Research Undertakings of the Biotechnology for Agriculture and Forestry Program of BIOTECH

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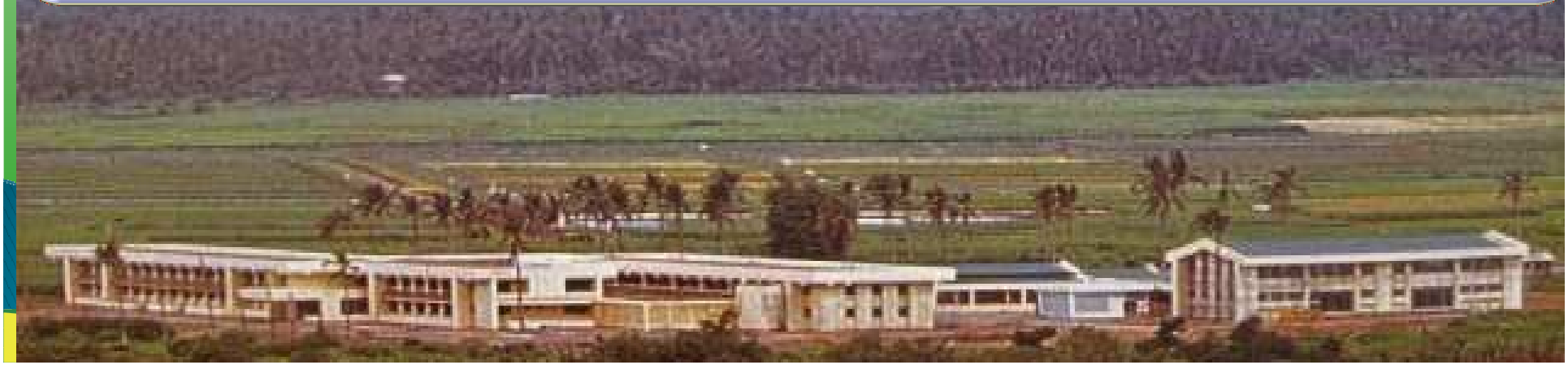
NATIONAL INSTITUTE OF MOLECULAR BIOLOGY AND BIOTECHNOLOGY
University of the Philippines Los Baños

Established on December 20, 1979 at the University of the Philippines Los Banos (UPLB)

BIOTECH Serves as the national R&D organization specializing in **agricultural**, environmental, food and feeds, and health biotechnology.

Capitalizes on the use of the country's diverse collection of **microorganisms**, rich natural resources and agro-industrial wastes, to develop and advance alternative technologies and products towards improved agro-industrial productivity.



PROGRAMS

- **Biotechnology for Agriculture and Forestry**
- Food, Feeds and Specialty Products Biotechnology
- Biotechnology for Health and Wellness
- Environment and Industrial Biotechnology
- Communication and Technology Transfer

SERVICES

- Philippine National Collection of Microorganisms (PNCM)
- Analytical Services Laboratory (ASL)
- Electron Microscopy Services Laboratory (EMSL)
- Fermentation and Engineering Services Laboratory (FESL)
- National Immunological Testing Laboratory (NITL)

Biotechnology for Agriculture and Forestry Program

- 27 Technical Staff
(9 PhDs, 3MS, 15BS)

- 23 Support Staff

Concerted efforts to address the problem on sustainable crop production and reforestation: Focus on microbial fertilizers and other microbe-based technologies

BIOTECH MISSION

Vigorous bioprospecting activities were conducted from 1980 – 1990 to isolate/screen microorganisms :

- Nitrogen-fixers
- Mycorrhizal fungi
- Plant growth promoting rhizobacteria
- Decomposers
  - bioconversion of crop residues and agro-industrial by-products into biofertilizers

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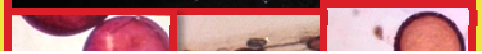
BIOFERTILIZER PRODUCTS DEVELOPED



BioGroe

- **Plant growth-promoting rhizobacteria (PGPR)**
- **Produce:**
  - ✓ **IAA, cytokinins, gibberellins**
  - ✓ **Siderophore**
  - ✓ **ACC deaminase**
- **Solubilize phosphorus**

BioQuick, BioFix BioGreen

- **Microbial inoculants for the bioconversion of crop residues and agro-industrial by-products into biofertilizers**

Developed by Drs. Bayani Espiritu and Mannix S. Pedro

BioQuick – fungal inoculant for effective decomposition of household and agro-industrial waste.

