

Embrapa Agrobiologia

2013

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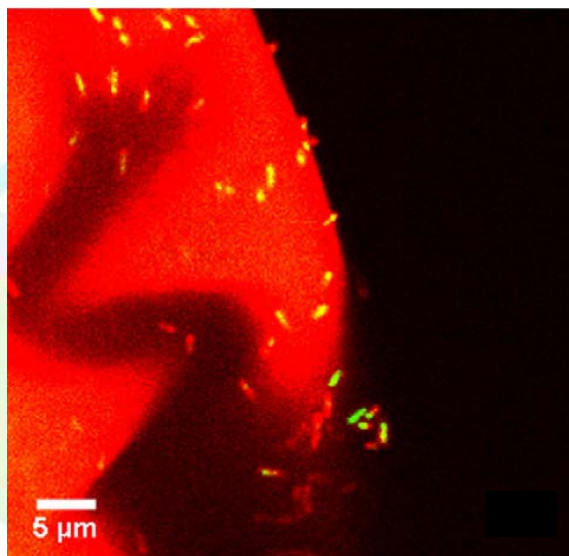


Embrapa

Agrobiologia

Embrapa Agrobiology's Mission

»»» *To generate knowledge, technologies and innovation supported by agrobiological processes in benefit of a sustainable agriculture for the society”*



Importance of Biological N₂ Fixation in soybean in Brazil



Production- Harvest 2012 = 81.000.000 t. (IBGE)
Yield 2,900 kg ha⁻¹ Estimate of N fixed = 4.900.000 Mg.
Price of N as urea = ~R\$2.550,00 or US\$ ~1.600,00.
This N₂ fixation is thus worth US\$ 6.5 billion year

Biological Nitrogen Fixation (BNF)

»»» ***BNF is the process of conversion of atmospheric N_2 (“dinitrogen”) to ammonium by living organisms***

*Plots of soybean planted in Rio Grande do Sul 40 years ago, inoculated or not with *Bradyrhizobium* spp.*



Competences and Research Lines



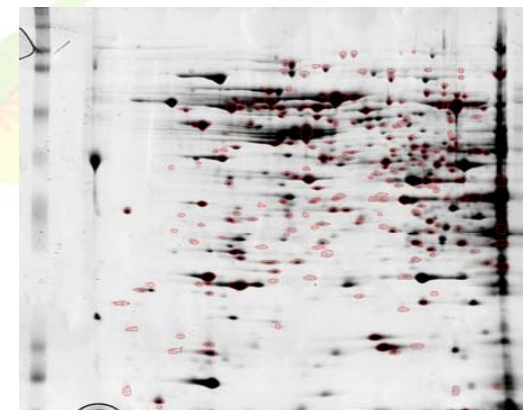
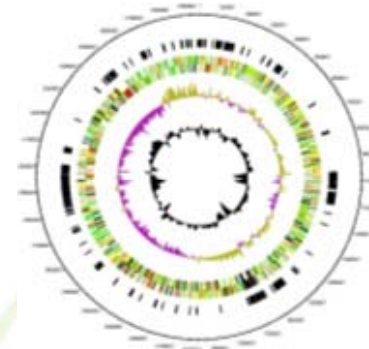
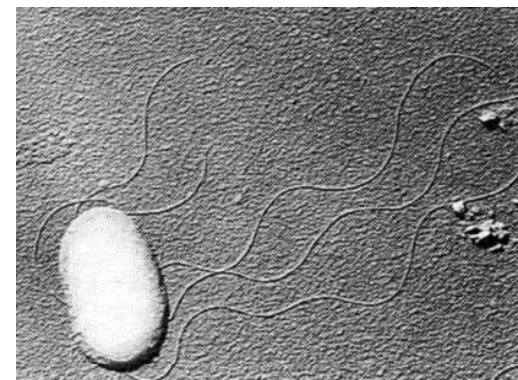
Some advances in RDI

»»»» **Genome Project- completed sequenced**

- » *Gluconacetobacter diazotrophicus*, strain PAL5 - isolated from sugarcane. Genome size - 3,999 Mb.

