Enhancing Soil functional diversity of Rice fields





Enhancing Soil functional diversity of Rice fields

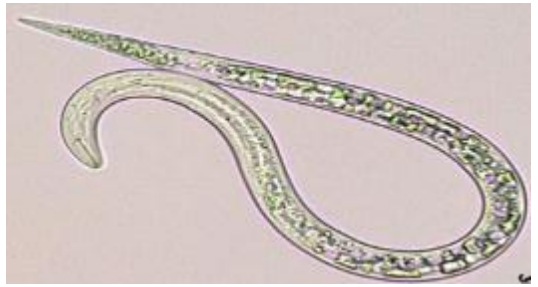
SofunRice aimed to address at least two questions:

1) Does conservation agriculture induce changes in living soil communities? If so, does this correspond to changes in the mineral composition of the soil? Which signature?

2) Can we identify microorganisms that may play a role in biological control?

Enhancing Soil functional diversity of Rice fields

From the point of view of a phytopathologist, what might be the point of using agroecology to fight against plant parasitic nematodes?



- Large host range that limit the possibilities of crop rotation
- No elite rice breeding lines or hybrid varieties resistant to the most damaging PPNs
- Methyl bromide, have been banned from most countries as a result of United Nations protocols (MBTOC, 2010)

Molecular Plant Pathology

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Pathogen profile

Meloidogyne graminicola: a major threat to rice agriculture

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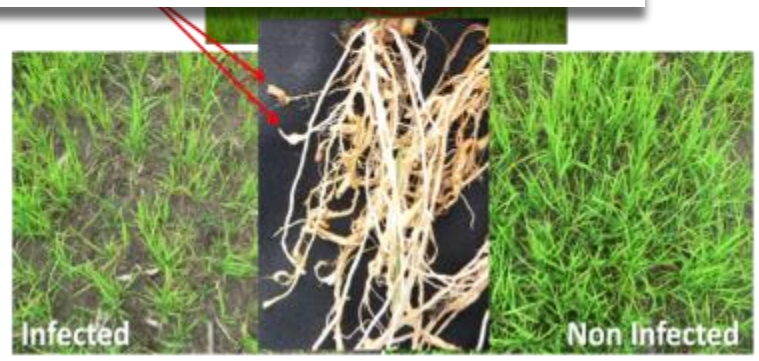

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MAFF task force set to ban fungicide

By May Kunmakara
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The Ministry of Agriculture, Forestry and Fisheries (MAFF) set up a task force yesterday, just 72 hours after the European Commission announced that Cambodia's milled rice industry must eradicate the use of the fungicide Tricyclazole by June or face import bans.

Hean Harn, director-general for the general directorate of agriculture at the ministry, told *Khmer Times* that the task force will comprise experts from his department and other sections of MAFF.

"They will work together to collect as much information as possible on the use of the fungicide by rice farmers and conduct tests with rice samples collected from local markets to detect the presence of Tricyclazole," Mr. Harn said.

The strict new Maximum Result Limit, by the European Commission, will mean rice must not contain more than 0.01 milligram of the chemical per kilogram of the grain.

The limit was adopted by the commission in February and rice producers are now being set deadlines to comply.

The European Commission said on Monday that rice farmers in Cambodia must stop the use of Tricyclazole by June.

Agricultural representatives from the European Commission also had a meeting with stakeholders from Cambodia's rice industry on Monday to inform them about the new minimal residual limits for Tricyclazole.

"Europe is one of our big rice importers and we have to take immediate action to avoid any problems," added Mr. Harn.

From September 2015 to April 2016, the European Union imported 261,692 metric tons of rice from Cambodia.

Tricyclazole is used by farmers to control rice blast disease which can be extensive due to the ability of the fungus to thrive under favorable conditions. According to medical research Tricyclazole residues in food can cause cancer in humans.

"Our experts will go directly to the big markets in Phnom Penh to test the milled rice sold by traders for Tricyclazole residues," said Mr. Harn.

Rice farmers use the fungicide Tricyclazole to control the fast spreading blast disease.

"At the same time we will conduct inspections of all licensed fertilizer and pesticide importers to make sure that they are not importing the fungicide," he added.

Responding to criticism from India, Vietnam and southern European rice producing countries that prohibiting the use of Tricyclazole could significantly affect production and exports, the European Commission said in a directive that: "The Commission's intention was not to damage the sector but to have a fair and transparent approach, based on science, for all substances in order to protect human health and the environment in accordance with the EU legislation."