BioFix – enrichment inocula containing an appropriate strain of nitrogen-fixing bacteria.

BioGreen – processed inoculated compost or bioorganic fertilizer.

Brown Magic

- Mycorrhizal fungal inoculant for orchids
- induces early flowering
- enhances production of more suckers & longer spikes

Developed by Dr. Marilyn B. Brown

Tissue-cultured orchids with Brown Magic

Vanda Inoculated with Brown Magic

NitroPlus

Nitrogen-fixing inoculant for legumes

99-124% increase in yield of legumes

Developed at BIOTECH by Dr. Erlinda Paterno, Dr. Maria Lourdes Sison and Prof. Fe Torres.

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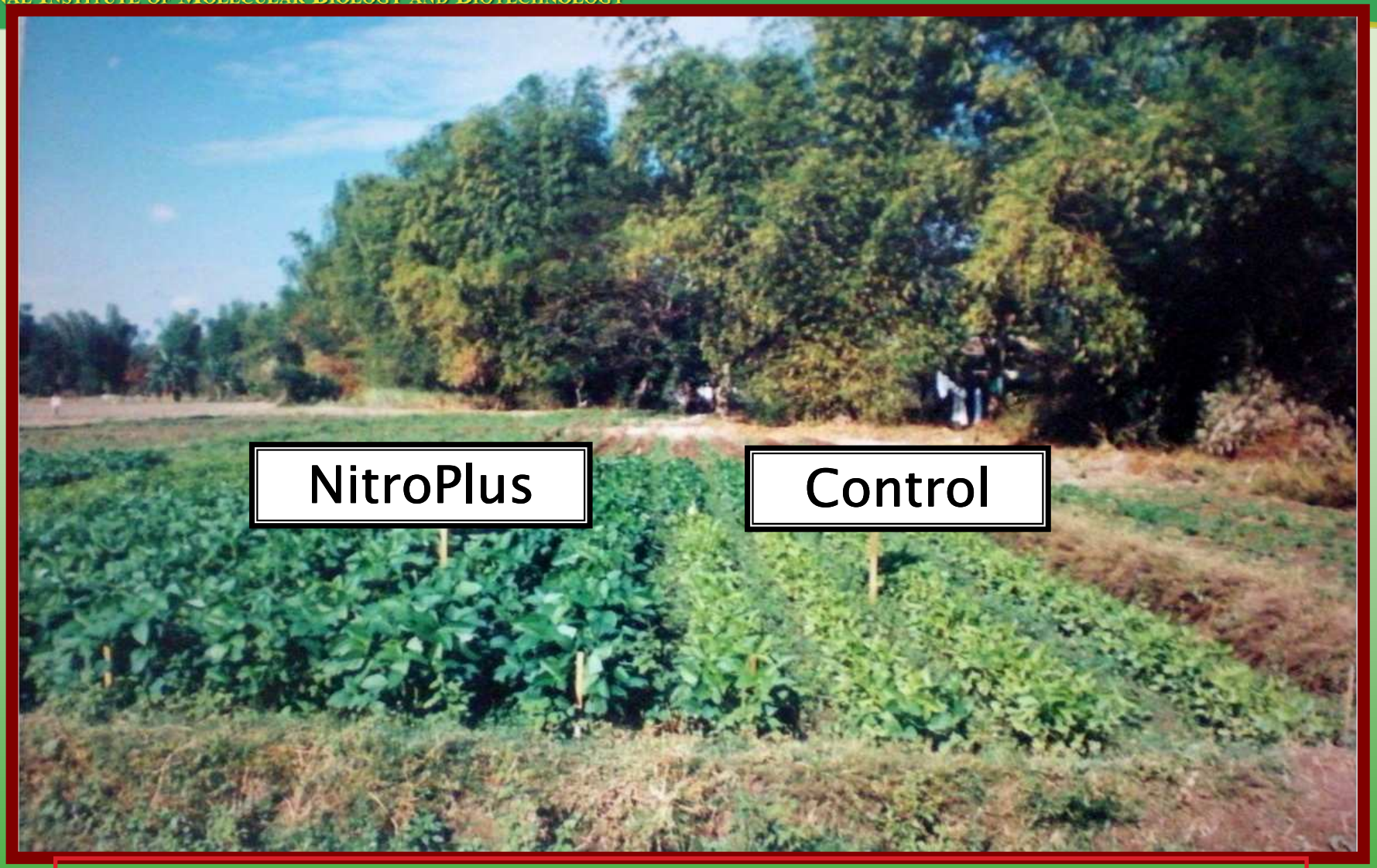

Effect of NitroPlus on Soybean Planted in Tarlac.

