How to set up on-farm crop trials testing microbial inoculants

WP5

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Introduction and training objectives:

- Microbial inoculants are soil amendments containing beneficial microorganisms, able to promote crop health and growth.
- Aimed at farmers, advisors and researchers thinking of carrying out their own on-farm trials testing microbial inoculant
- This presentation provides guidance to design trials that assess impacts of microbial as a natural method to increase soil fertility, health and crop growth.

Why test microbial inoculants?

- Microbial inoculants are soil amendments containing beneficial microorganisms, able to promote crop health and growth.
- A wide range of microbial inoculant products are available commercially, presented as inputs for crop production that increase soil fertility and nutrient accessibility in crops.
- Microbial inoculants can be easily applied to soils, seeds and crop roots, and are cheaper than more resource-intensive inputs. Microbial inoculants are biological and free from chemical products, lowering their environmental impact in contrast to artificial nitrogen, phosphorus, and potassium fertilisers.
- The effects of microbial on soil and crop health can vary depending on local environmental conditions and management.

Top: soli sample taken by UK arable farmer. Bottom: potato crops in east of UK. *Source: LEAF.*

Stage 1:

- Identify a crop you think will benefit from a microbial treatment, for example, potatoes or wheat.

- Ideally a selected crop will be a regular part of a rotation subject to biotic (e.g., pest or disease) or abiotic (e.g. nutrient deficiency or drought) stressors.

Plot trials testing microbial inoculants in potatoes at Newcastle University research farm, UK. *Source: LEAF*

Stage 2:

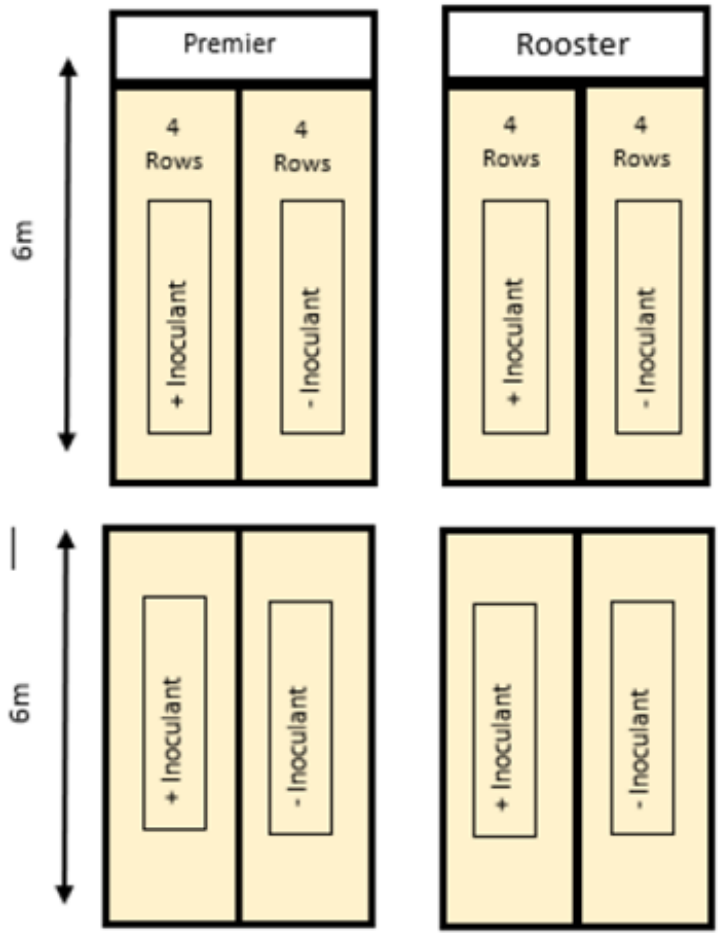
- Select and buy a microbial inoculant product you are interested in using on-farm.

- Make sure to check if the product is approved for commercial use in the specific location (country/region) and according to any relevant certification standards.

Commercially available microbial inoculant product sold in the UK.
Source: PlantWorks

Stage 3:

- Select two adjacent areas in a crop field that can be used for a control plot and a variable plot.
- Make sure that the two plots are similar in every other way, with the same past crop rotation, management and simi-lar soil type, aspect, and slope.
- Keep away from field boundaries, hedges, and margins.
- Plot sizes can be as large as a hectare but must be at least 6m in length and the width of relevant planting equipment. This ensures a large enough area to avoid unwanted external influences on the area.