In the meantime, the Cambodia Rice Federation (CRF) also set up its own working group to spread the news to their members, farmers, millers and exporters.

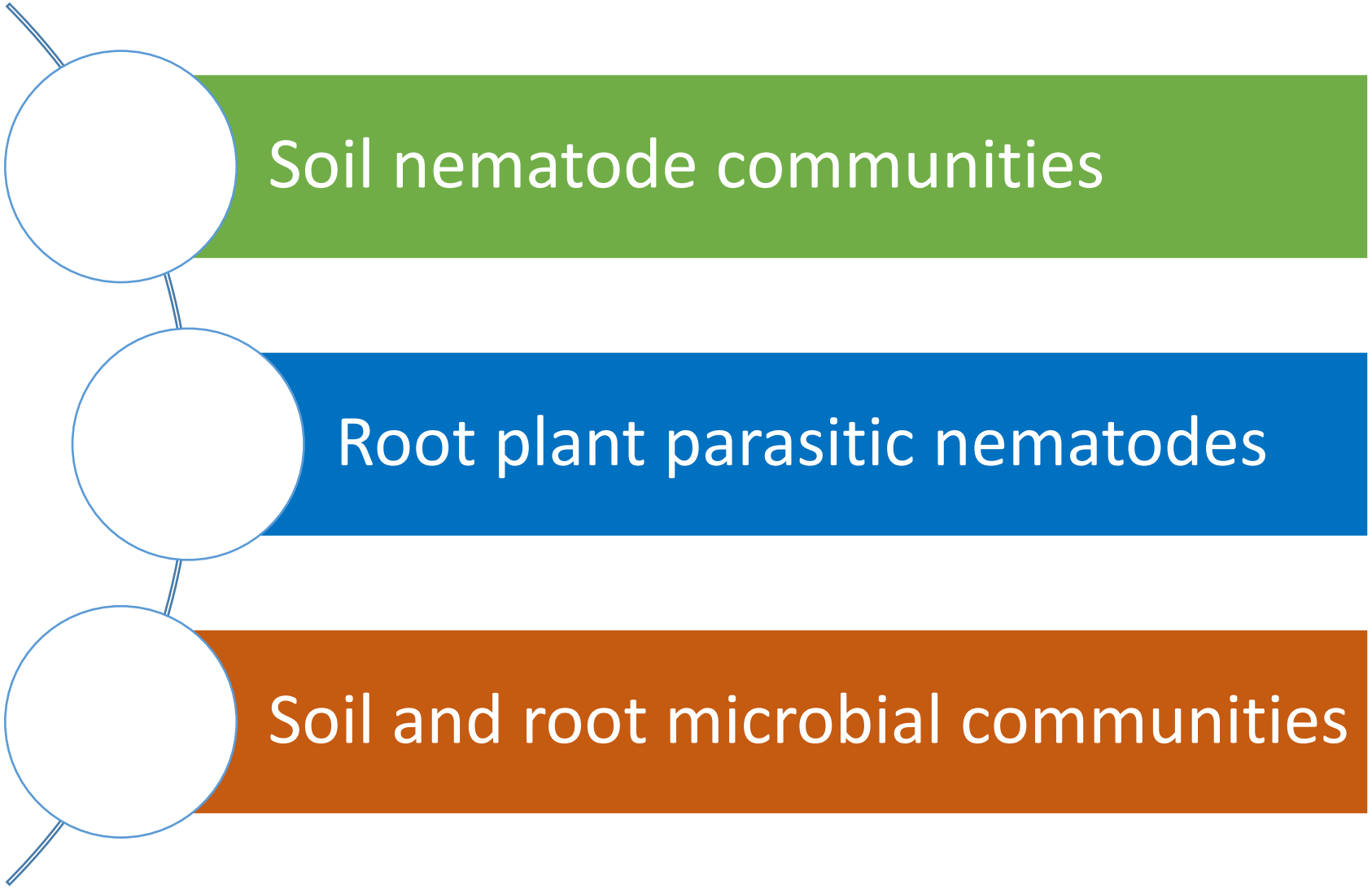
Hun Lak, vice president of CRF, told *Khmer Times* his federation is cooperating with EU representatives to conduct research in rice-producing provinces nationwide.