MYKOVAM

- Mycorrhizal inoculant containing spores, infected roots and other infective propagules of endomycorrhizal fungi
- Replaces about 60-85% of the plants' chemical fertilizer requirement
- For almost all plants except orchids and crucifers
- Biological control against root pathogens

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Lanzones of **Dr. Alexis de Manuel** in Cotabato after applying Mykovam

VAMRI (VAM MAGIC)

Mycorrhizal Root Inoculant for Agricultural Crops, Ornamentals and Fruit Crops

- Enhance plant absorption of water and nutrients esp. phosphorus; also serves as biocontrol agent of soil-borne diseases of different crops.

- Developed by Dr. Marilyn B. Brown, Elsa M. Luis and Adora M. de Castro

MYCOGROE TABLETS

- Mycorrhizal inoculant with spores of ectomycorrhizal fungi
- Replaces about 60-85% of the plants' chemical fertilizer requirement
- For trees: *Eucalyptus, Acacia, Casuarina*, Alnus, Dipterocarps and Pines

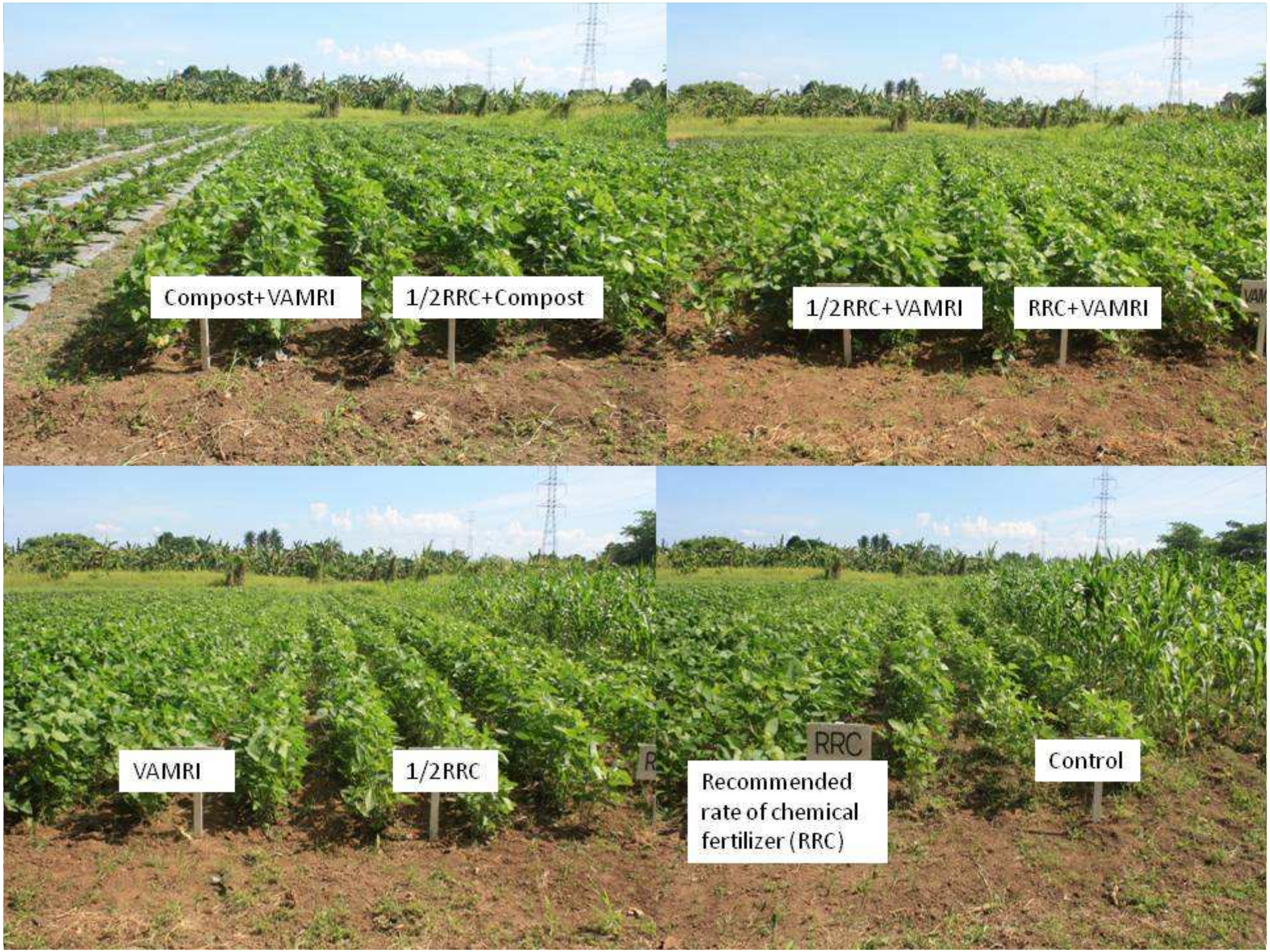
CONTROL MYCOGROE

Advantages/Impact of biofertilizer

- Can replace 50-100% of the plant's chemical fertilizer requirement depending on fertility status of the soil.
- Thus, farmers may have increased savings/income.
- They impart a degree of plant resistance or tolerance to many stressants including soil-borne pathogens, drought, pollutants etc.
- Contribute to the maintenance of ecological balance

PRA cum seminar and farmers field day at BIOTECH, UPLB


½ RRC
Welcome!
APSA
3rd PGPR CONFERENCE
Guests & Participants
to the
FIELD DEMONSTRATION OF
BIOFERTILIZER TECHNOLOGIES FOR
SUSTAINABLE AGRICULTURE
APRIL 24, 2013
BIOTECH, U.P. LOS BAÑOS


Compost+VAMRI
1/2RRC+Compost
1/2RRC+VAMRI
RRC+VAMRI
VAMRI
1/2RRC
RRC
Recommended rate of chemical fertilizer (RRC)
Control

Establishment of local capacity-building among technicians, extension workers and leading farmers

Farmer's field visits/demo

Goal: Reduce dependence on chemical inputs through accession and use of genetic resources for production of biofertilizers, biostimulants and biopesticides (**BFSP**)

