MICROBIAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE -INTERDEPENDENCE-

Side event – ABS 9
Cali, Colombia
March, 2010

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TSBF - CIAT

PLANT AND ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE HAVE A RELATIVELY WELL KNOWN ORIGIN

NATIVE GENETIC RESOURCES

EXOTIC GENETIC RESOURCES

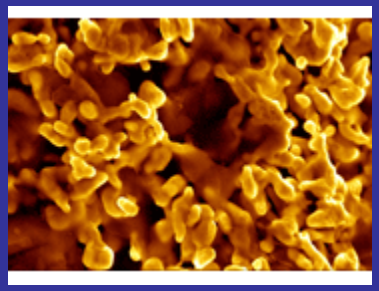
MICRORGANISMS : HABITATS

Plants

Marine

Soil

Bacteria and archaea in hydrothermal environment



Bacteria in gold grains

Associations with animals

MICRORGANISMS – HOW MANY ?

- **BACTERIA**
- **ARCHAEA**
- FILAMENTOUS FUNGI AND YEAST
- PROTOZOAN
- MICROSCOPIC ALGAE
- VIRUS

prokaryotes

eukaryotes

Abundance of soil organisms

Organism	Number per gram soil (~1 tsp)	Biomass[1] (lbs per acre 6”)
Earthworms	–	100 – 1,500
Mites	1-10	5 – 150
Nematodes	10 – 100	10 – 150
Protozoa	up to 100 thousand	20 – 200
Algae	up to 100 thousand	10 – 500
Fungi	up to 1 million	1,000 – 15,000
Actinomycetes	up to 100 million	400 – 5,000
Bacteria	up to 1 billion	400 – 5,000

[1] Biomass is the weight of living organisms

29 COLLECTIONS WITH AROUND 30,000 SPECIMENS

ENVIRONMENTAL USE

FUNGI AND BACTERIA FROM INVERTEBRATES

ENTOMOPATHOGENIC MICRORGANISMS

PHYTOPATHOGENIC MICRORGANISMS

DIAZOTHROPHIC BACTERIA

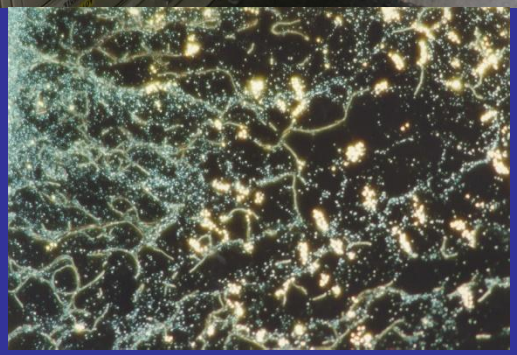
ANIMAL DESEASES

VIRUS

Culture Collection holdings world wide

Continent	Collections	Strains
Africa	11	12 255
Asia	177	322 195
Europe	173	1 005 930
America	121	326 297
Oceania	43	89 786
	525	1 756 463

World Data Centre for Microorganisms (WDCM) http://wdcm.nig.ac.jp



WFCC position on Access and benefit sharing http://www.wfcc.info/NEWSLETTER/GGTSPUstyx2. bba.de-31757-6599860-DAT/WFCC-NL-January-2009.pdf

