Sustainable Development through Improved Agriculture

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21st Century

Knowledge based economy

build on

the molecular foundations of life sciences

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Agriculture Biotechnology

- Food and Feed production
- Food processing Industry
- Forestry
- New materials (bulk products)
- Molecular Pharming
- Environment

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Creating Value with Genetic Engineering

Input Traits

- Biotic stresses: Insect resistance; Nematode resistance; Striga resistance; Tolerance towards bacterial, fungal and viral infections
- Abiotic stresses: Better adaptation towards drought- salinity- cold, low nutrients, water logging, heavy metals

Physical Traits

Maturity; Plant architecture; Pod shattering; Shelf life

Output Traits

Content and quality of starch cellulose, protein, oil, nutritional elements

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Seed Industry for Europe and the Less Developed Countries

Promoting a vibrant sector seed industry, with access to value enhancing technologies can help ensure food production, stimulate rural economy and become the driving force for developing an agriculture based industry.

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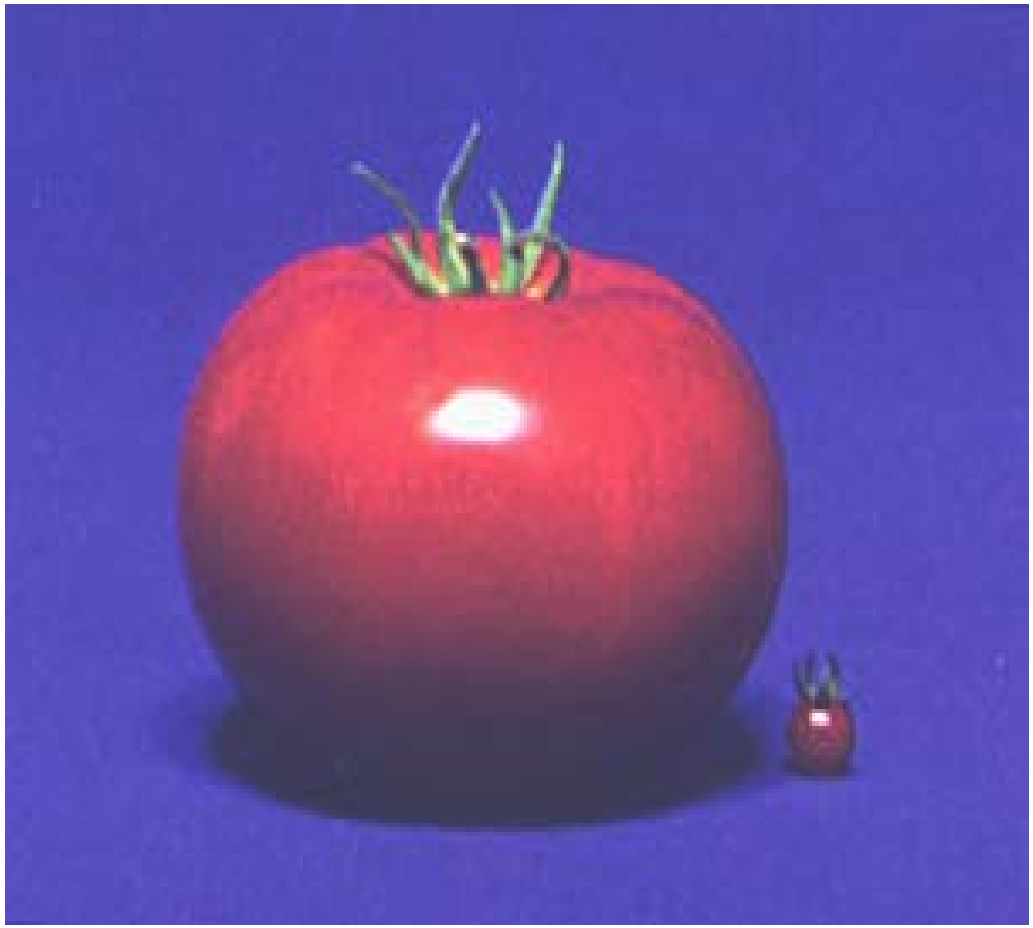

Certain domesticated tomato fruits (left) are dramatically larger than their wild counterparts (right). Liu et al. (Cornell University, Ithaca, NY) provide evidence that much of this size difference is attributable to a heterochronically regulated, negative fruit growth regulator (fw2.2) that affects cell division patterns in the tomato fruit (copy-righted by Kent Loeffler)

Plant Physiology, May 2003, Vol. 132, pp. 292-299)

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Populus as a model tree

- Fast growth
- Vegetative propagation
- Inter-specific hybridisation
- 3-generation breeding pedigrees
- Genetic transformation
- Small genome: 550Mb; 19 chr
- Genome sequenced (first tree)
- Economically relevant woody crop
  - Pulp and paper
  - Timber
  - Board, ….