»»»» **Functional genome project of *G. diazotrophicus* (pós-genomic era)**

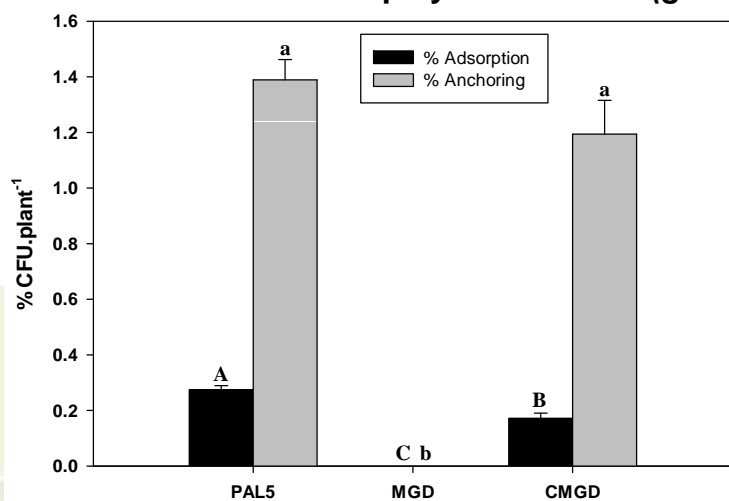
- » Metabolism of nitrogen
- » Quorum sensing genes;
- » Phytohormones pathway (IAA, Giberellins, etc)
- » Osmotolerance regulation;
- » Bacteriocins;
- » Polysaccharid genes;
- » Gluconic acid pathway;
- » Promoter trapping sequences;
- » Unknown functions



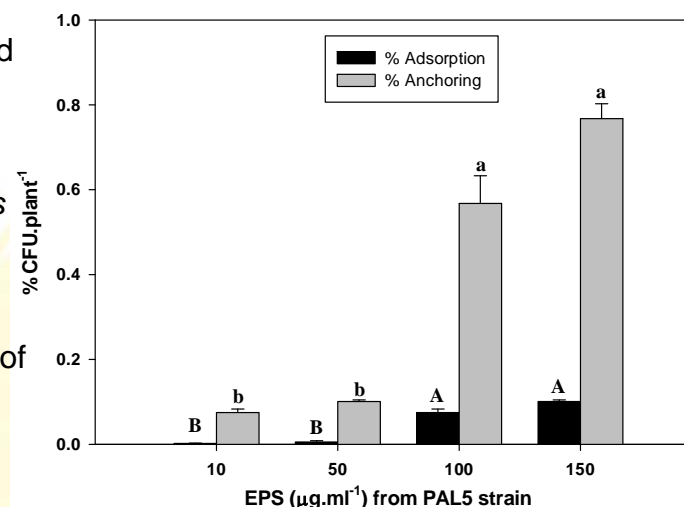
Some advances in RDI

Functional genomic analysis of the endophytic diazotrophic *Gluconacetobacter diazotrophicus* strain PAL5

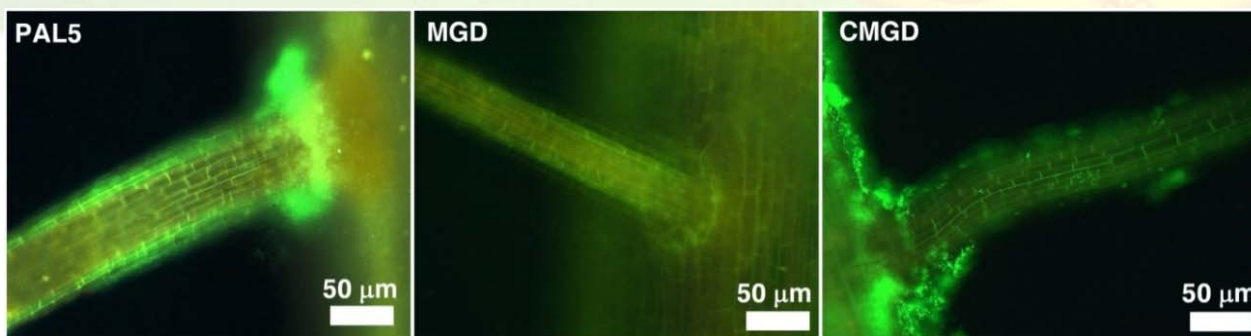
Exopolysaccharide (*gumD*) gene is involved in the initial steps of root colonization