"It was a bit of a shock for us when got the news from the EU," he said. "Currently our rice is not contaminated, but we have to be careful to keep it that way, because the EU market represents more than 50 per cent of our total exports of milled rice."

MFIs relax stance on rates cap

European commission announced that rice industry must eradicate the use of the fungicide Tricyclazole by June 2017

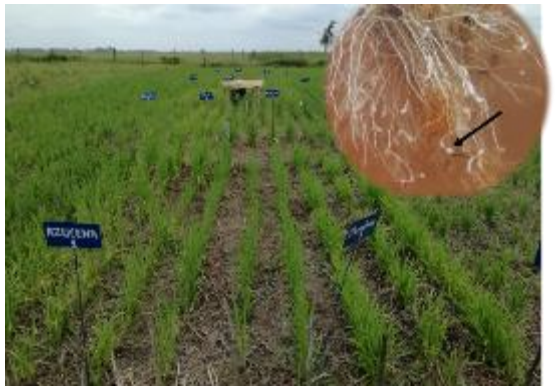
SofunRice declined in three work package



WP1 Soil nematode communities

Nematode communities serve as indicators of the structure and overall functioning of soil food webs.

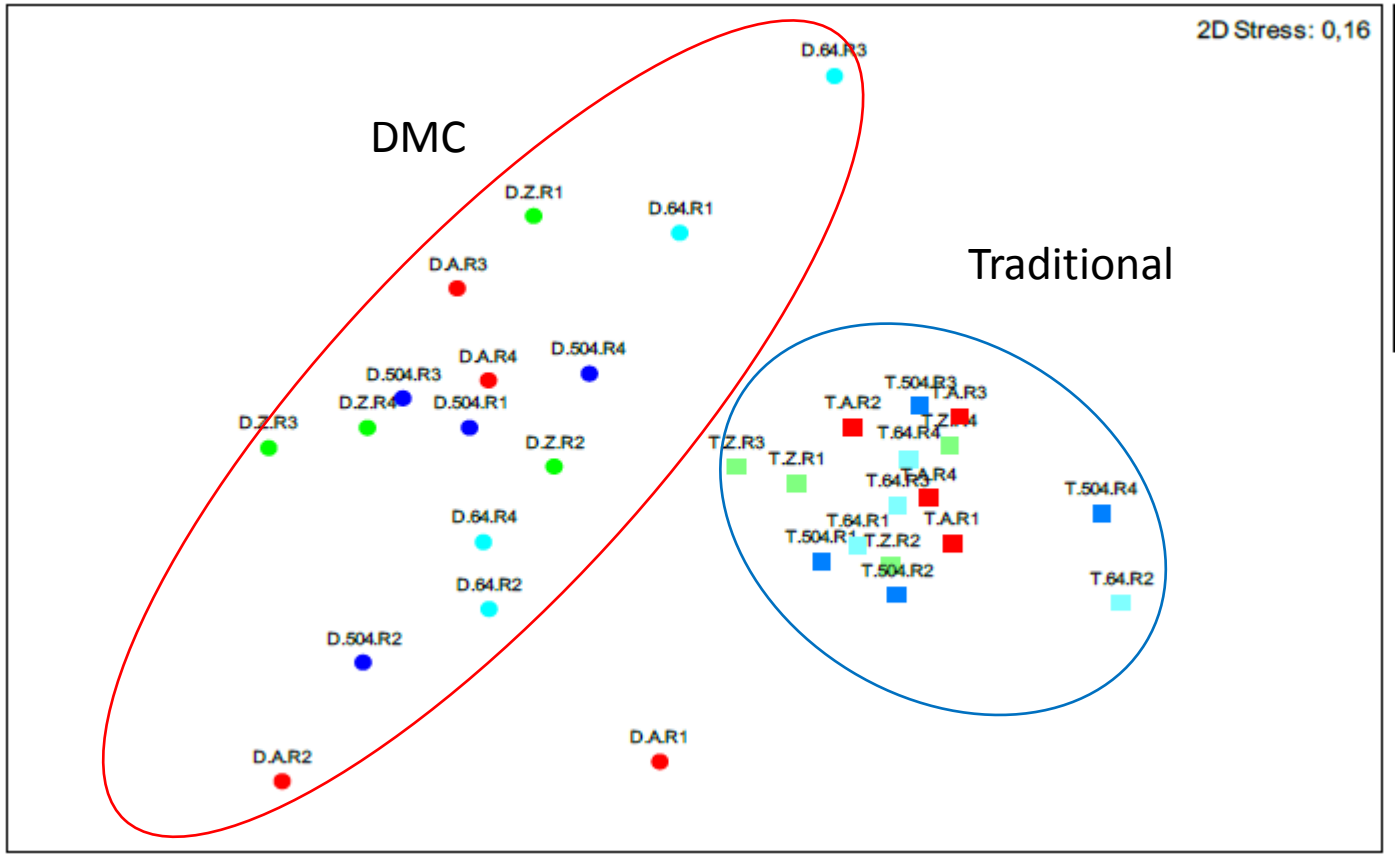
M&M:
32 soil samples (250g) from DMC (16) and from CT (16)
An average of 1600 *vs* 1300 nematodes/ sample were extracted (elutriation method)
A subsample of 174 nematodes/sample were phenotypicaly identified