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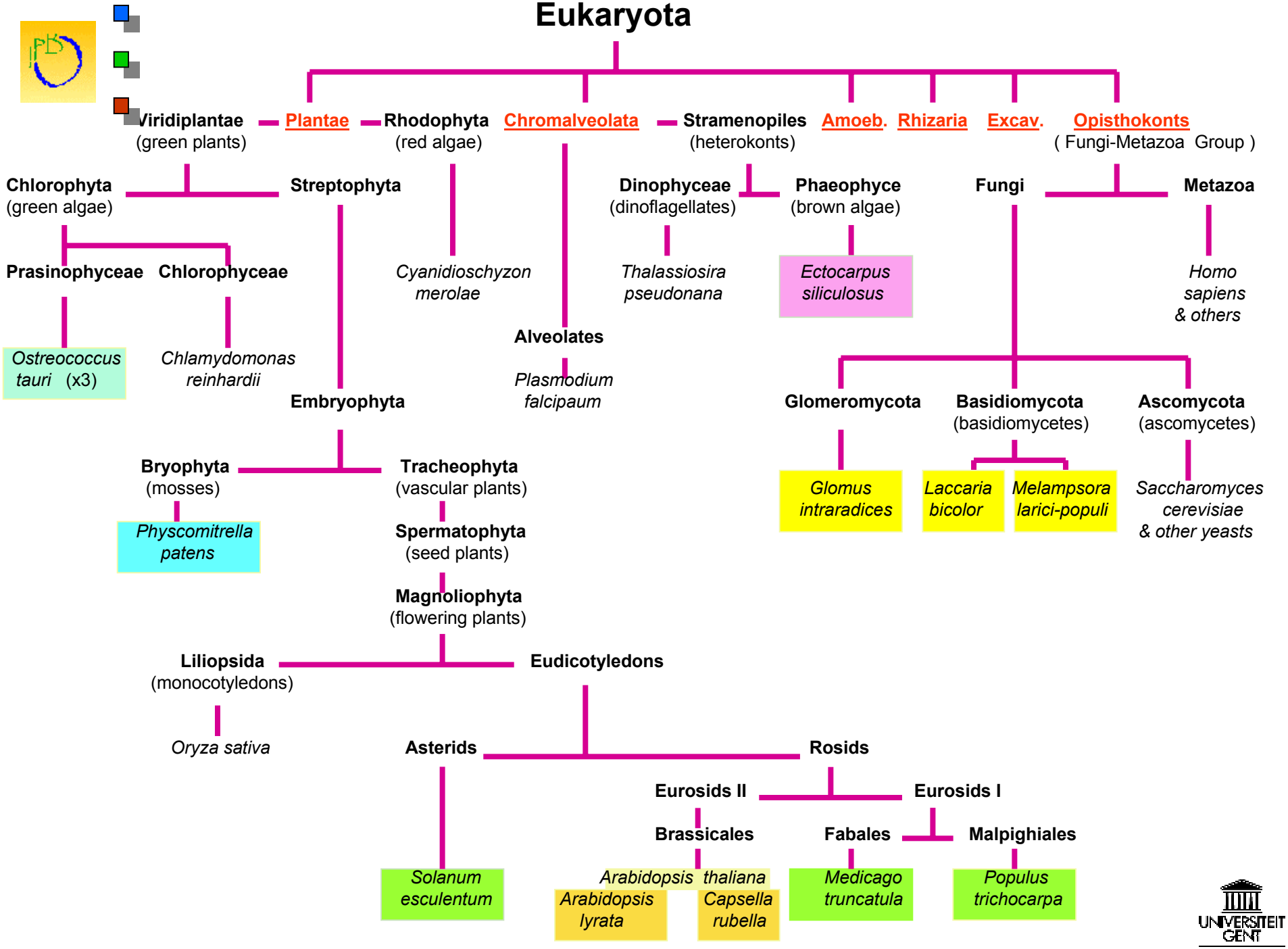
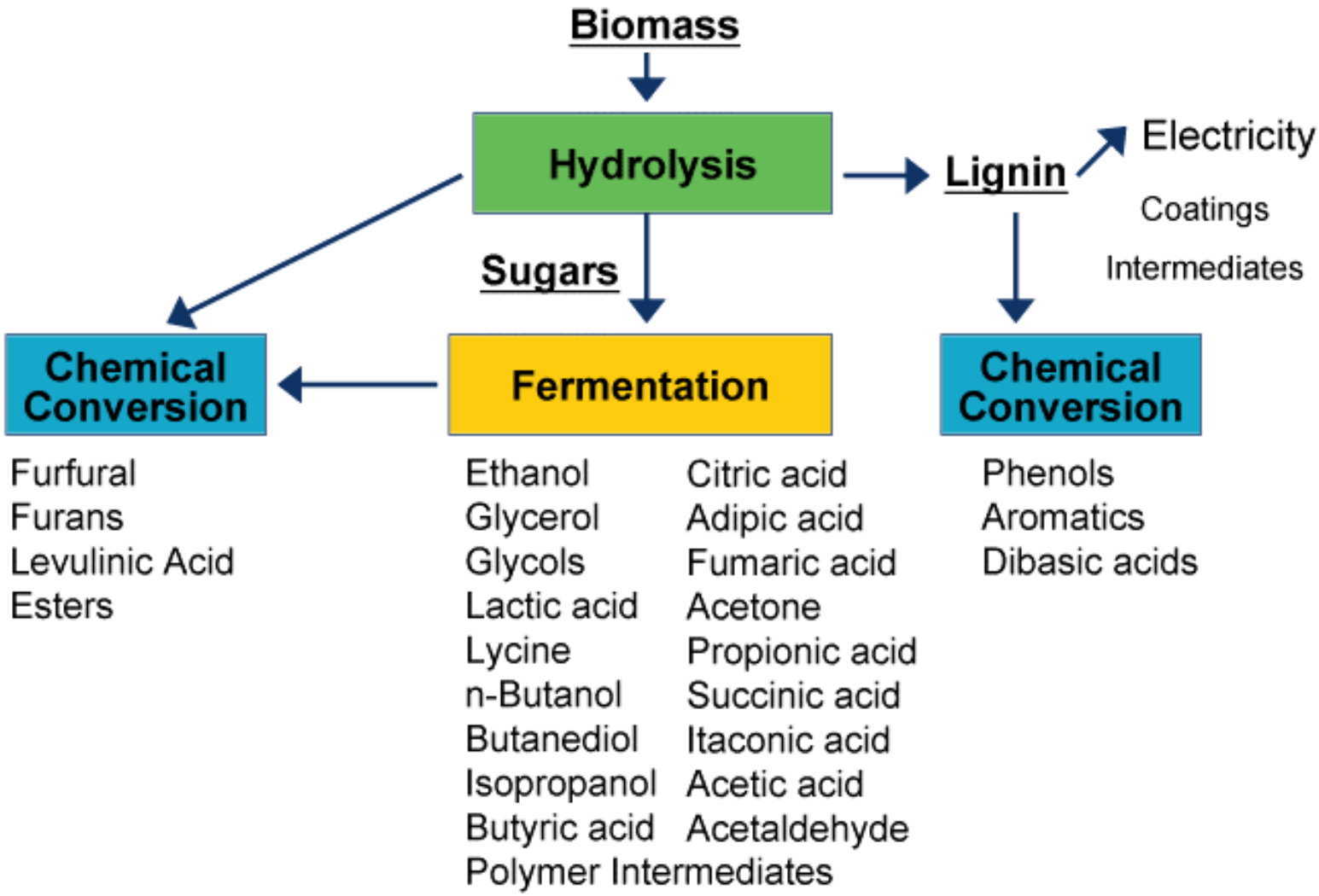

