Utilization of Soil Microbial Diversity for Crop Production in Sri Lanka

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Fertilizers and Soil Fertility

- **Short term crops** require a rapid supply of nutrients to produce high yields.
- This warrants the application of **chemical fertilizers: N, P & K** in particular. However continuous use of such fertilizers had not given sustainable high yields, but led to environmental pollution which had resulted in an increase in environmental health problems.
- It is therefore necessary to explore **alternatives** to sustain high yields and soil fertility **for eco-friendly agriculture**.

The Sri Lankan Scenario

- Sri Lanka imports all our chemical fertilizer requirements and provide them to farmers under a heavy subsidy.
- Excessive use of fertilizers had led to severe environmental pollution and had increased environmentally related health problems like Chronic Kidney Disease of uncertain etiology, Cardiovascular diseases, cancer and blue baby syndrome.
- The government had therefore decided to minimize the use of chemical fertilizers with alternative sources.
- This presentation reports on the development and use of **Biofertilizers** in Sri Lanka using its soil microbial biodiveristy

BIOFERTILIZERS

- **Live microbial entities** that improve soil fertility and plant growth.
- **Different from all other fertilizers** which function as **non-living substrates** providing nutrients to plants.
- Biofertilizers are **live microbial inoculants** that associate intimately or live in symbiosis with plants and improve uptake of nutrients.
- This presentation will describe the development of **rhizobial biofertilizers** and **biofilm-biofertilizers** by the NIFS and their use in Sri Lanka.

METHODOLOGY

- Isolation and purification of **Rhizobia** from root nodules of local crop and wild legumes followed standard methods (Somasegaran & Hoben 1994). Initial isolation and successive culturing was on CRYMA to detect contaminants until pure cultures were obtained and these were maintained on YMA and sometimes on ½ Lupin Agar.
- Free living and root associated bacteria and fungi were grown on standard media and selected isolates were made to form bio-films as described in Seneviratne et al (2011).
- All isolates came from Sri Lankan soil microbial biodiversity.

RHIZOBIOLOGY

Field testing vegetable beans and groundnut

- Vegetable beans (*Phaseolus vulgaris*)



- Groundnut (*Arachys hypogea*)



