CÂMARA DOS DEPUTADOS
COMISSÃO DE MEIO AMBIENTE E DESENVOLVIMENTO SUSTENTÁVEL

AUDIÊNCIA PÚBLICA

SITUAÇÃO DAS CULTURAS AGRÍCOLAS GENETICAMENTE MODIFICADAS NO BRASIL , SOB A ÓTICA ECONÔMICA

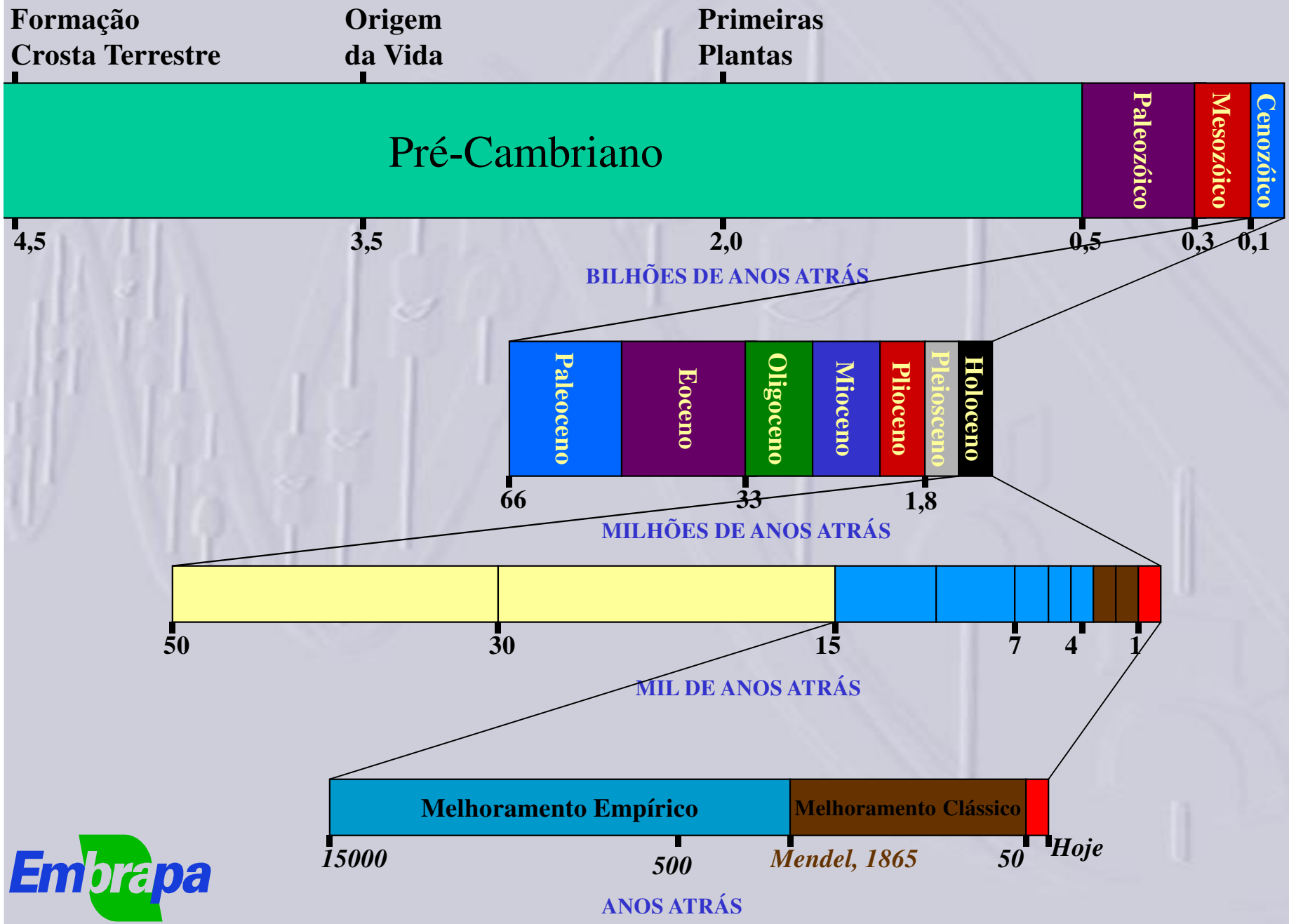
- ✓ Requerimento nº 234/2017 – do Deputado Nilto Tatto (PT/SP)