Adsorption and anchoring colonization phases of *G. diazotrophicus* strain PAL5, mutant MGD and restored strain in roots of rice seedlings



Effect of EPS addition (from the wild-type PAL5 strain) on the colonization of rice roots by the MGD mutant of *G. diazotrophicus*



Adhesion of the rice root surface by the *gfp* labeled strains of *G. diazotrophicus* (wild-type, EPS mutant and restored strain).

Meneses et al, 2010

Some advances in RDI

»»» Inoculant for sugarcane

2 companies to commercialize the technology for sugar cane inoculant use of the Embrapa trade mark.



5 packs containing 1250 g of peat + bacteria (mixed with clean water)



Some advances in RDI

»»» Selection of rhizobium and arbuscular mycorrhizae for *Mimosa artemisiana*



100 kg/ha de N Strain SMF 1382 Control





Road embankment Niteroi - RJ



Some advances in RDI

Land Reclamation

»»»» Comperj: 300.000 seedlings



»»»» Projetos 2011-12

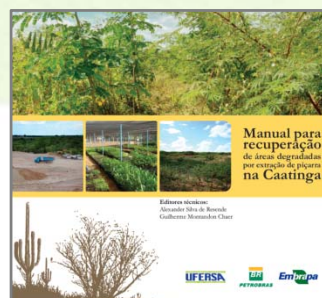
» Olympic compromise to neutralize CO2 emissions. INEA-COB