FORAGE CROP CLOVER AT AMBEWELA DAIRY FARM

Coated clover seeds

Field application

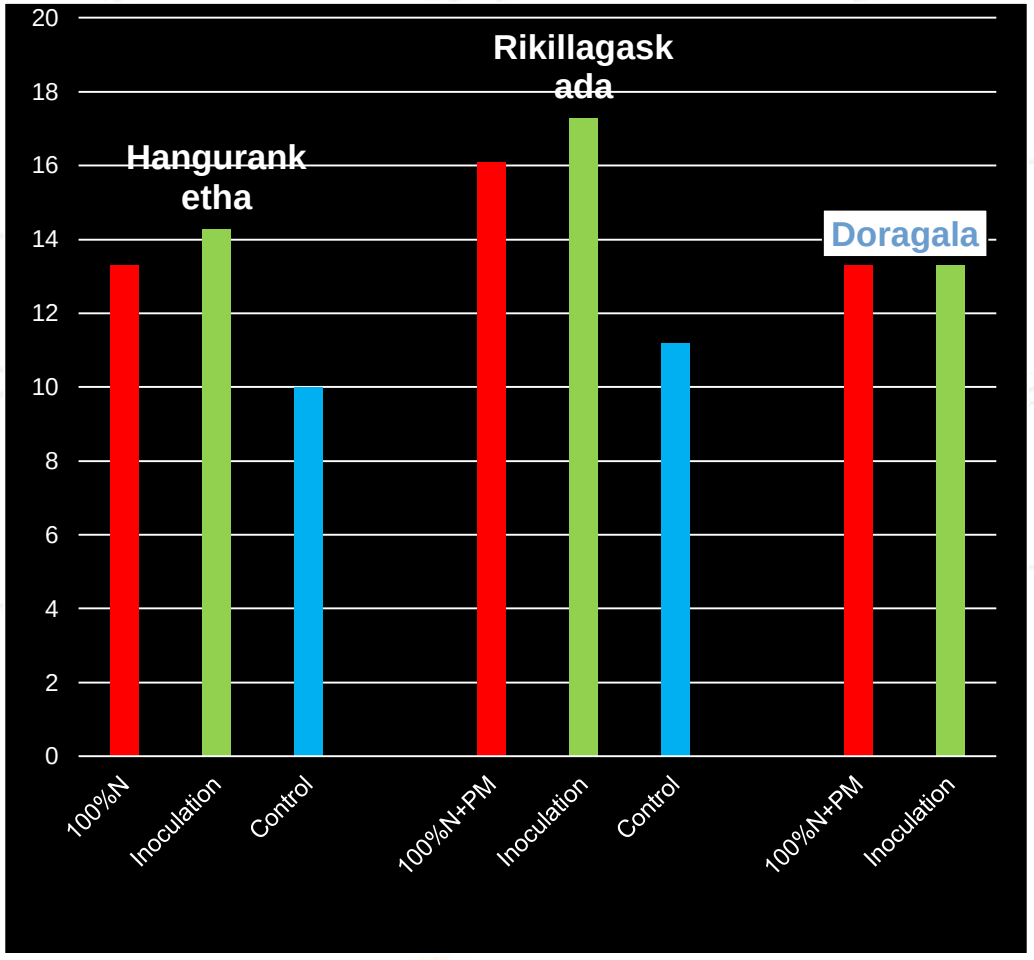
Loading liquid inoculant

Spraying inoculant after crop cut

RESULTS

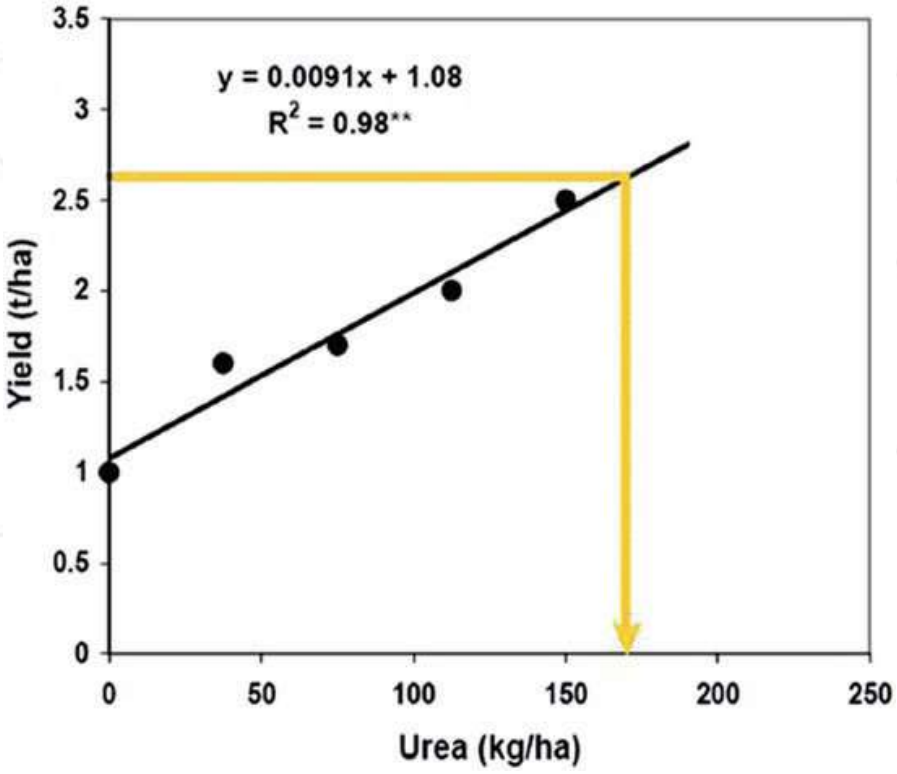
2017: Dept of Agriculture: Inoculated Soybean

VEGETABLE BEANS (*Phaseolus vulgaris*)