Data: 31/10/2017 (terça-feira)
Horário: 14h
Local: Anexo II – Plenário 08

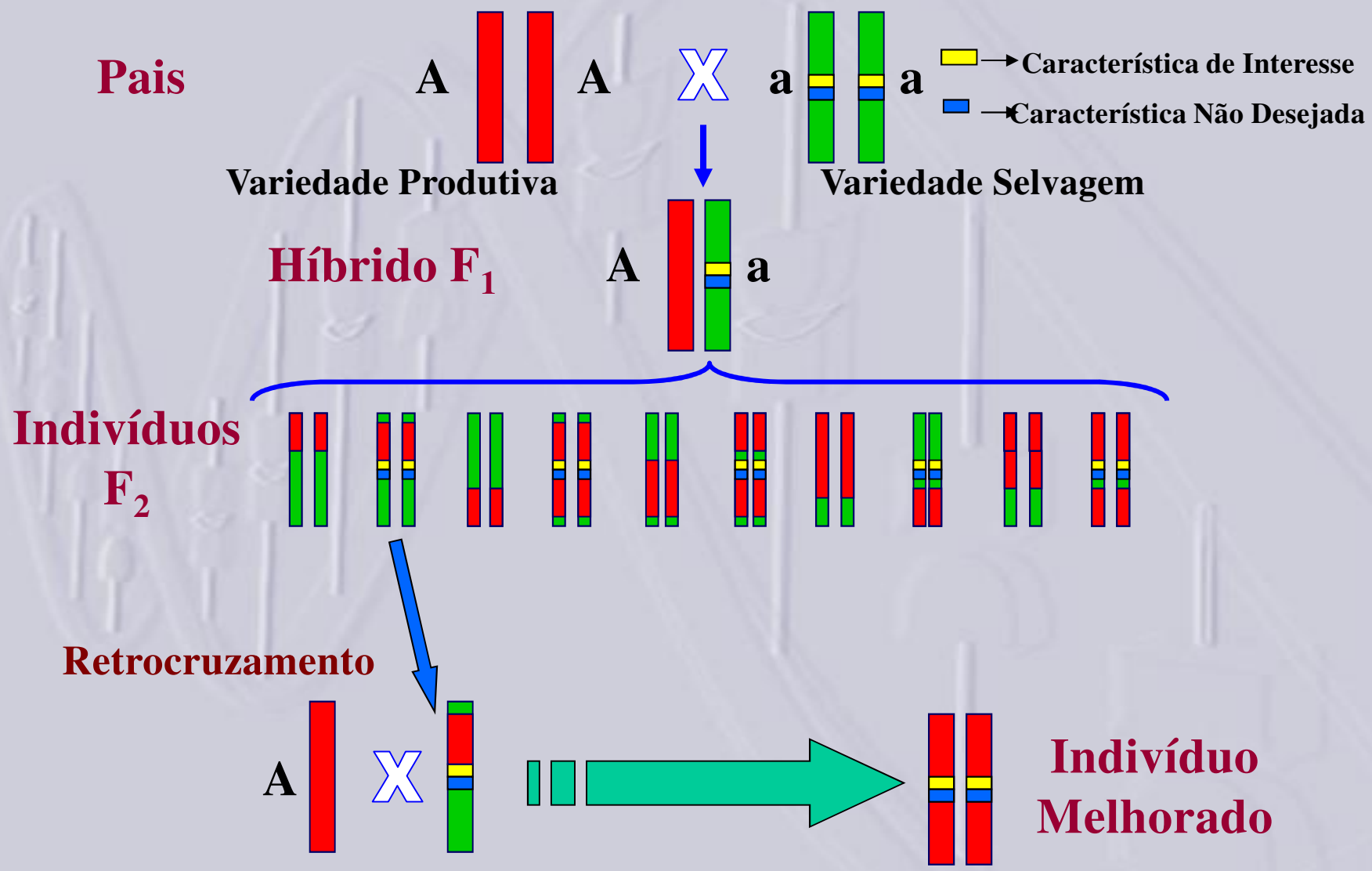
Embrapa

Alexandre Nepomuceno, Ph.D.