INTERDEPENDENCE
FOOD INDUSTRY

Lactobacillus bulgaricus
Streptococcus thermophilus

Lentinula edodes

Penicillium roquefortii

Saccharomyces cerevisiae

AGRICULTURE - DIFFERENT PROCESSES

BIOLOGICAL CONTROL

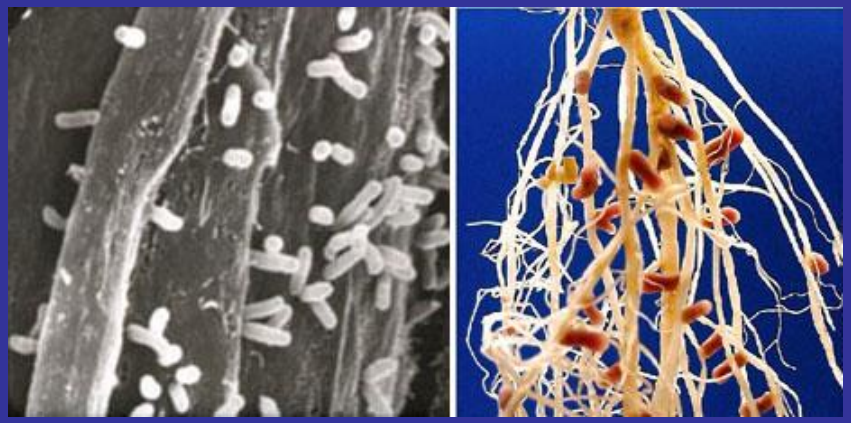
Metarhizium anisopliae

Cordyceps sinclairii

NUTRIENT ABSORTION

Mycorriza

ROOTS



NITROGEN FIXATION

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Rhizobium

ENVIRONMENT BIORREMEDIATION

DEGRADATION OF OF ENVIRONMENTAL POLLUTANTS (PESTICIDES) BY FUNGI AND BACTERIA

PLANT AND ANIMAL HEALTH QUARANTINE EFFORTS TO CONTROL PESTS

Orange Rust
Sugar Cane

Citrus desease (*X. fastidiosa*)

Citrus desease
(*X. axonopodis*)

AFTOSA

COMPLEX INTERNATIONAL FRAMEWORK
TRADE BARRIERS TO GLOBAL COMMERCE
NON TRADE BARRIERS - SAFETY

GLOBAL INTERDEPENDENCE TO DEVISE METHODS OF DIAGNOSTICS AND CONTROL

GROWING APPLICATIONS

INOCULANTS FOR FEED STOCKS

BIOFUEL PRODUCTION (fermentation)

BIOMASS CONVERTION – ENERGY (e.g. BIOGAS)

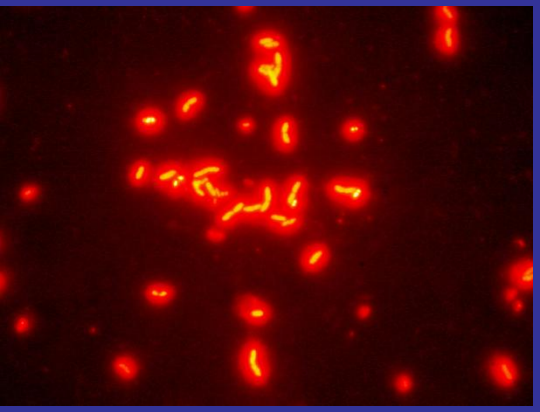
INDUSTRIAL USE IN MORE NATURAL AND SUSTAINABLE PROCESSES - ENGINEERED “BUGS”