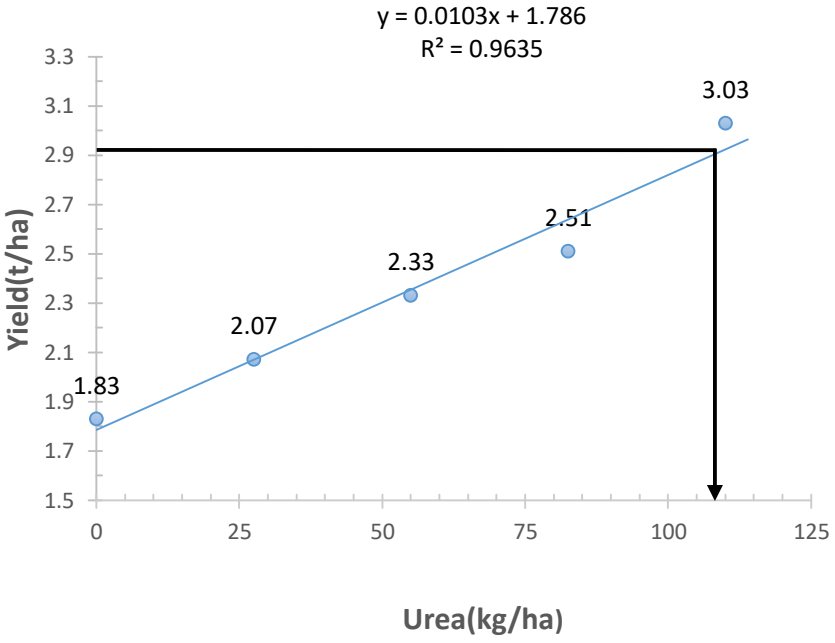


Comparison of Rhizobial Inoculation with Fertilizer N-reponse

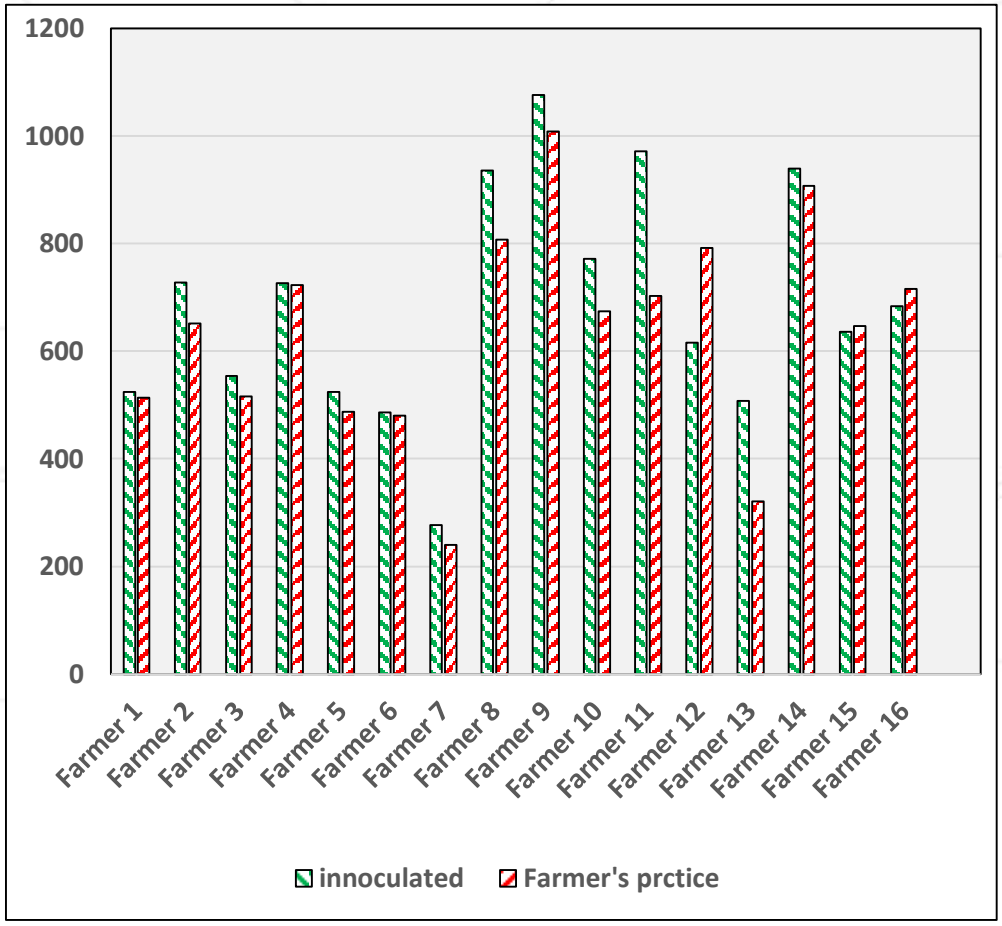
On Soybean (*Glycine max*)



On beans (*Phaseolus vulgaris*)