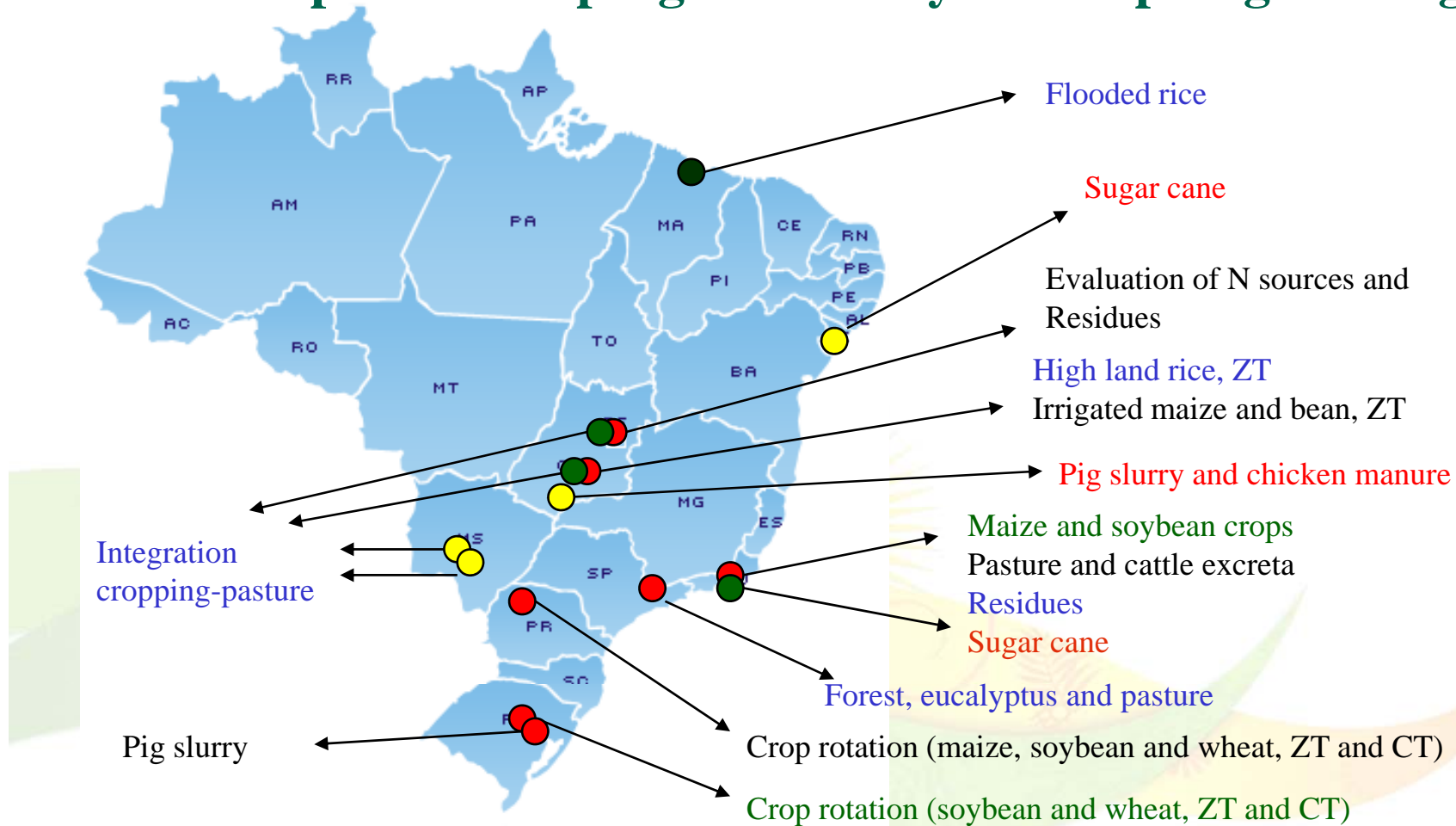


»»»»

» 2 Books

Reclamation of degraded areas in the semi arid region





Some advances in RDI

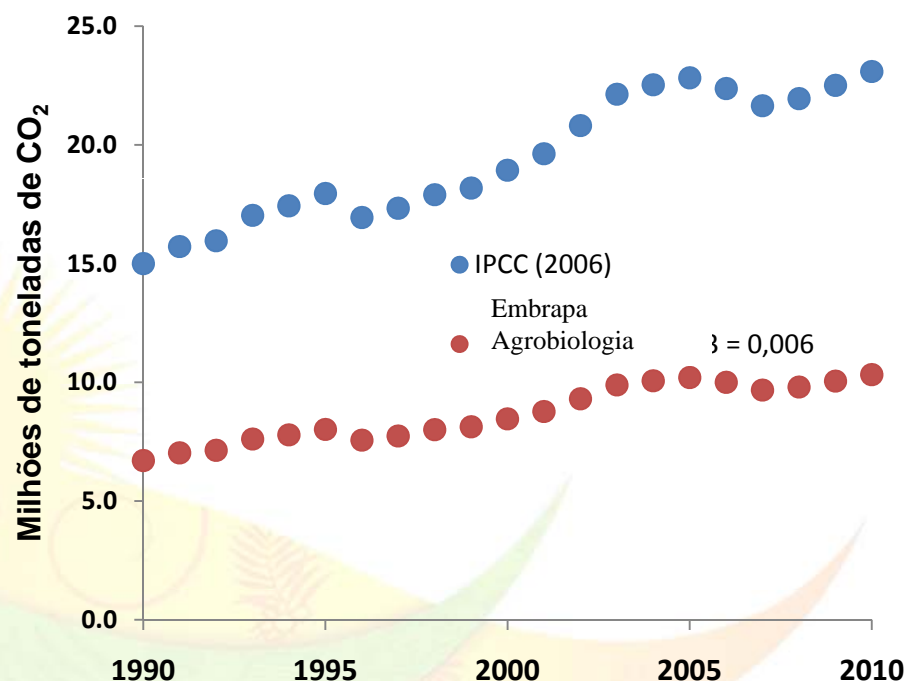
»»» Impact of Brazilian cattle in the nitrous oxide emissions