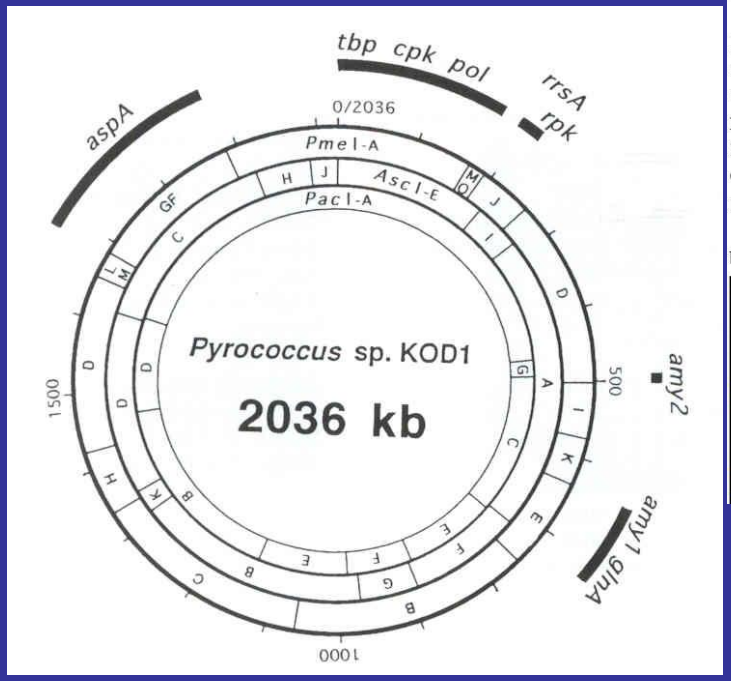
"ADVANCED" APPLICATIONS

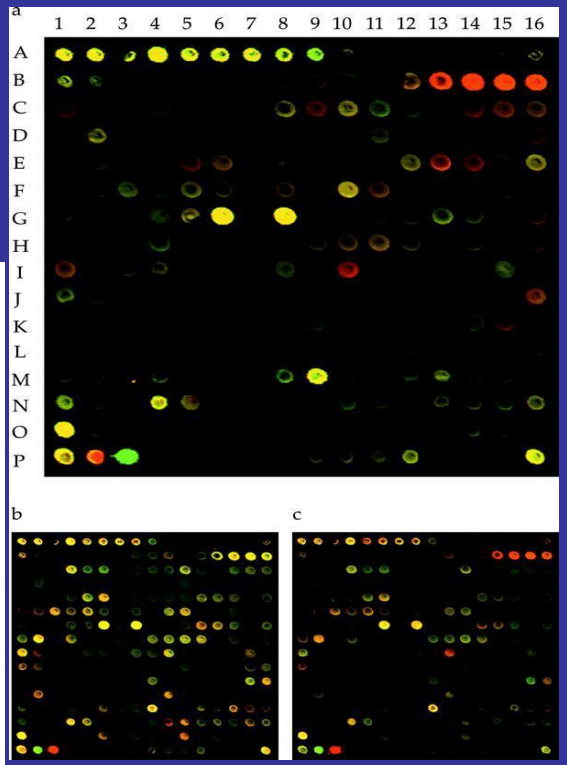
BIOTECHNOLOGY

CLONING VECTORS /
TRANSFORMATION /
EXPRESSION VECTORS
(biofactories)