Evolução ⇒ Melhoramento Empírico ⇒ Melhoramento Científico



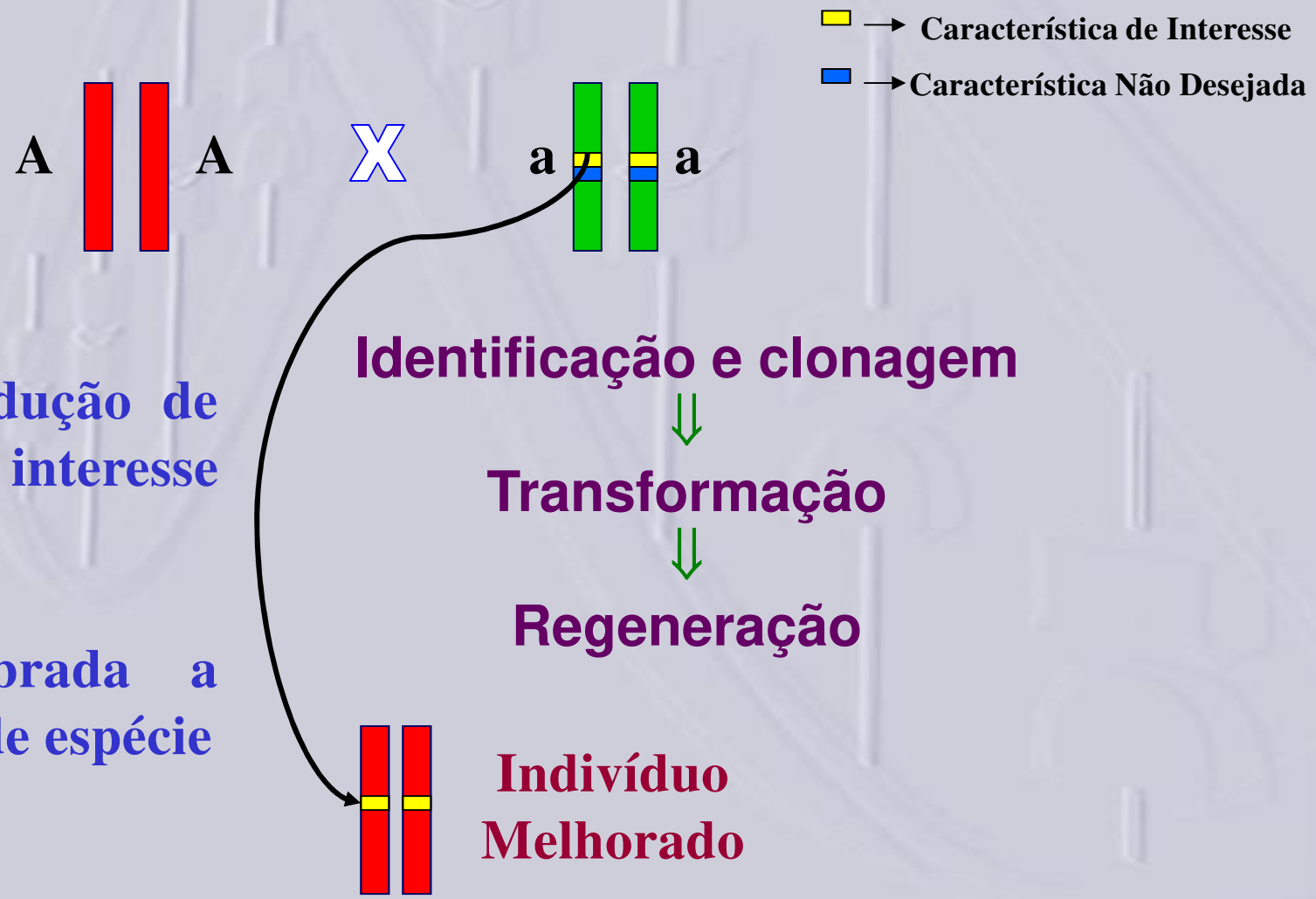
Melhoramento Clássico



Embrapa

Apartir da Década de 70...

Biotecnologia - Engenharia Genética



✓A introdução de genes de interesse é pontual

✓É quebrada a barreira de espécie

Embrapa

Os Organismos Geneticamente Modificados e seus derivados já são usados a mais de 4 décadas na Medicina e na Industria.

Insulina Humana

CDS06OUT97

HUMALOG® MIX 25

insulina lispro

(25% de Solução de Insulina Lispro e 75% de Suspensão de Insulina Lispro Protamina)

Derivada de ADN* Recombinante

D.C.B. 04920

FORMA FARMACÊUTICA, APRESENTAÇÕES E COMPOSIÇÃO

HUMALOG MIX 25 - é uma suspensão de cor branca constituída de 25% de solução de insulina lispro e 75% de suspensão de insulina lispro protamina (NPL), para administração subcutânea em uma concentração de 100 unidades / mL (U100) de insulina lispro (derivada de ADN* recombinante), apresentada em refil (carpule de vidro tipo I) de 3 mL em caixa com 2 e 5 refis, para uso em CANETAS compatíveis com a administração de insulina.

Cada mL contém:

Insulina lispro derivada de ADN* recombinante.....100 unidades

Excipientes: metacresol, glicerol, fosfato de sódio dibásico, fenol, sulfato de protamina, óxido de zinco e água para injeção q.s.p.

* ADN = Ácido Desoxirribonucléico

USO ADULTO

Produção Industrial de Queijos

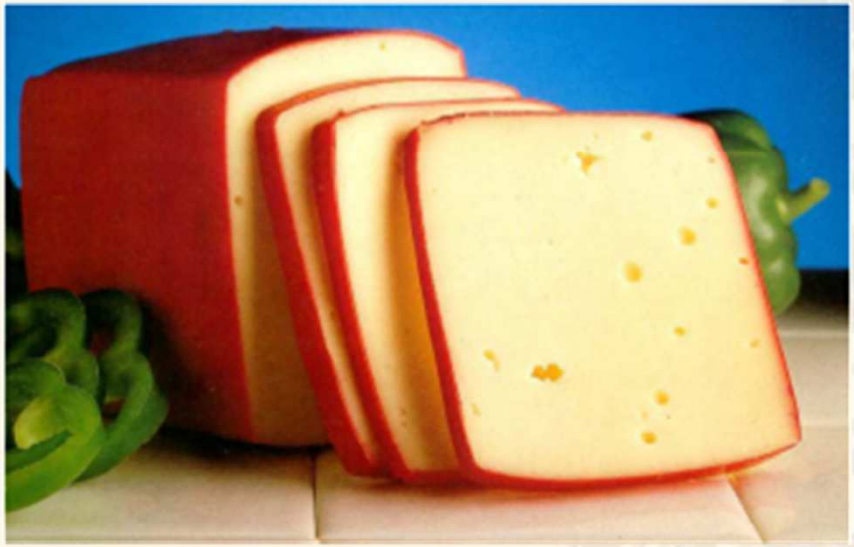
Quimosina

coagulação

Cultura Lática

proteases
peptidases
autolisina

Enzima proteolítica: pode reduzir o tempo de maturação: economia de US$ 50 milhões



Maturação

Autólise, Proteólise, Lipólise
Compostos aromáticos

PUREZA E IDENTIDADE

- Alto grau de pureza e qualidade:
- não possui enzimas contaminantes (pepsina, normalmente encontrada no coalho de estômago de bezerros)
- não possui resíduos de DNA/RNA
- não possui resíduos dos organismos de produção
- aprovação por série de testes toxicológicos

(aprovada pelo FDA e UE)

Embrapa

Alimentos Lácteos

Bactérias Lácteas
Geneticamente Modificadas


Vinho
Leveduras Geneticamente Modificadas
para produção de Vinho
Embrapa

Leveduras GM na fabricação de Cervejas

Patents

Amylolytic enzyme producing microorganisms, constructed by recombinant DNA technology, and their use in fermentation processes

EP 0257115 A1

Publication number	EP0257115 A1
Publication type	Application
Application number	EP19860111586
Publication date	2 Mar 1988
Filing date	21 Aug 1986
Priority date ⓘ	21 Aug 1986
Also published as	DE260404T1, DE3751326D1, DE3751326T2, US5100794
Inventors	Alexander Strasser, Feodor Bernard Martens, Jürgen Dohmen, Cornelius P. Hollenberg
Applicant	Heineken Technisch Beheer B.V.
Export Citation	BiBTeX, EndNote, RefMan

Patent Citations (8), Referenced by (8), Classifications (26), Legal Events (4)

External Links: Espacenet, EP Register

ABSTRACT

This invention provides a method for producing amylolytic enzymes by culturing a microorganism, having received as a result of recombinant DNA technology DNA sequences from a donor yeast comprising the coding sequences for the amylolytic enzymes wherein the host microorgamism is capable of expressing said amylolytic enzymes. Furthermore, this invention provides microorganisms genetically engineered as to being able to produce and express the amylolytic enzymes, a vector containing the DNA sequences, coding for the amylolytic enzymes and the respective DNA sequences. The said host microorganisms are useful in the production of biomass and many fermentation processes, preferably in the production of special beers.