FIELD TESTING OF INOCULANTS WITH MUNG BEANS



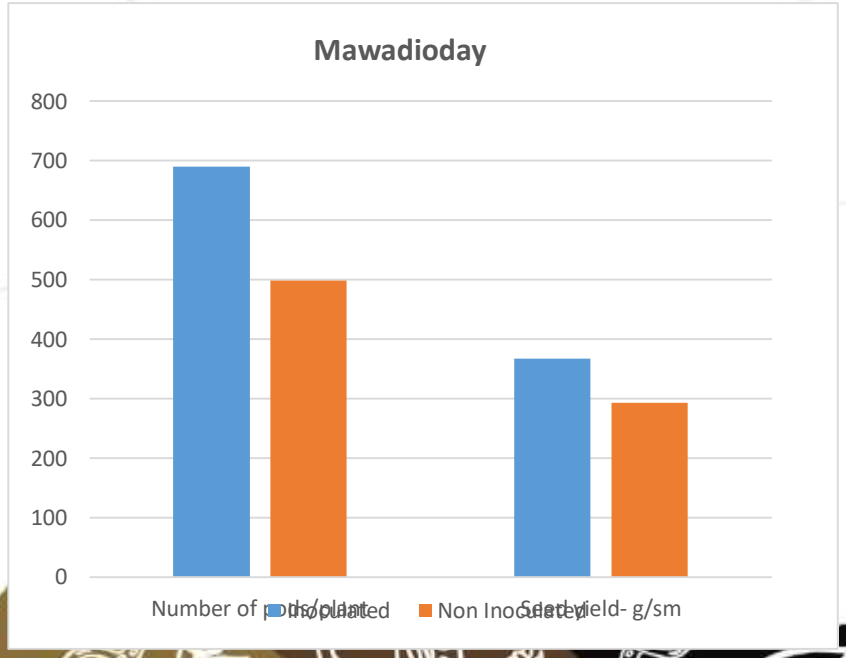
by different farmers

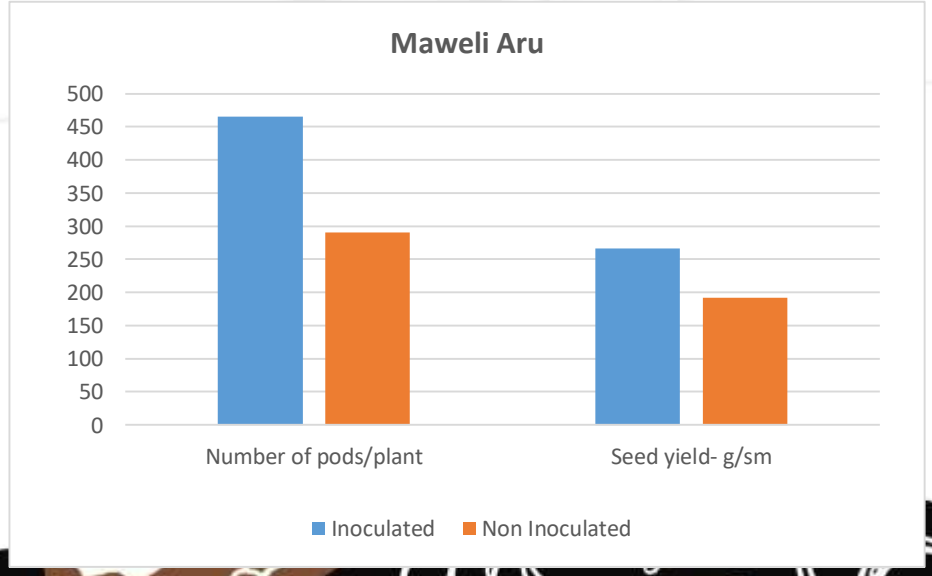
Results with Groundnut

Inoculated

Uninoculated

Inoculated **Uninoculated**



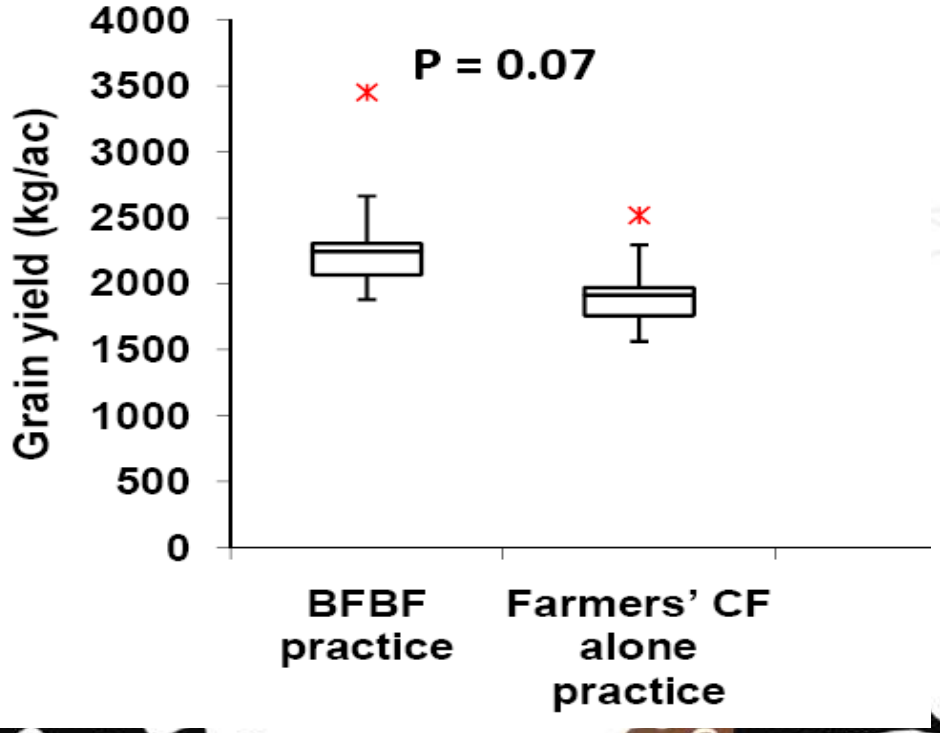


Right: BFBF applied plant
Left: Farmer's practice

Mr. R. Gunaratne Banda, Rambukkana, Kegalle
2020 Maha Season

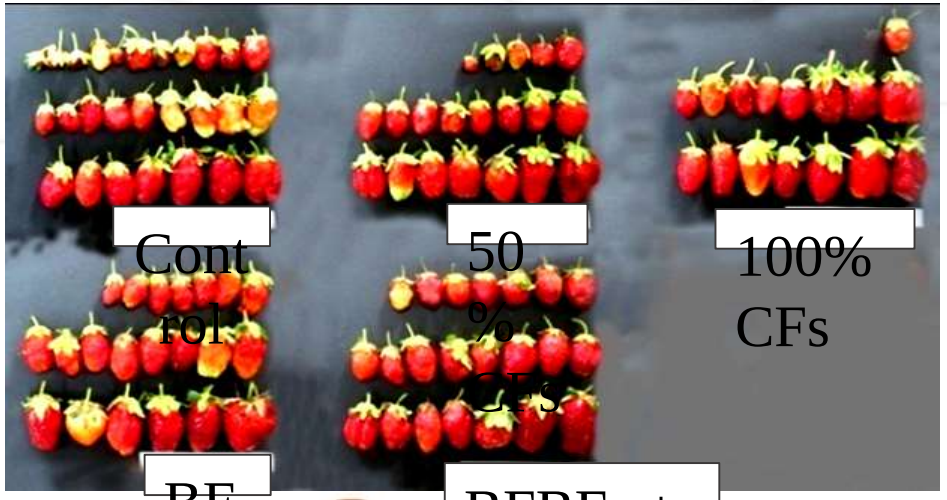
Statistical comparison of paddy grain yields between BFBF practice (2307 kg/ac) and farmers' CF alone practice (1916 kg/ac) in island wide field trials in 82 locations during Yala 2018

In farmer field research even up to P = 0.10 is considered **as statistically significant (Mullen et al., 2008)**



BFBF Field Trials with Corn at Mahiyangana

Field testing of BFBF with vegetables & Fruits



BIOFILM-BIOFERTILIZER ON TEA

Conclusions

- **Rhizobium biofertilizers are supplied annually to about 10,000 acres of food legumes and 250 acres of the forage legume clover grown at Ambewela Dairy Farm.**
- **Field trials with Biofilm-Biofertilizer (BFBF) on non-legume crops like corn, vegetables & fruits and tea had been successful. Field trials amounting to 15000 acres done with rice in 80 locations has shown that more than 50% of NPK fertilizer can be saved with 20 to 30% increases in yield. Currently extension work on application of BFBF to 100,000 acres of rice is in progress.**
- **The Government has approved providing BFBF to rice farmers under a subsidy scheme from the next season.**
- **These biofertilizers can be recommended with confidence for low cost, eco-friendly agriculture and support the Government's efforts to achieve the Sustainable Development Goals of the United nations.**

THANK YOU FOR YOUR KIND ATTENTION