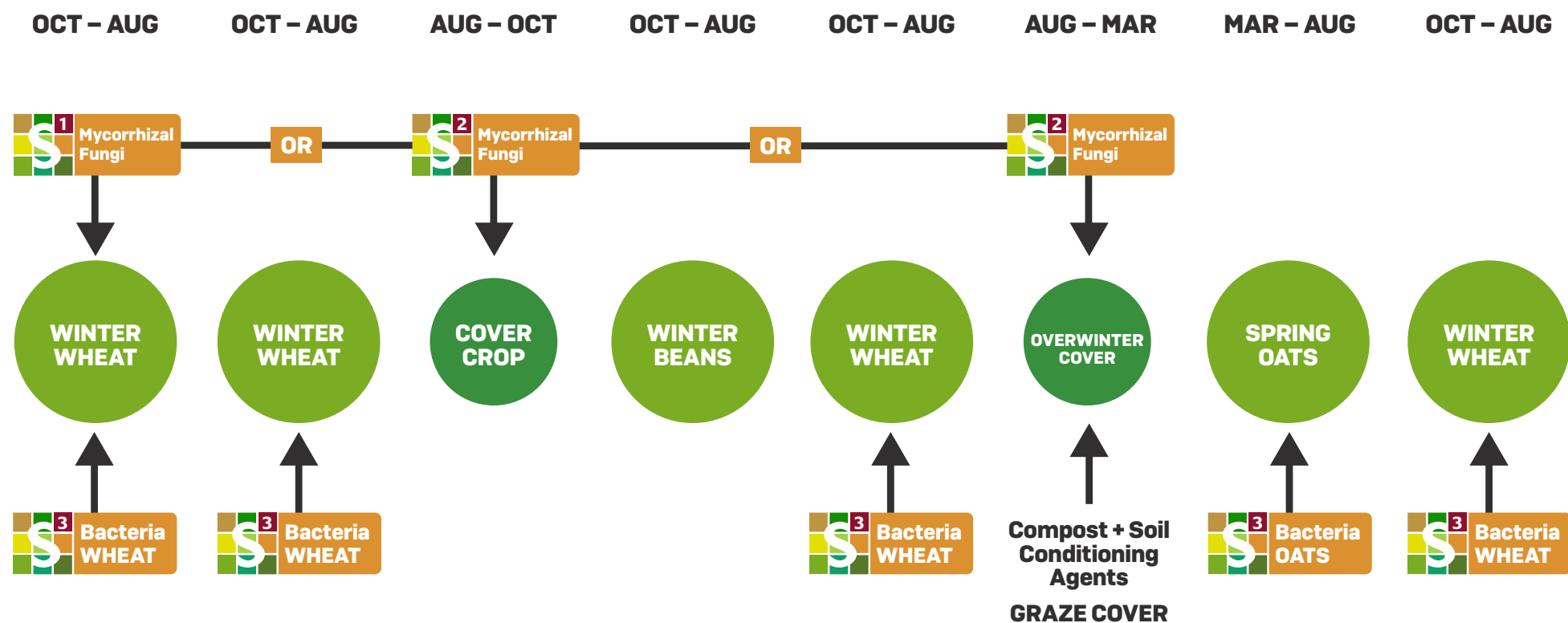
## POSITIVE PRESSURES



## NEGATIVE PRESSURES

# Smart Rotation: Strip Tillage / Direct Drilling **EXAMPLE**

The adoption of continued green cover and appropriate selection of cover crops allow for the management of mycorrhizal fungi over the rotation program. Increased fungal mass in the soil directly enhances the functioning of applied beneficial bacteria.



Two options would be recommended for this rotation, a high concentration blend of mycorrhizal fungi for drilling with the first wheat or a lower concentration blend to treat the follow on cover crop



SR3 Wheat can be supplied for single use in spring or as a two part treatment for use in winter and spring



# Conservation / Regenerative Rotation

The implementation of direct drilling offers the greatest opportunity for soil management over a rotation.