Some advances in RDI

»»» N₂O emission by cattle in urine and feces at Cerrado conditions

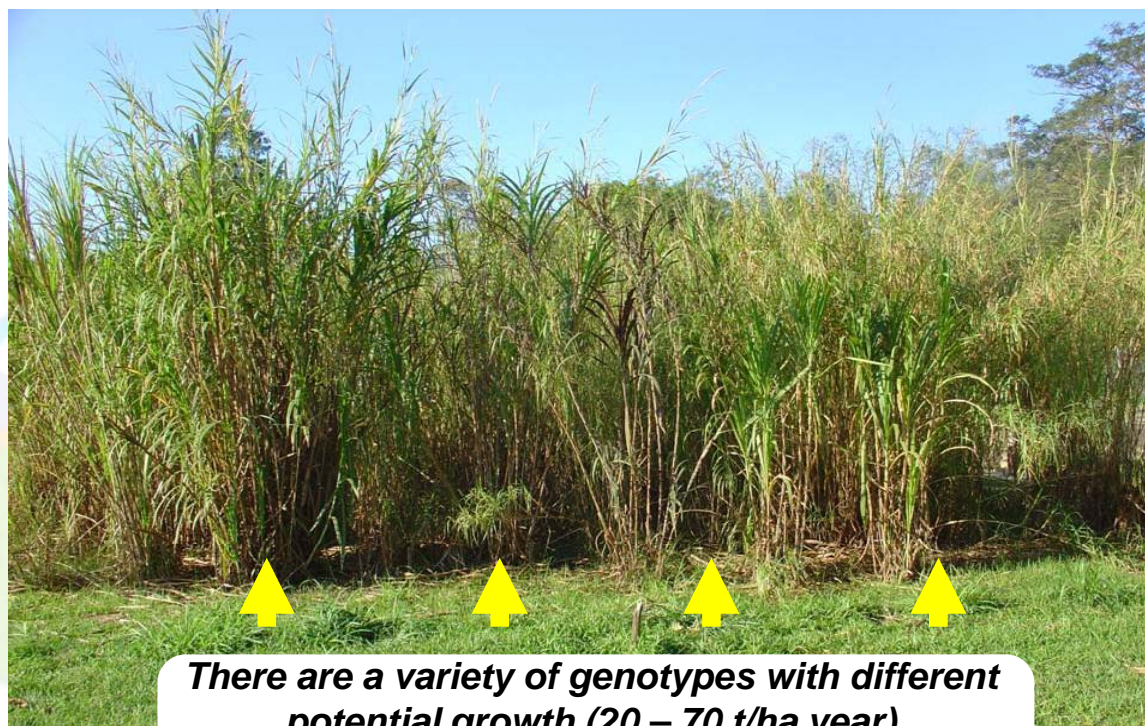
- » The data indicate that the emission factor for N in urine and feces are much lower than 2% of the value proposed by the IPCC.
- » Under conditions of extensive pastures of the Cerrado, rarely more than 60% of N is excreted in the urine, so the emission factor would be around 0.5 to 0.7%.



Some advances in RDI

»»»» *Technology of biomass elephant grass as a renewable energy source: used by red ceramic industry*

- » Productivity and quality selection of genotypes for energy production
- » Total Partner institutions: Cerâmica União de Campos; Embrapa Agrobiologia ; IPT-SP

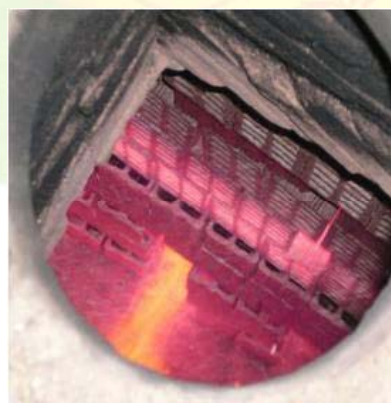


There are a variety of genotypes with different potential growth (20 – 70 t/ha year) performance depends on soil and climate

Some advances in RDI

»»» *Cutting and drying in field*

- » Energy balance and greenhouse mitigation
- » Total power generated: 22 kcal to each kcal fossil applied
- » Mitigation of greenhouse gases (replacement of natural gas): 9 tonnes of CO₂/Ton. bricks produced
- » Economy (R\$) 70% compared to the use of natural gas in Rio Janeiro)



Organic farm

(Fazendinha Agroecológica)

A joint venture between Embrapa-Agrobiologia, the federal Rural University and PESAGRO – the Rio State Agricultural Research Institute



Infrastructure – Laboratories (19)

»»»- Nitrogen and Isotopes (^{15}N e ^{13}C)