Vacinas

butantan

pesquisar Embrapa

o butantan | produção | pesquisa | cultura | saúde | educação | fundação

vacinas

produtos | vacinas | soros | controle de qualidade
embalagens | produtos em desenvolvimento | assuntos regulatórios
unidades | dengue | production | producción
ensaios clinicos

As vacinas são recursos indispensáveis para a saúde individual e pública. Através da imunização é possível prevenir infecções e impedir que várias doenças se espalhem por um território. Atuam estimulando o organismo a produzir sua própria proteção (por exemplo, a produção de anticorpos) contra doenças. É a maneira mais eficaz de controlar e até erradicar doenças.
O Instituto Butantan é responsável pela produção de importantes vacinas: vacina adsorvida difteria, tétano e pertussis (DTP), vacina adsorvida difteria e tétano adulto (dT), vacina adsorvida difteria e tétano infantil (DT), vacina adsorvida hepatite B (recombinante), vacina influenza sazonal trivalente (fragmentada e inativada) e vacina raiva inativada (VR/VERO).

Novas vacinas entraram no calendário nacional de vacinação a partir de acordos de transferência de tecnologia de parceiros privados com o Ministério da Saúde e o Instituto Butantan:

- HPV, em parceria com a MSD – para meninas de 11-13 anos
- Hepatite A em parceria com a MSD – para crianças de até 1 ano
- dTpa em parceria com a GSK (GlaxoSmithKline) – para gestantes

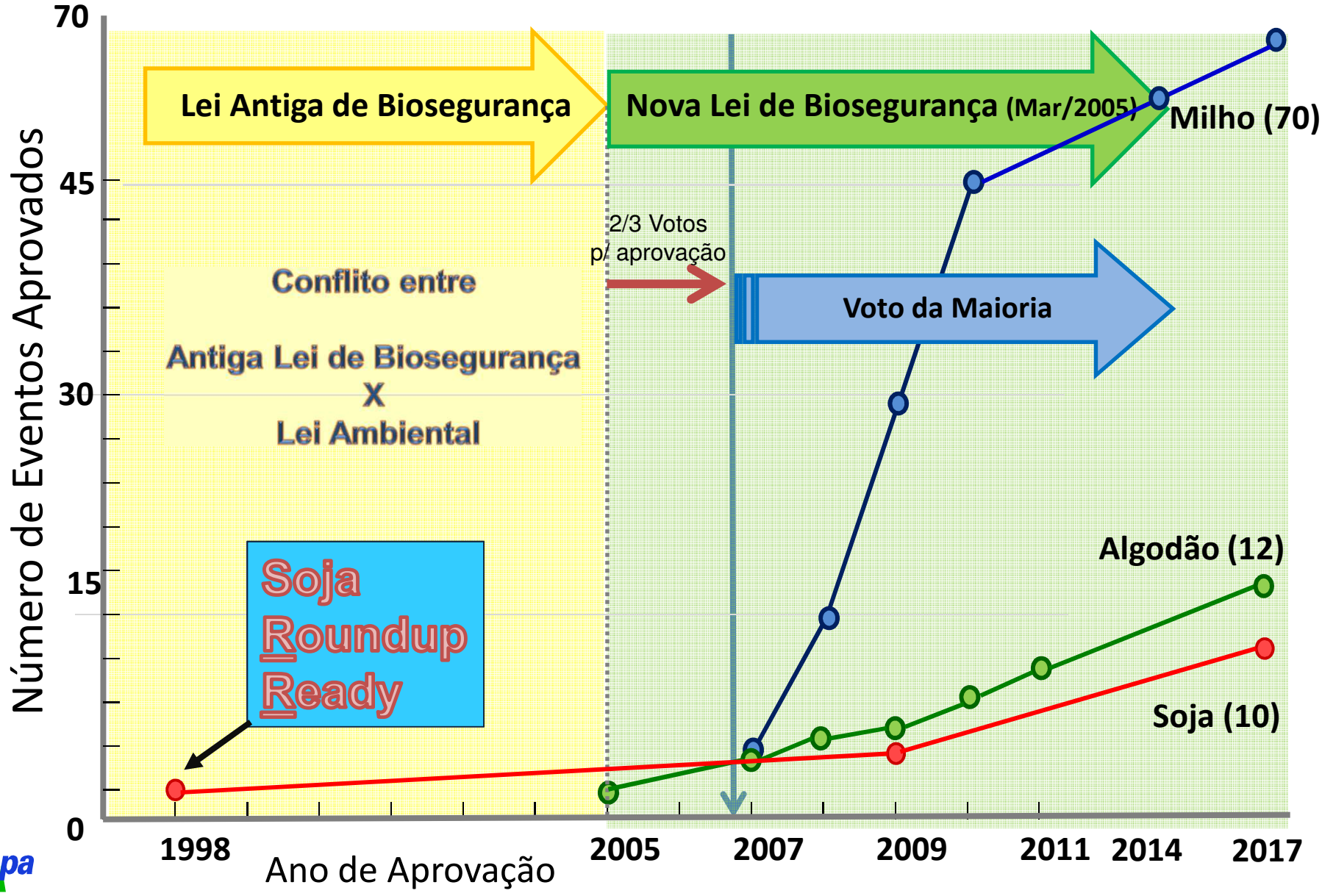
Produção de vacinas

Instituto Butantan: Produz milhões de doses de vacinas virais recombinantes contra Hepatite B

Celulases/Lipases/Proteases - Enzimas recombinantes (transgênicas) utilizadas na indústria de detergentes, sabão em pó/liquido e sabonetes