Eukaryota
Viridiplantae
(green plants)
Plantae
Rhodophyta
(red algae)
Chromalveolata
Stramenopiles
(heterokonts)
Amoeb.
Rhizaria
Excav.
Opisthokonts
(Fungi-Metazoa Group)
Chlorophyta
(green algae)
Streptophyta
Dinophyceae
(dinoflagellates)
Phaeophyce
(brown algae)
Fungi
Metazoa
Prasinophyceae
Chlorophyceae
Cyanidioschyzon merolae
Thalassiosira pseudonana
Ectocarpus siliculosus
Homo sapiens & others
Ostreococcus tauri (x3)
Chlamydomonas reinhardii
Alveolates
Plasmodium falciparum
Embryophyta
Glomeromycota
Basidiomycota
(basidiomycetes)
Ascomycota
(ascomycetes)
Bryophyta
(mosses)
Tracheophyta
(vascular plants)
Glomus intraradices
Laccaria bicolor
Melampsora larici-populi
Saccharomyces cerevisiae & other yeasts
Physcomitrella patens
Spermatophyta
(seed plants)
Magnoliophyta
(flowering plants)
Liliopsida
(monocotyledons)
Eudicotyledons
Oryza sativa
Asterids
Rosids
Eurosids II
Eurosids I
Brassicales
Fabales
Malpighiales
Solanum esculentum
Arabidopsis thaliana
Arabidopsis lyrata
Capsella rubella
Medicago truncatula
Populus trichocarpa