METAGENOMICS
DNA SHUFFLING – NEW
FUNCTIONAL DNA
SEQUENCES NOT FOUND
IN NATURE

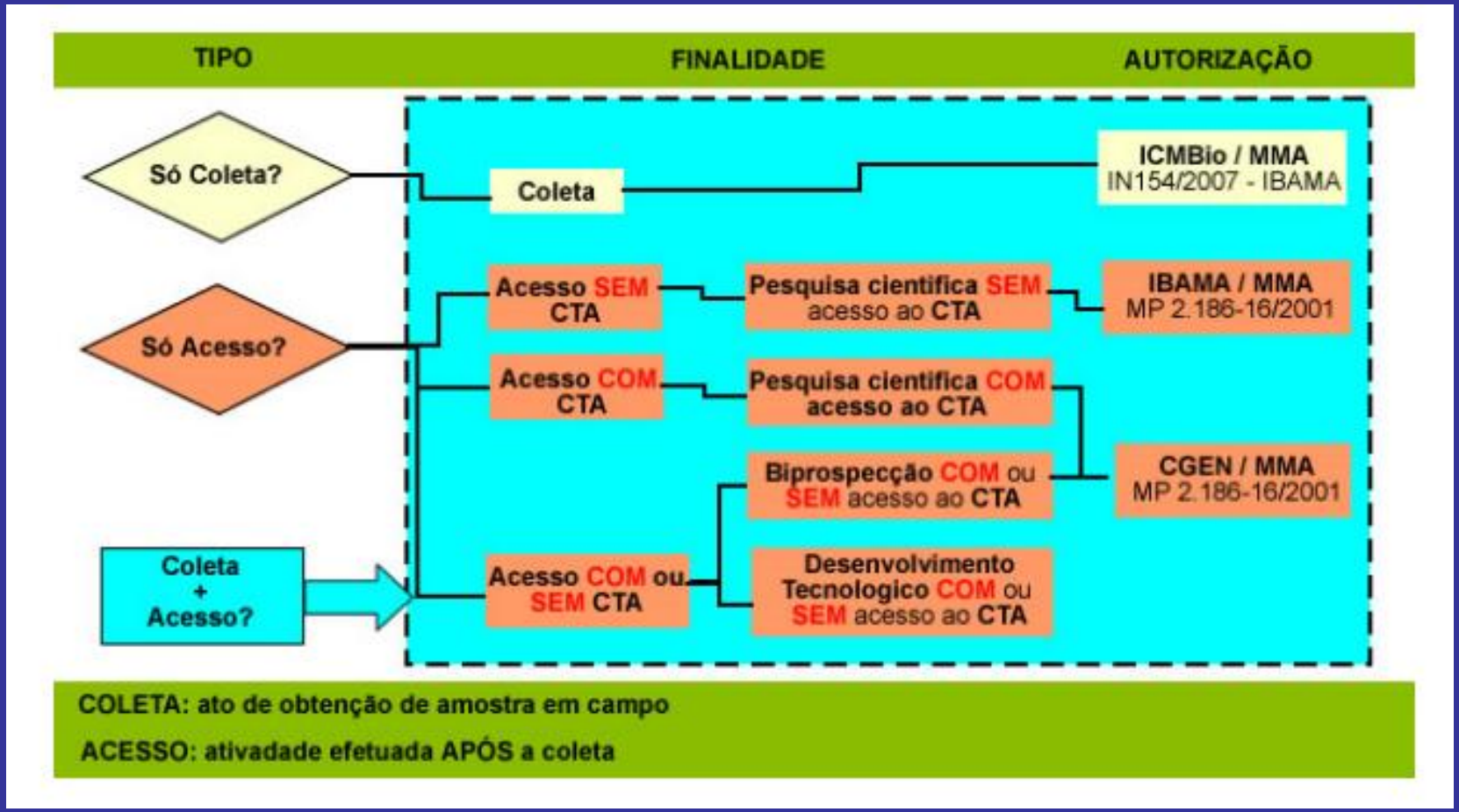






INTERDEPENDENCE ON INFORMATION GENOME SEQUENCES AND PROTEOMICS PUBLIC DATA-BASES

Autorization to collect ≠ Autorization to access and developed research (basic & bioprosp)



QUESTIONS FOR POLICY MAKERS

- **COUNTRY OF ORIGIN DEFINITION APPLIED TO MICRORGANISMS**

  Who owns a "bug" ??? BEFORE AND AFTER 92 ?
  SAME SPECIES OF MICRORGANISMS FOUND IN MANY COUNTRIES ? – DIFFERENT STRAINS

  CULTURE COLLECTIONS – outside the collecting territory

- ***IN SITU* CONDITIONS DEFINITION APPLIED TO MICROORGANISMS**

  IS IT THE SOIL OR THE WATER OF A GIVEN COUNTRY ??
  IS IT THE ANIMAL GUTS ?? When the animal is an exotic breed ?
  IS IT THE PETRI DISH IN A LAB ? (microbes have a different life span !)

- **BENEFIT SHARING CHAIN FOR "NATIVE" MICRORGANISMS AND FOR lMODIFIED MICRORGANISMS**

A PRACTICAL CASE
SOIL IMPROVEMENT IN AFRICA
NITROGEN FIXATION PROGRAM

BRAZIL CULTIVATES SOYBEAN, BEANS AND FAVA BEANS
EMBRAPA DEVELOPS RESEARCH ON NITROGEN FIXATION SINCE THE 70'S
BRAZILIAN SOYBEAN IS MOSTLY PRODUCED WITHOUT NITROGEN ADDITION
WHAT SAVES MONEY AND IS GOOD FOR THE ENVIRONMENT !

TWO YEARS AGO – THE GATES FOUNDATION PROPOSED TO TAKE THE TECHNOLOGY TO AFRICAN COUNTRIES RESPONDING TO THEIR REQUEST

The Official Launch Of The Biological Nitrogen Fixation (BNF) Project
At Safari Park Hotel, Nairobi, On 20th January 2010

TEST BRAZILIAN IMPROVED VARIETIES OF SOYBEANS AND OTHER BEANS
TEST WELL KNOWN NITROGEN FIXING MICROORGANISMS ADAPTED TO BRAZILIAN SOILS IN SIMILAR CONDITIONS ORGANIZE LOCAL RESEARCH TO COLLECT, STUDY AND DEVELOP INOCULANTS WITH LOCALLY COLLECTED STRAINS TO CHECK IF THEY ARE BETTER ADAPTED AND MIGHT PRODUCE BETTER RESULTS (PROBABLY DONE BY EMBRAPA AND PRIVATE COMPANIES)

BIOLOGICAL NITROGEN FIXATION

The project is supported by a grant (39 million – 4 years) from the Bill & Melinda Gates Foundation and will draw on expertise from a large number of research and development specialists from Africa, Australia, Europe and Brazil. Under the project **state-of-the-art legume and rhizobial inoculant technologies will be used by African smallholder farmers t**o triple the inputs of free atmospheric nitrogen by Biological Nitrogen Fixation (BNF), and thereby improving crop and livestock productivity, human nutrition and farm income, while enhancing soil health.

PROJECT WITH GATES RULES – NO IP APPLIED TO TARGET COUNTRIES

THANK YOU

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HOW FAR BACK IN BENEFIT SHARING WITH THE NECESSARY LEGAL CERTAINTY ?????