DMC Traditional

WP1 Soil nematode communities

Preliminary results:
DMC and CT data points are grouped independently: The DMC practice leads to shifts in the taxonomic traits of soil nematode communities



Non-metric multidimensional scaling (**NMDS**)

WP1 Soil nematode communities

Preliminary conclusions:

- 41% increase of **Cp1** index (**bacterial feeder opportunist**) under DMC
- 127% increase of **Enrichment Index (EI)** under DMC suggesting a higher availability of nutrients (especially nitrogen) under DMC
- Structure index (SI) and Maturity index (MI) are slightly higher in DMC suggesting that soil biological network is slightly more complex (nematodes with long cycles of the high levels of the trophic chain (omnivores and carnivores))
- **Metabolic footprints (EFOOT**), are more important in DMCs

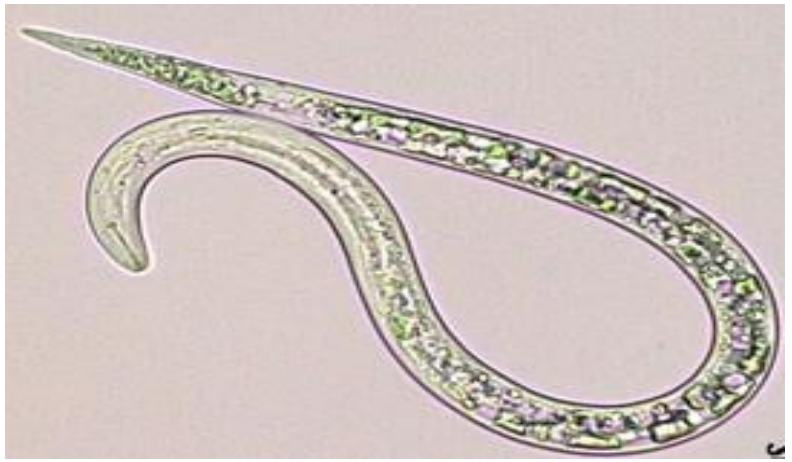
  The increase in the total footprint reflects the increase in soil biological activity

- The DMC practice seems to allow both to stimulate the bacterial activity and to generate important flows of nitrogen.
- Specialization of the soil food web towards the exploitation of primary resources by bacterial routes (EI & EFOOT) and in a lower aspect by fungi routes

WP2 Root plant parasitic nematodes

- In soil we identified *Telotylenchidae* (or *Tylenchorhynchus*), *Meloidogyne*, *Pratylenchidae* (or *Hirschmanniella*) and few *Criconematidae* species