Plot trial design of on-farm trial testing microbial inoculants in different potato varieties (Rooster and Premier) in the east of the UK. *Source: LEAF*

Stage 4:

- At sowing, sow seeds in the control plot as ‘normal’ based on typical management and cropping system. In the variable plot, sow seeds (of the same variety) along with application of the microbial inoculant as directed by the sup-plier.
- Record date and time of sowing and application, soil type, and seed rate. Keep seed rates the same in each plot and sow both plots on the same day.
- Keep all applications of inputs the same in each trial plot (e.g., fertilizer, irrigation, micronutrients, etc.).
- Once the crop is established, record and compare any differences between the plots throughout the growing season (e.g., disease presence, leaf greenness, evidence of pests, crop height, etc.). At harvest, measure and compare yields in each plot.

Records of biotic stresses:
Diseases
Pests

Field measurements:
Biomass sampling
Nitrogen residues (biomass and soil)

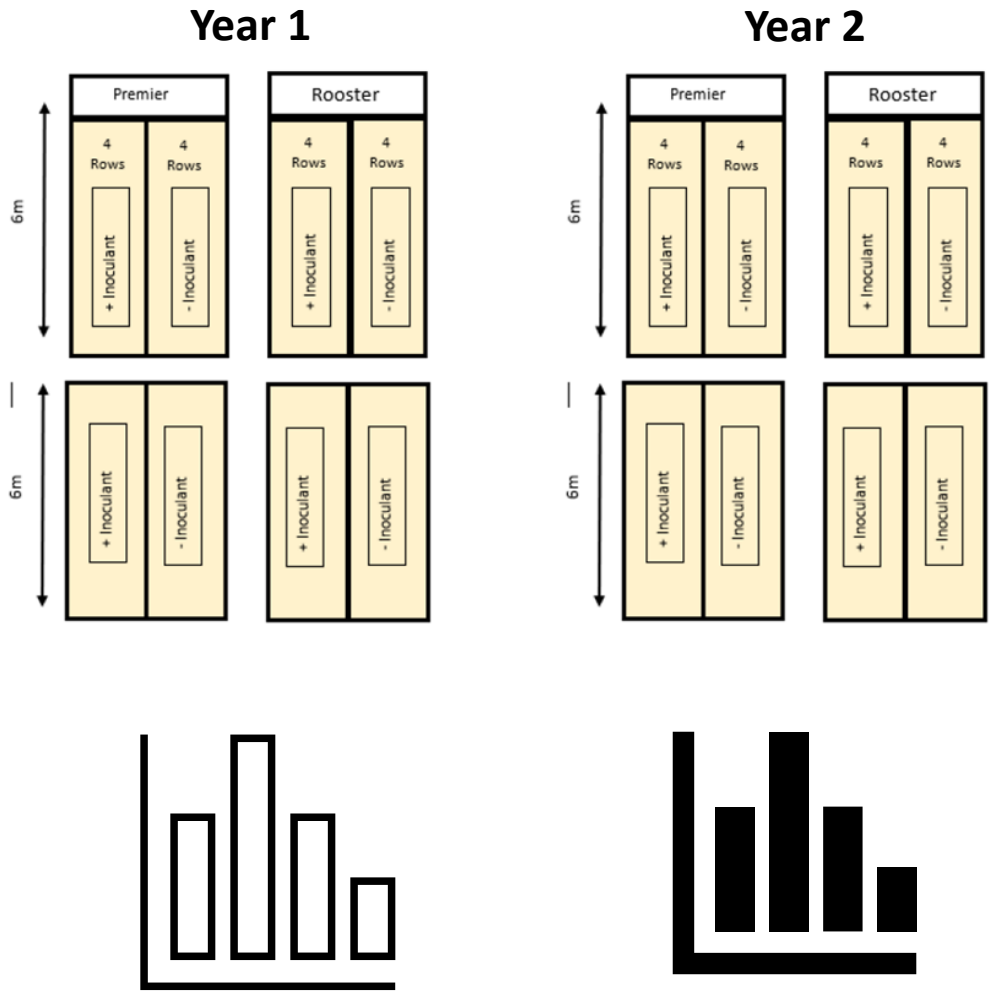
Timings of phenological stages:
Emergence
Heading
Flowering
Harvest

Management practices:
Irrigation
Nitrogen application (timing and rate)
Pesticide application

Stage 5:

- Where you only have two plots to compare, consider if any differences in yield you recorded have resulted in an economic benefit considering the costs of application and the value of the crop.

- If possible, it is a good idea to repeat your trial at several places within the field so that you can calculate average yields and the standard deviation of those yields
- This will give you a better idea of whether the differences between the treatments are due to simple variability within the field, or if they are true differences.



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Benefits:

- On-farm trials testing microbial inoculants will help to determine if they are an easier, cheaper, and more practical alternative to conventional inputs and application methods.

- Testing microbial inoculants on commercial farms will contribute to research into their efficacy.

- Trials will help to determine if microbial inoculants can be an important and positive innovation for agriculture in the future