Embrapa

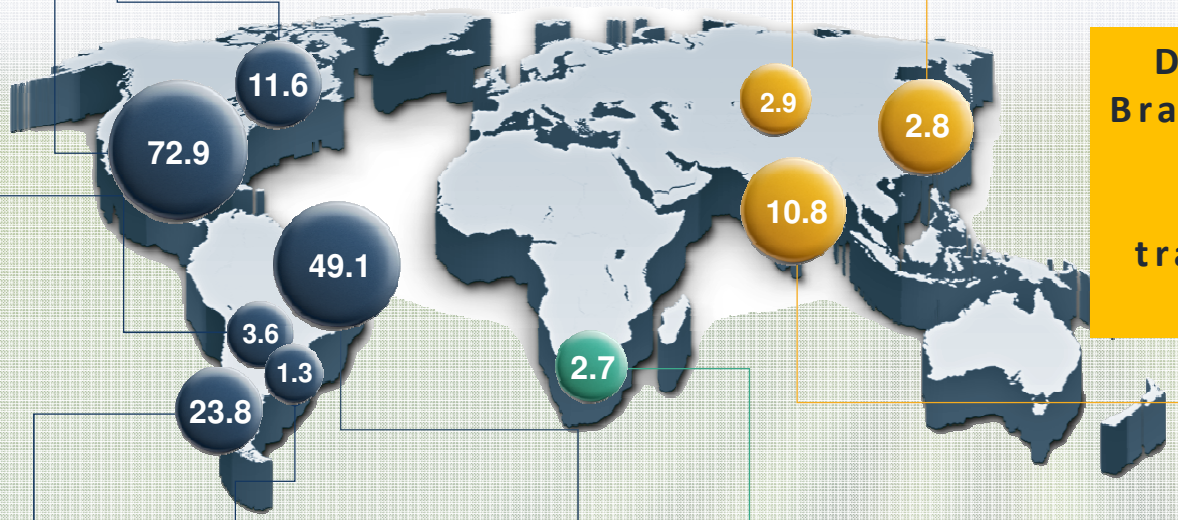
Biotecnologia na Agricultura Brasileira



Embrapa

ÁREA PLANTADA DE TRANSGÊNICOS NO MUNDO

(EM MILHÕES DE HECTARES)