Biofertilizers & Biostimulants

Biopesticides & Bio-control Agents

Microbial Genebank

Proj 1. MykoPlus mycorrhiza plus N fixers, Phosphorus solubilizers, & growth hormone secretors

(demo trials)

Proj 2. Endophytic bacterial inoculant

Proj 3. Multi-strain microbial inoculant for acid soils

Proj 4. Microbial consortia-based stimulants

Proj 5. Callus-microbe co-culture against *Fusarium* wilt of tomato

Proj 6. Yeast against postharvest pathogens

Proj 7. Bacteria & endophytic fungi against *Panama* wilt *Foc* TR4- banana & sheath blight of corn

Proj 8. Long-term preservation of cultures; taxonomic identification of accessions; fingerprinting of inoculant strains

Promotion & Demo trials

Screening, Development & Field Testing

Upgrading of Bio-resources

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Future Undertakings

- The program needs to be relevant for the future generations.
- Aside from the given and existing projects on biofertilizers (improvement and development), microbial diversity and macrofungi there is a need to include other research areas in agriculture and forestry.
- Agriculture will intensify because of population growth but decreasing arable land, and for mitigation of climate change.

Scope/Areas

A. Plant/Soil

1. Biocontrol agents/Biopesticides

Direct action against plant diseases/post harvest pests/weeds

2. Soil microbial diversity

- Information/knowledge necessary to answer issues of conservation, sustainability and preservation
- Molecular tools will be applied

3. Phyto/bioremediation

- Management of the native/introduced soil microbial community, in conjunction with higher plants to detoxify, immobilize or mineralize organic contaminants

4. Biosensors

- Monitor survival/persistence of biofertilizers
- Detect presence of economically important pathogens

5. Coconut biotechnology

- Nutrition
- Pest/disease control (Scale insects) – look for the vector and control

6. Plant disease diagnostics

- Detection kits

7. Tissue culture

- Propagation
- Plant regeneration

What natural products?