- In plant only *Meloidogyne* and *Hirschmanniella* species were found

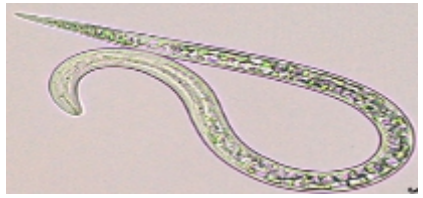


Meloidogyne graminicola

Hirschmanniella mucronata

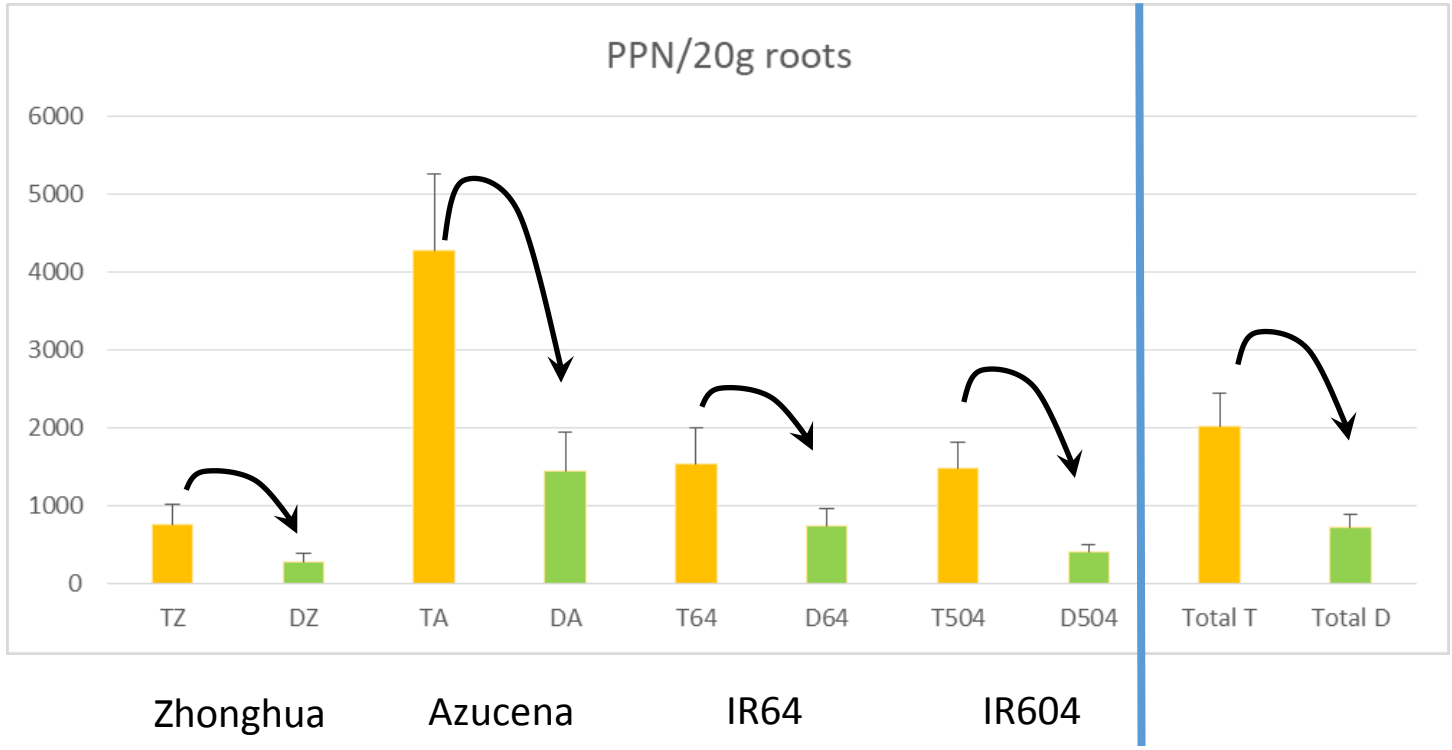