Biorefinery: Sugar = Ethanol + Other, Higher Value Chemicals



www.bcintlcorp.com/ images/biorefinery.gif

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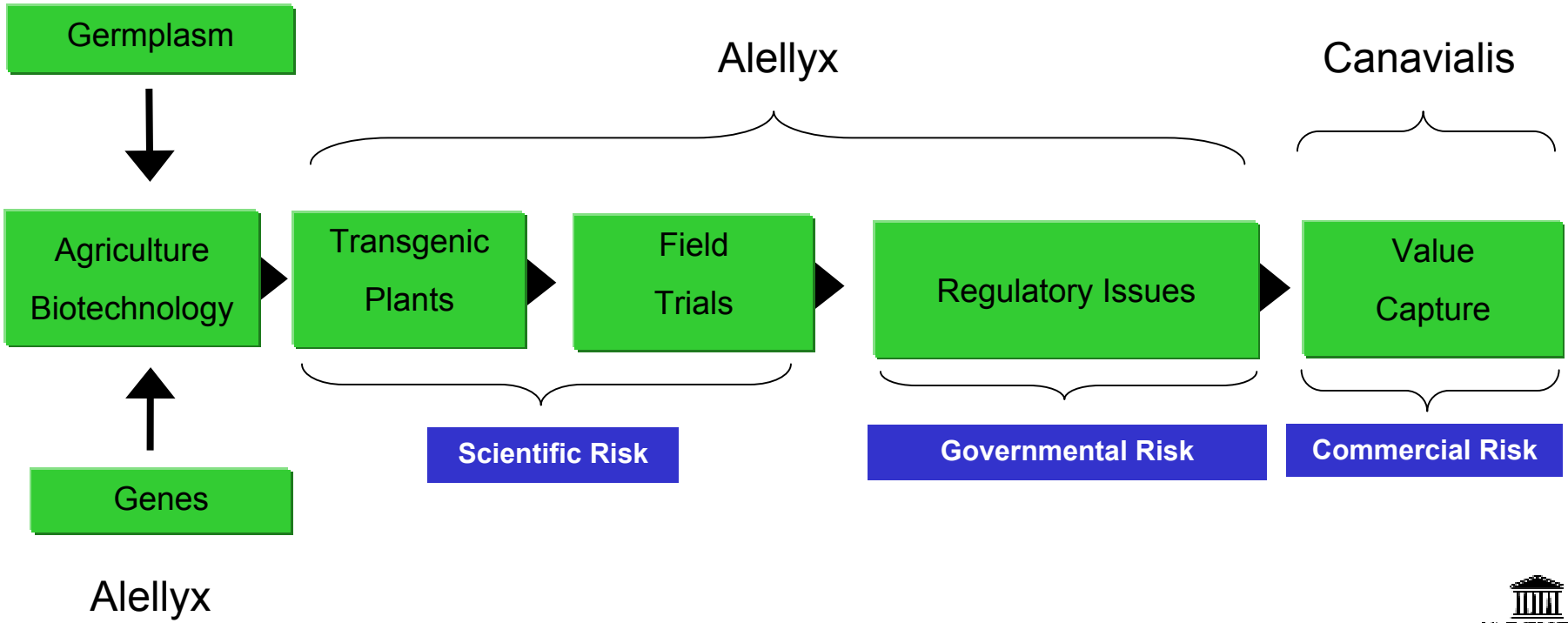
POSITIONING ALELLYX AND CANAVIALIS IN THE BIOTECHNOLOGY CHAIN

Germplasm:
- Crop specific
- Region specific
- Not portable in different markets

Canavialis



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Energy from plants is as an essential element for building a sustainable economy

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- At present almost all the world's food crops are based on a mere nine species of plants, but in the future any of thousands of other species might prove invaluable.

- Today's apparently useless species may contain tomorrow's medicine.