B. Forest

- Edible and nutraceutical macrofungi
- Development of insect pest resistance of forest/fruit trees
- Development of transgenic forest species for phyto/bioremediation
- Molecular characterization of heavy metal tolerant microbes

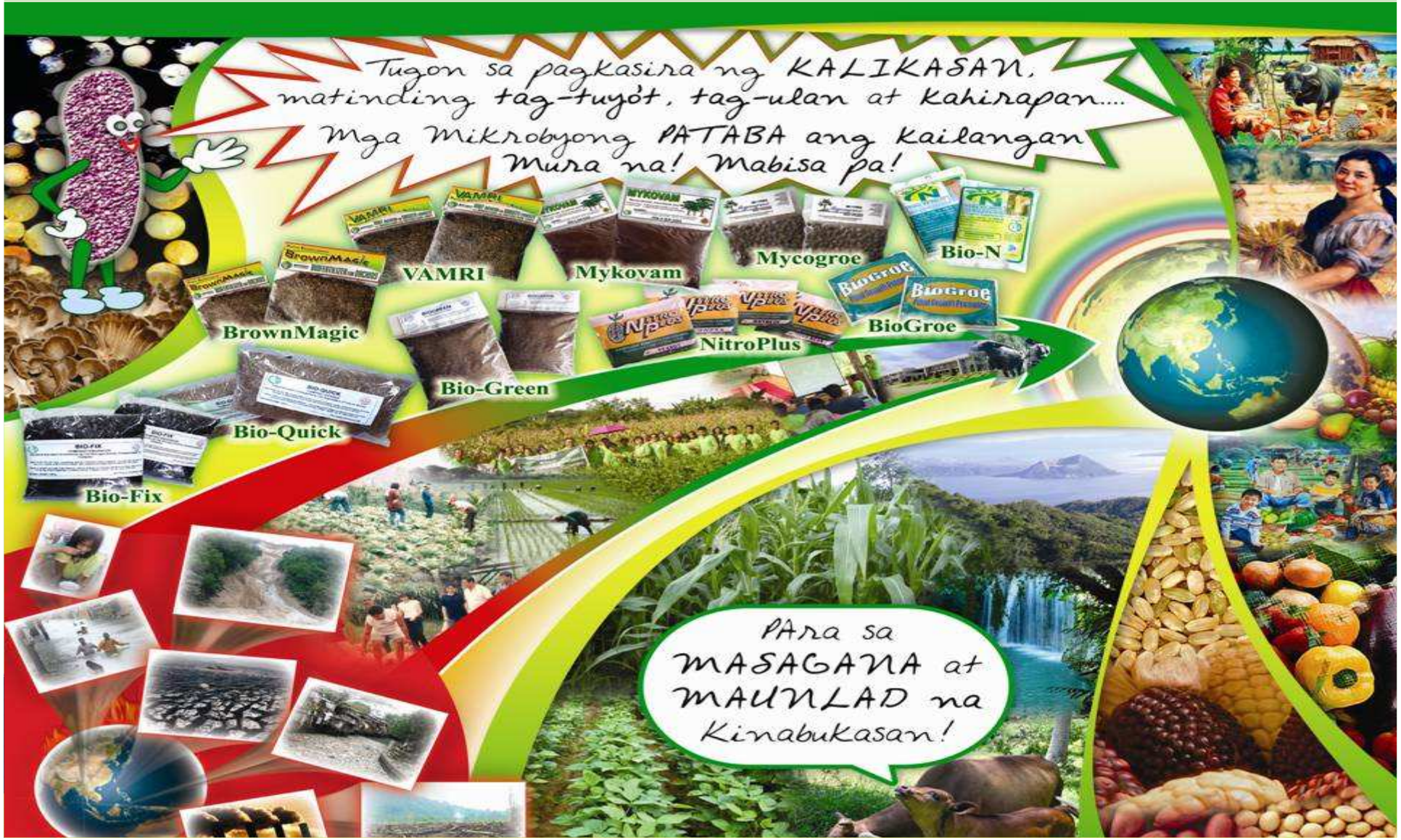
C. Animal

- Vaccine
- Diagnostics

D. Management of Agricultural and Forest Product Wastes

- Utilization of agricultural wastes for mushroom production
- Bioconversion of agri-waste and by-products for feeds of animals and aquaculture
- Develop protocol for more rapid composting of agricultural and forest/ product wastes.

BIOFERTILIZERs: Mikrobyong Pataba



Thank you!