WP2 Root plant parasitic nematodes

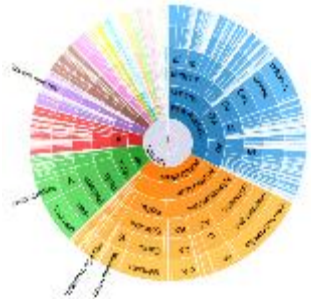
Hirschmanniella mucronata



Meloidogyne graminicola

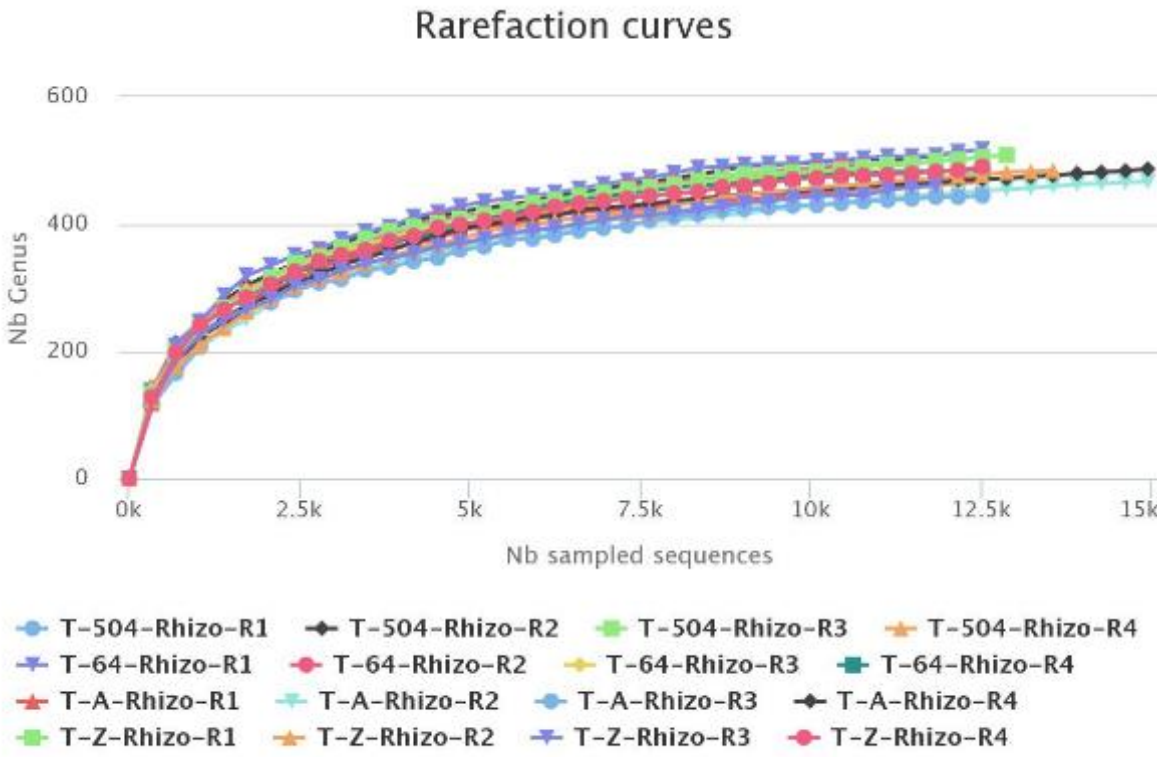
181% decresase of PPN infection under DMC