## POSITIVE PRESSURES

DIVERSIFICATION

LOWER  
DIESEL COSTS

NEW  
MARKETS  
/NOVEL CROPS

LONG TERM  
SOIL QUALITY  
GOAL

CONSERVATION  
/REGENERATIVE  
ROTATION

Increasing pressures  
leading to adoption of  
greater soil focused  
farming

LOSS OF  
PESTICIDES

REDUCTION  
IN SOIL QUALITY

HIGH WEED  
PRESSURE

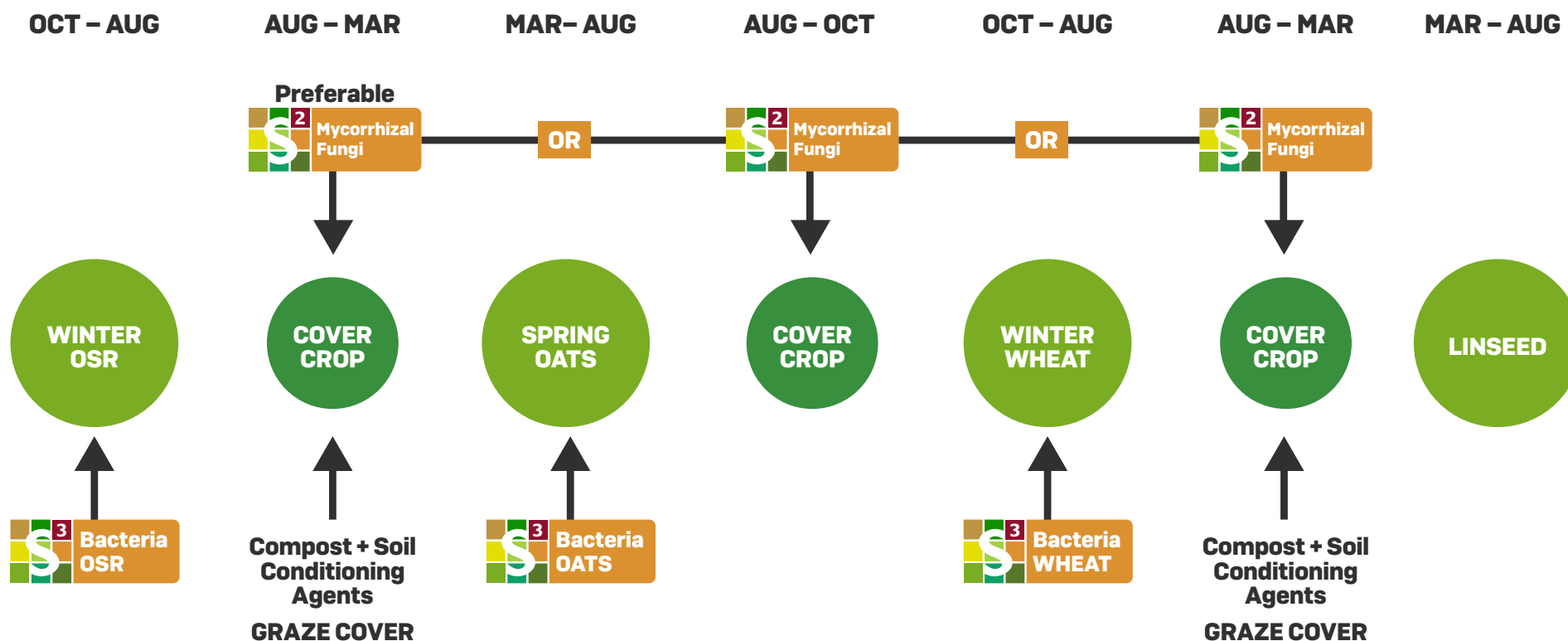
HIGH PEST  
PRESSURES

## NEGATIVE PRESSURES



# Smart Rotation: Direct Drilling **EXAMPLE**

A rotation for Direct Drilling that allows for 2x high value Winter crops and provides 3x cover crop opportunities every four years. OSR will break the carbon cycle for Arbuscular Mycorrhizal Fungi, therefore reintroduction of these micro-organisms with the following crop is highly recommended. Consideration must be given to proper management of the intervening covers, as well as taking advantage of the opportunities therein to nourish soil biology.



Three options would be recommended for this rotation, a high concentration blend of mycorrhizal fungi for drilling with the first wheat or a lower concentration blend to treat the follow on cover crops



SR3 Wheat can be supplied for single use in spring or as a two part treatment for use in winter and spring

# About Us

PlantWorks is the UK's resource for bio-fertilisers. Our products are developed by a qualified group of in-house mycologists, bacteriologists and horticulturalists and in collaboration with leading academic institutions.

PlantWorks is based at facilities at the Kent Science Park and NIAB EMR in Kent where it produces mycorrhizal fungi and beneficial bacteria. The company is one of Europe's largest manufacturers of mycorrhizal fungi producing in excess of 150 tonnes of high grade inoculum every year.

In 2013 PlantWorks extended its product range through the introduction of a series of Plant Growth Promoting Rhizobacteria [PGPR]. This group of bacteria cover functions from non-host specific nitrogen fixation, phosphorus solubilisation to plant hormones production.

The SMART ROTATION brand was launched in 2017 after four years of laboratory and field research. The product range currently comprises ten products with a series of new additions currently in trial.



# Products

## MYCORRHIZAL FUNGI GRANULAR FORMAT

Product Code	Description	Actives	Treatment Area per Unit
SR001	<b>SR1 Cereals</b>	AMF* + Biostimulant (30% Active Ingredient)	<b>1 Hectare</b> [~2.5 Acres]
SR002	<b>SR1 Field Vegetables</b>	AMF + Biostimulant (60% Active Ingredient)	<b>1 Hectare</b> [~2.5 Acres]
SR003	<b>SR2 Fodder Grass, Leys &amp; Cover Crops</b>	AMF + PGPR**	<b>1 Hectare</b> [~2.5 Acres]

\*AMF - Arbuscular Mycorrhizal Fungi

\*\*PGPR - Plant Growth Promoting Rhizobacteria



### TALK TO AN EXPERT

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## BENEFICIAL BACTERIA LIQUID FORMAT

Product Code	Description	Actives	Treatment Area per Unit
SR004	<b>SR3 Beets &amp; Spinach</b>	PGPR** + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR005	<b>SR3 Carrots &amp; Potatoes</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR006	<b>SR3 Onions &amp; Leeks</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR008	<b>SR3 Oil Seed Rape</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR009	<b>SR3 Wheat</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR010	<b>SR3 Oats</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]
SR011	<b>SR3 Lettuce</b>	PGPR + Biostimulant	<b>5 Hectare</b> [~12.5 Acres]