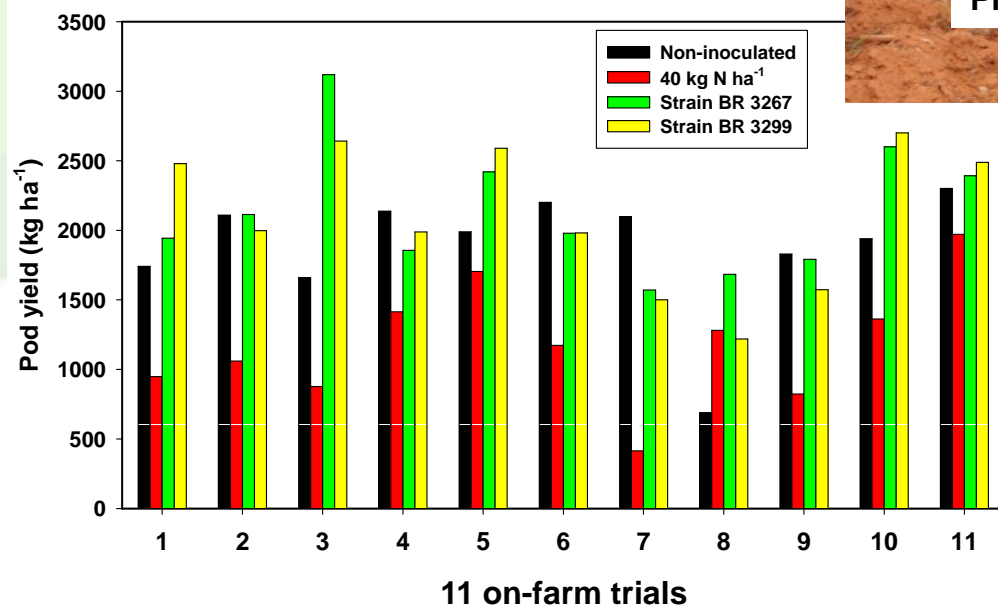
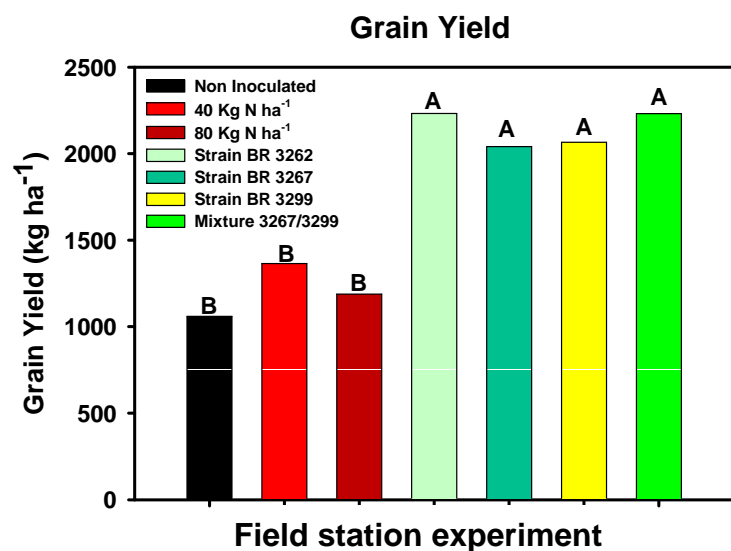
- Gas chromatography for GHGs
- Organic Agriculture
- Soil organic matter
- Enzymes
- Biological control
- Soil fauna
- BNF Leguminous Trees
- Collection of cultures
- Microbial Ecology

- Soil and Plant analyses
- Eletronic and optical microscopy
- Micorrizas
- BNF Grasses
- Genetics/Biochemistry
- Genome
- Molecular Techniques – Multi-user
- Inoculant Development
- Inoculant Production



International Networking

➤➤➤ Inoculant for Cowpea



Embrapa Agrobiology Staff

➤➤➤ **Total: 144 employees: 42 researchers (most of all PhD), 36 analysts (under graduate) and 66 support**



Thank you!



Ministry of
Agriculture, Livestock
and Food Supply