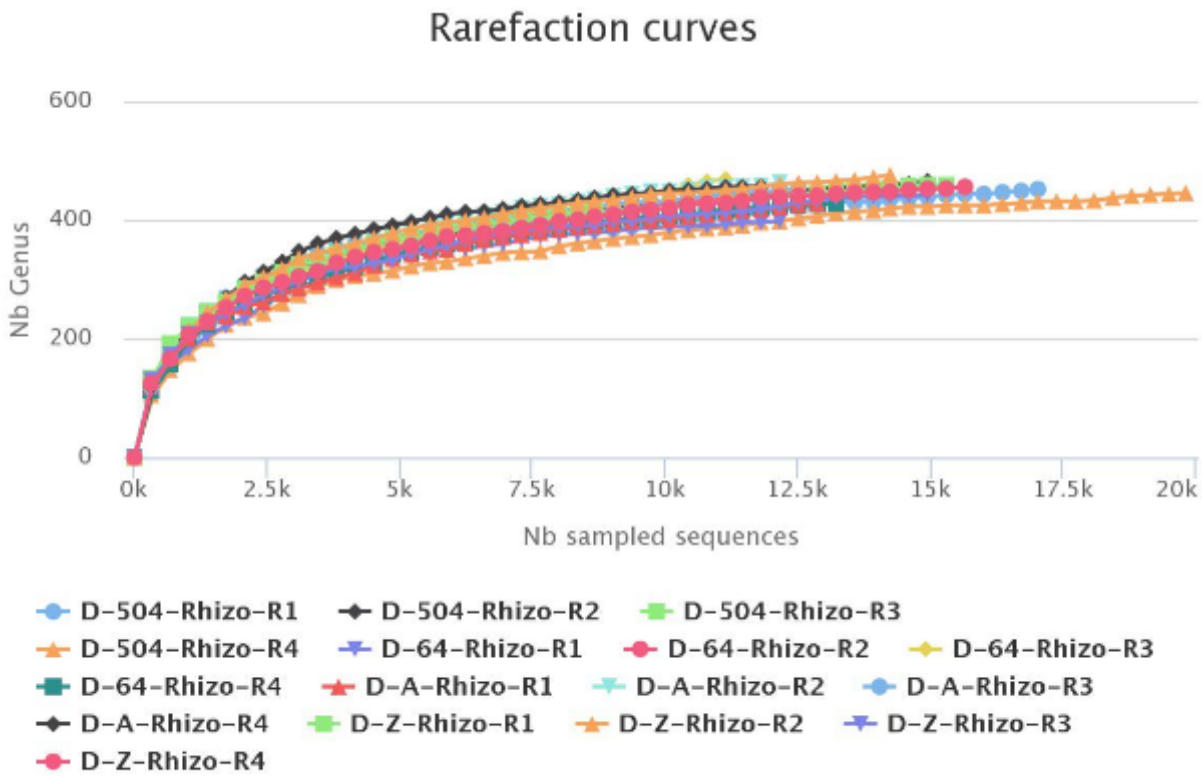


WP3 Soil and root microbial communities

Traditional

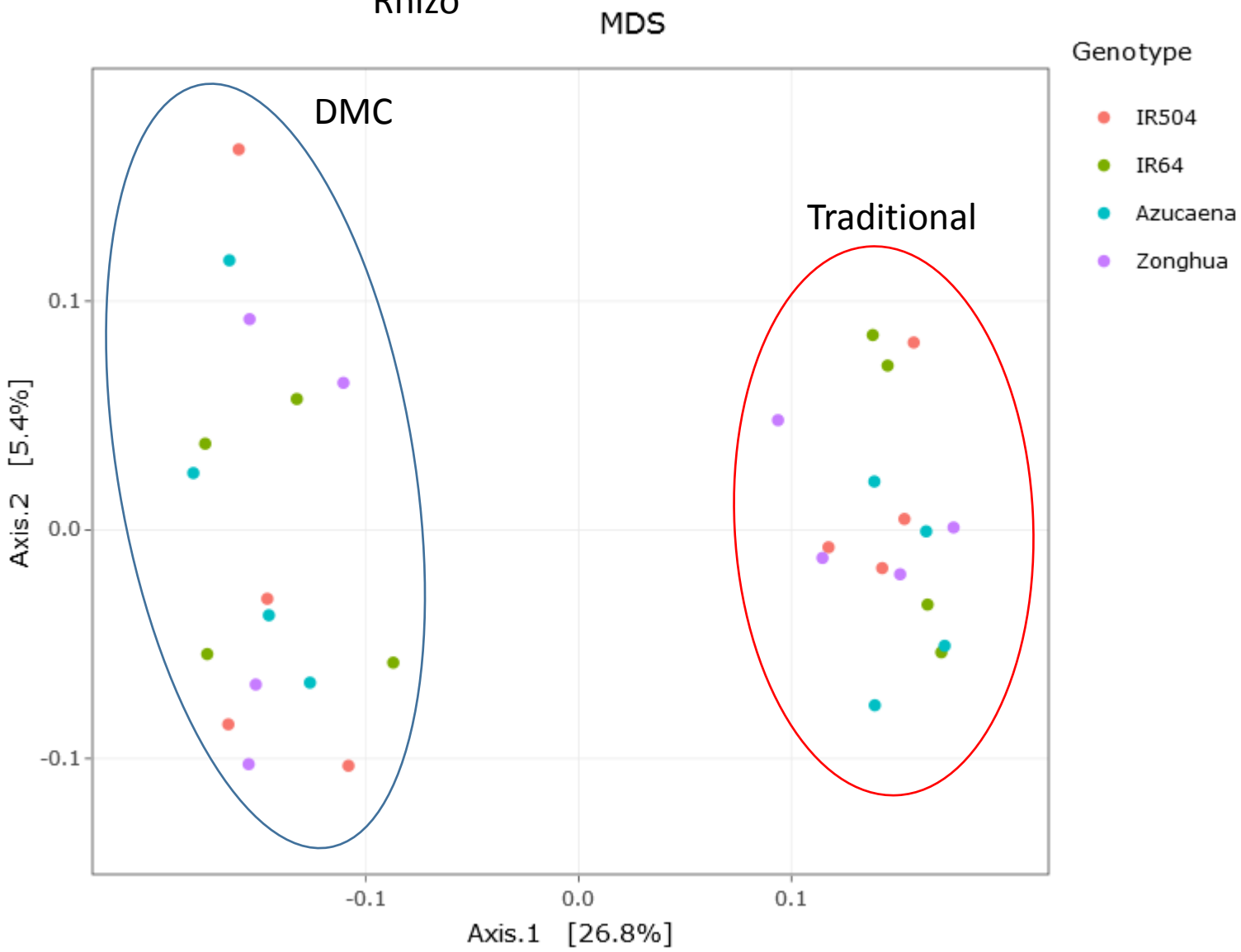


DMC



WP3 Soil and root microbial communities

Rhizo

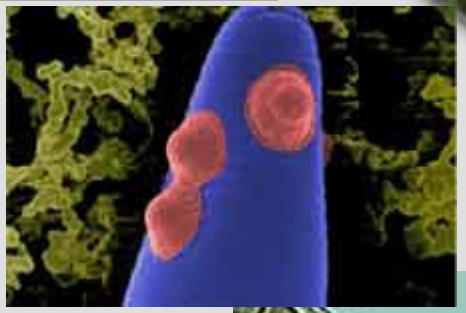


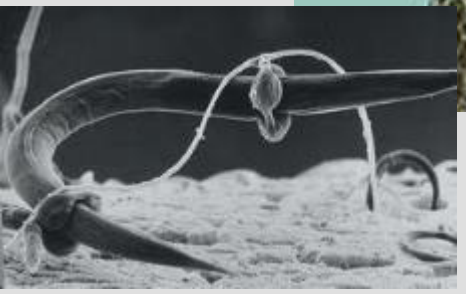
Exploring the microbiome and nematofauna to assess the DMC transition