1º EUA

Soja
Milho
Algodão
Canola
Abóbora
Batata
Alfafa
Beterraba
Papala

4º CANADÁ

Soja
Milho
Beterraba
Alfafa
Canola

7º PAQUISTÃO

Algodão

8º CHINA

Algodão
Papaya
Álamo

Desde 2009, o Brasil tornou-se o 2º maior produtor de transgênicos do mundo

6º PARAGUAI

Soja
Milho
Algodão

3º ARGENTINA

Soja
Milho
Algodão

10º URUGUAI

Soja
Milho

2º BRASIL

Soja
Milho
Algodão

9º ÁFRICA DO SUL

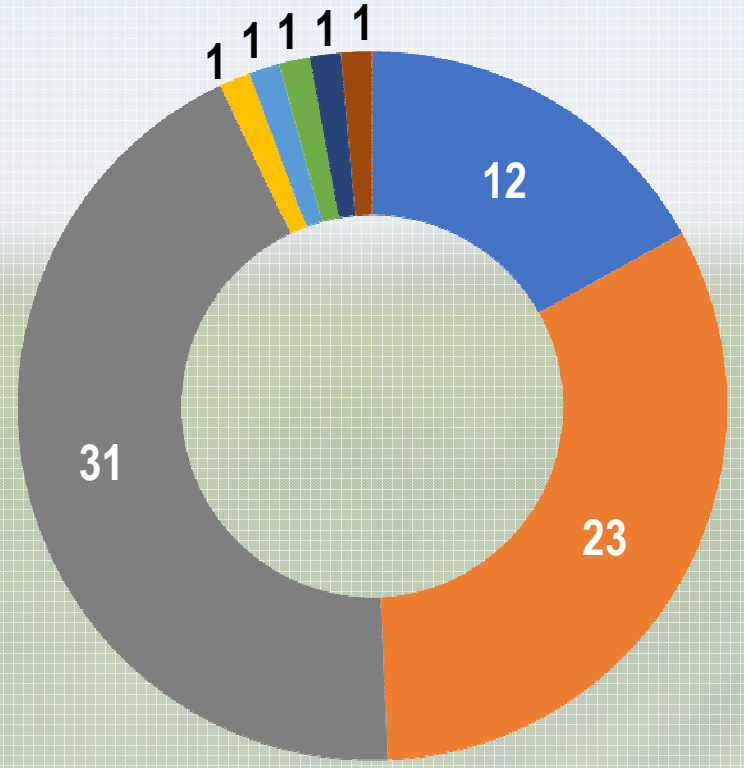
Soja
Milho
Algodão

5º INDIA

Algodão

ISAAA, 2017

CARACTERÍSTICAS PLANTAS GM
APROVADAS NO BRASIL



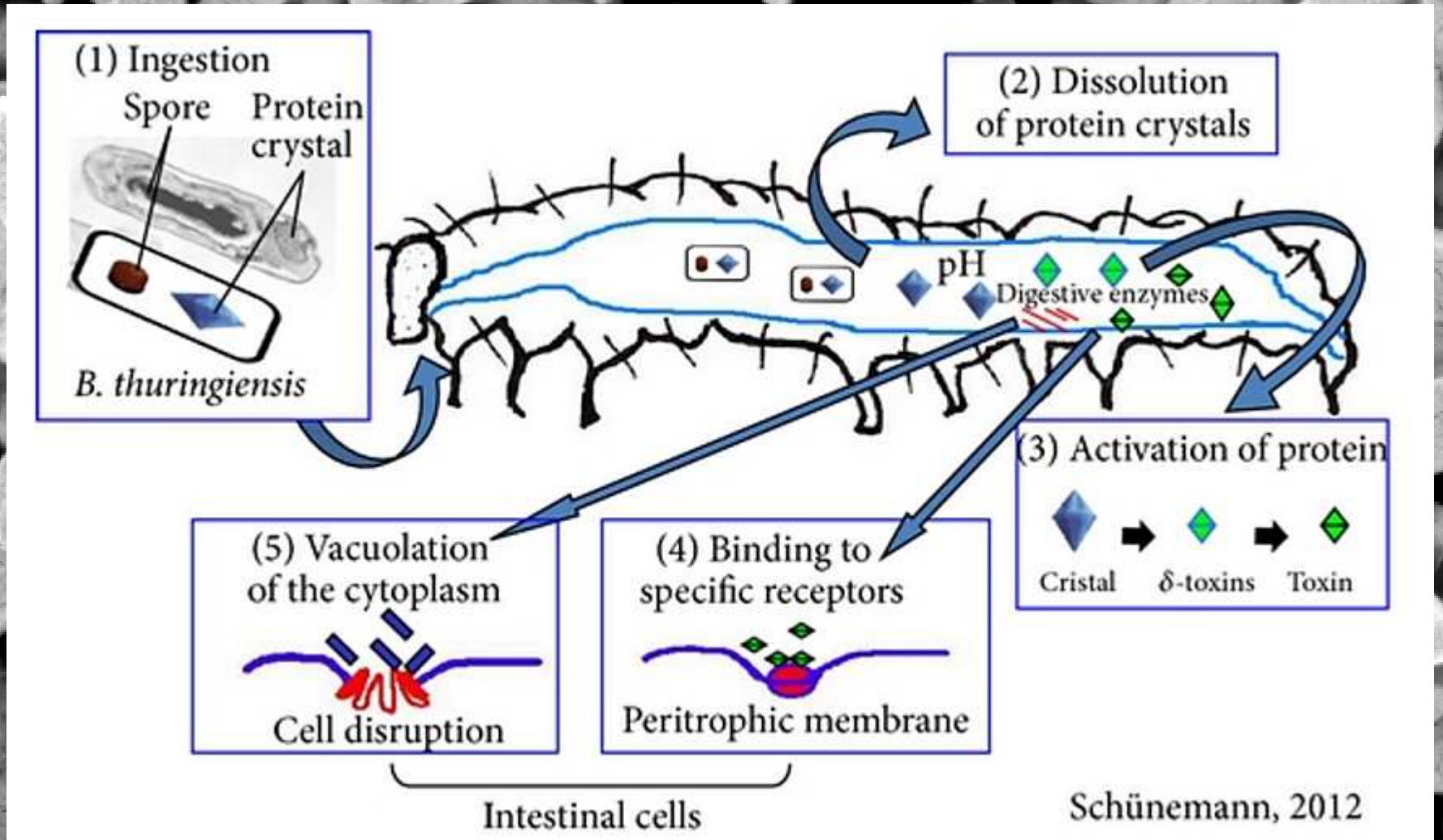
- Resistência a Insetos (RI): 12
- Tolerância a herbicidas (TH): 23
- TH+ RI: 31
- Resistência à vírus: 1
- Restauração da fertilidade: 1
- Aumento de produtividade: 1
- Tolerância à seca: 1
- Produção de etanol (quebra de carboidrato):1