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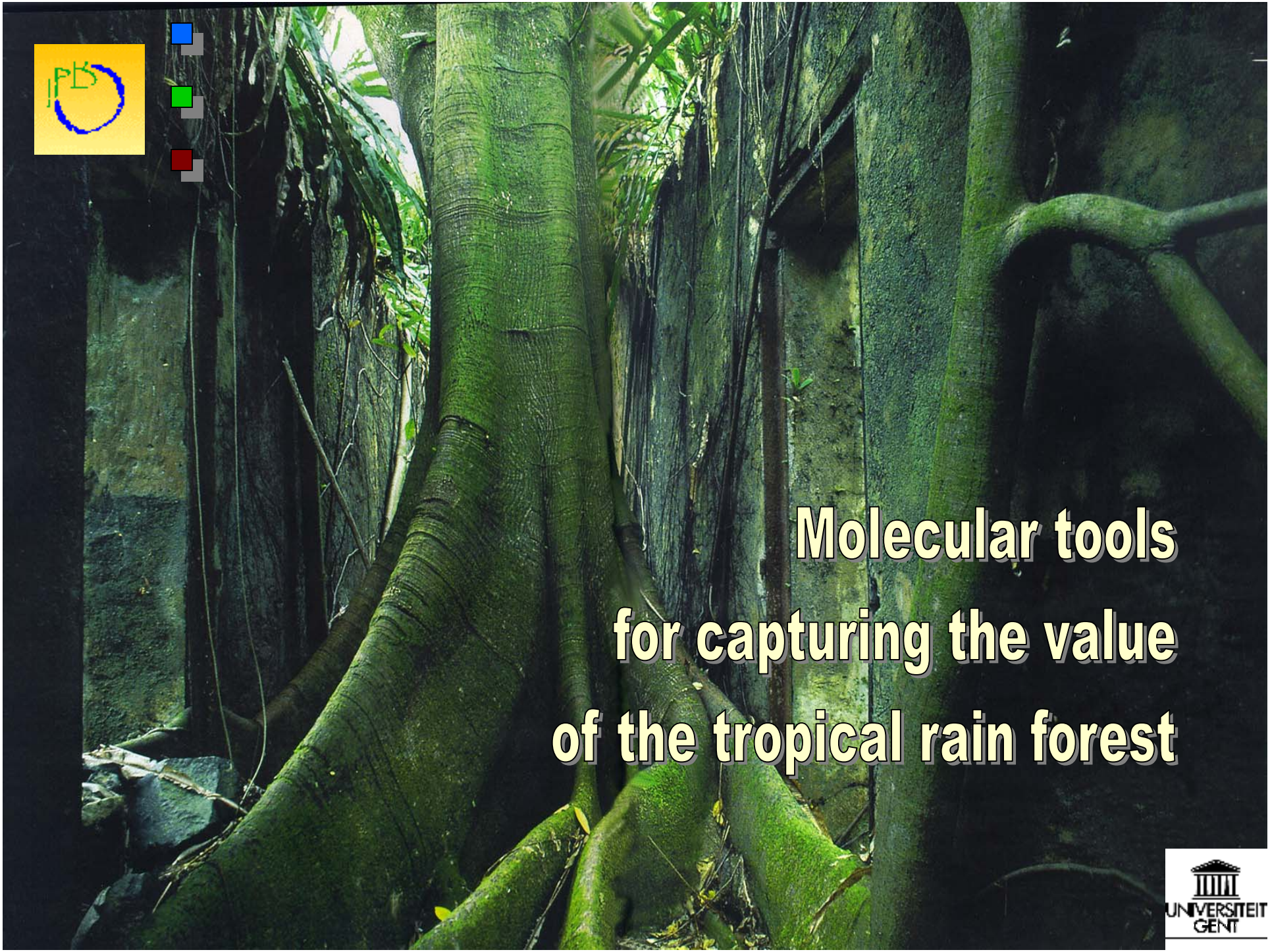
Molecular tools
for capturing the value
of the tropical rain forest

Improved Organic Agriculture

- From « integrety of nature »
- To « mutation breeding »
- Till « No tillage, low inpact sustainable farming »

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Major Public Concerns

Safety Issues

- **Human and Animal Health**
  - No adverse effect reported with the approved GM-crops

    Ref. Modern food biotechnology, human health and development : an evidence based study

    WHO report, June 2005, http://www.who.int/foodsafety
- **Environmental**
  - Already a long list of beneficial effects
  - No alarming scenario was confirmed
  - Long term ecological effects can be lower than those of traditional agriculture

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The violent opposition to GM-plants

1. Science harms “nature”
2. Multinationals control our food chain
3. Whatever positive scientists say about GM-plants, « we are against ». It is society not scientists who decide on moral and ethical issues

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