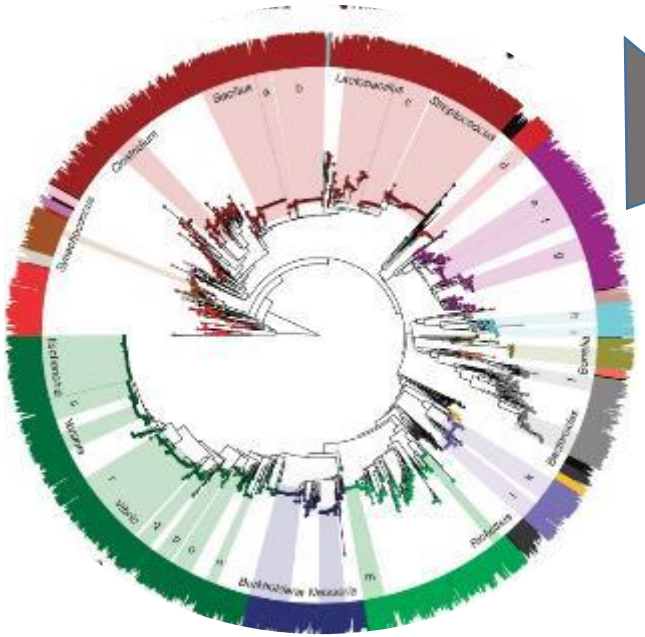
Exploring the microbiome and nematofauna for a biocontrol strategy

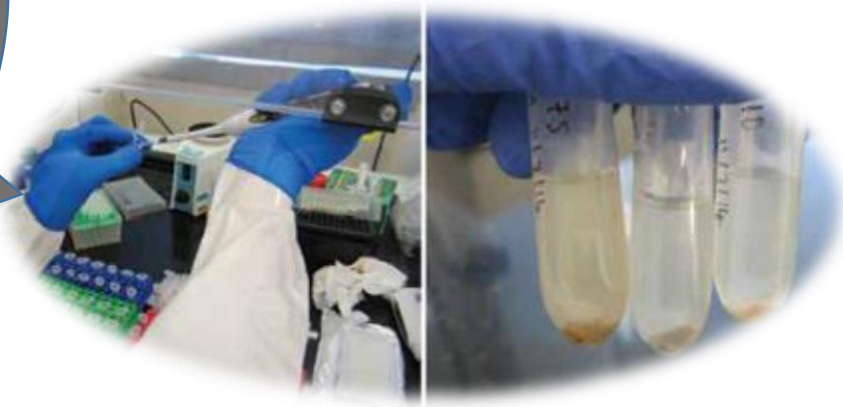
Microbial-control

Nema-control









In order to continue on this approach we proposed a JEAI (HEALTHYRICE) on this topic…

Fidero Kuok (ITC) & Lionel Moulin (IRD)