71 APROVAÇÕES

CTNBio, 2017

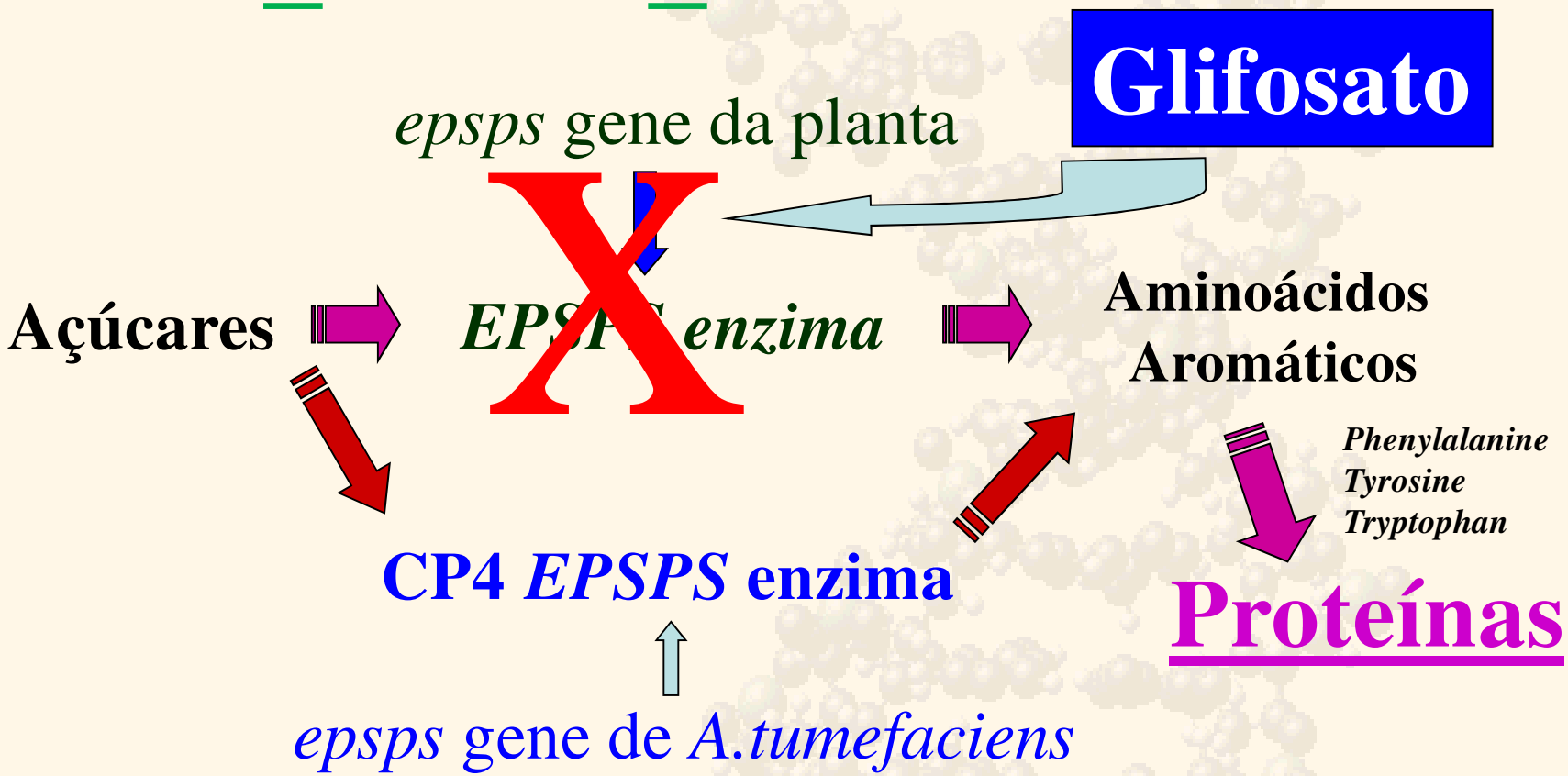
Bacillus thuringiensis

δ-Endotoxina – *cry* Genes



Plantas Resistentes Herbicida Glifosato

Roundup Ready (RR)



EPSPS : 5-enolpyruvylshikimate-3-phosphate synthase

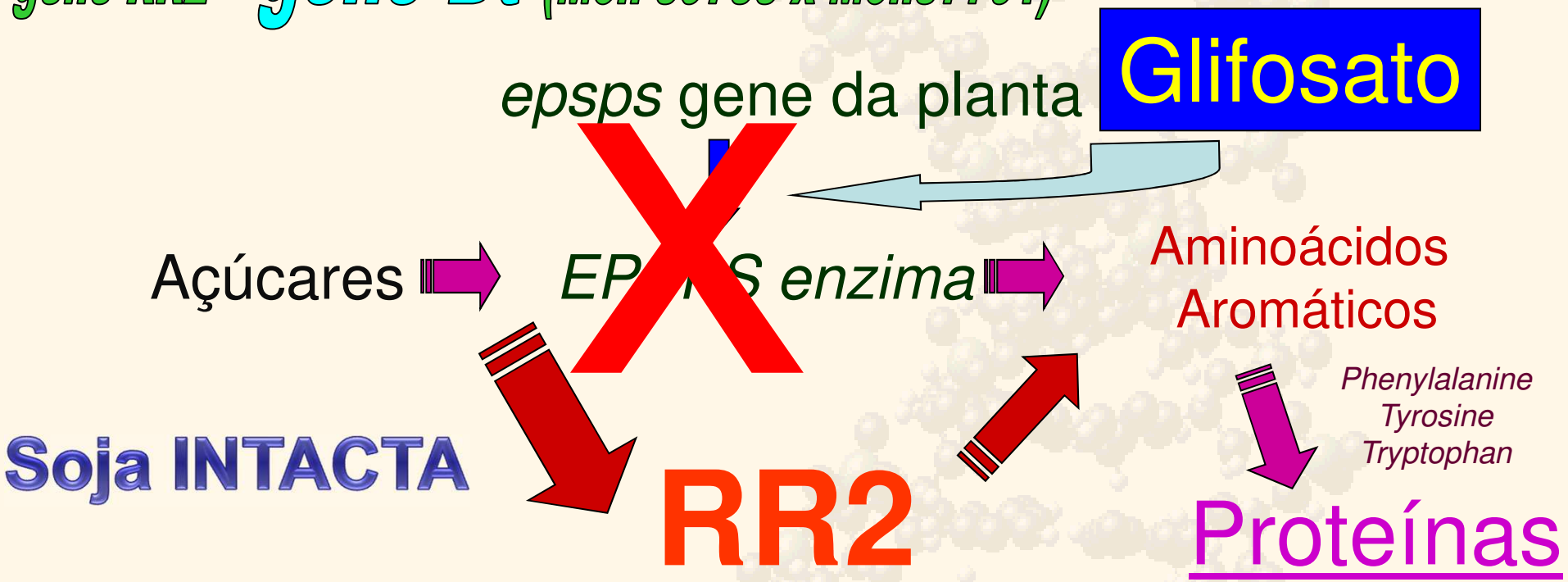
Biobalística

SEM Otimização de Códons

Construção 35S:CP4-Epsps:T-NOS

Soja - Resistência a Glifosato e Insetos

gene RR2 + gene Bt (Mon 89788 x Mon87701)



Agrobacterium tumefaciens
Otimização de Códons
Vários Elementos Gênicos Trocados

Plantas GM resistentes a outros princípios ativos recentemente aprovados e em processo de Análise na CTNBio

Modo de Ação	Família Química	Ingrediente Ativo	Situação
Inibidores da Síntese de Lipídios (ACCase)	Aryloxyphenoxy Cyclohexanedione	FOP	Aprovado Comercialmente
Reguladores de Crescimento	Phenoxy	2,4-D	Aprovado Comercialmente
Reguladores de Crescimento	Acido Benzóico	Dicamba	Aprovado Comercialmente
Inibidores de Pigmentos (HPPD)	Isoxazole	Isoxaflutole	Aprovado Comercialmente

Consumo de Glifosato nos EUA após a adoção da Tecnologia RR

No Brasil, os herbicidas na cultura da soja convencional correspondem a ~52% do valor das vendas totais de herbicidas (~U$ 676 milhões)

(Ferreira et al. 2002)

Fonte: Departamento de Agricultura dos EUA - USDA; Relatório de Uso de Químicos na Agricultura - "Agricultural Chemical Usage" – 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002.

Embrapa

Ministério da Agricultura Pecuária e Abastecimento

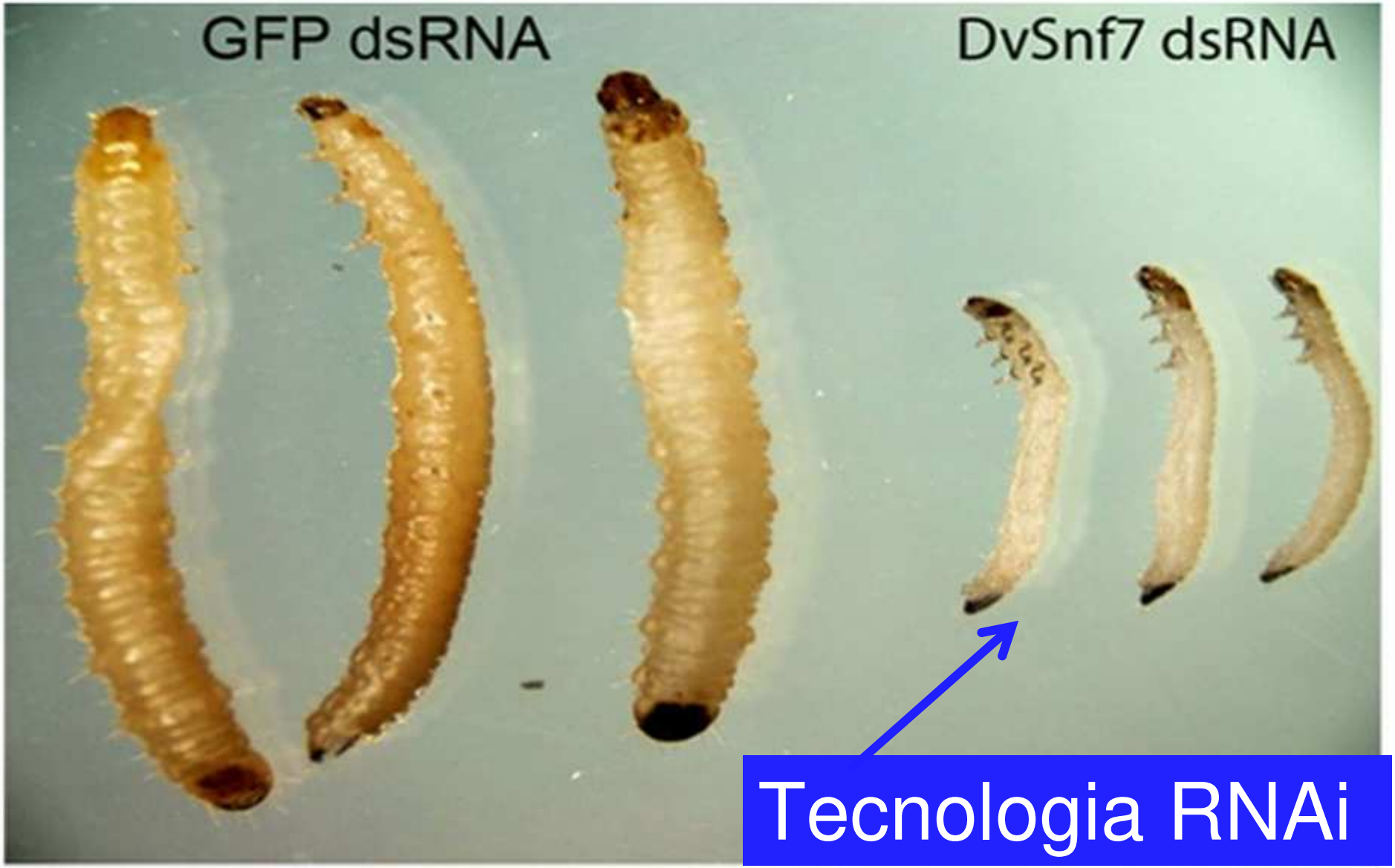
Novos OGMs com características importantes para a Agricultura Brasileira

Source: CTNBio, 2014.

Evento MON 87411: Cry3Bb1, **dvsnf7**, cp4-epsps

Aprovado em 2016

Diabrotica sp. **(Vaquinha, Brasileirinho, etc)**




Source: CTNBio, Abril 2015
Eucalyptus
Primeira Árvore GM no Mundo
Velocidade de Crescimento
7 Anos em 5
Evento H412
Liberado Comercialmente no Brasil
09 de Abril , 2015.

Cana de Açúcar BT

Primeira Cana de Açúcar GM in Brazil

8 de Junho, 2017

Aprovada para uso Comercial

Centro de Tecnologia Canavieira - CTC

Bacillus thuringiensis – BT Gene

Gene Cry 1Ab

PATENTE da Monsanto VENCIDA

plenish

FIND A SUPPLIER | RELATED LINKS | EVENTS | RESOURCES | ABOUT PLENISH® HIGH OLEIC SOYBEANS




PLENISH® | FARMING | FOOD | CONSUMERS | PRESS | SEARCH | SEARCH BY KEYWORD | GO

A soybean with a healthier oil profile

Health-conscious consumers expect foods with labels that say 0g trans fat. Food manufacturers and fast food restaurants are working to find oils that can meet this demand without sacrificing performance—or the taste that keeps their customers coming back. Farmers want a soybean with strong agronomics and increased demand. Enter Plenish®—a Pioneer® brand soybean with a healthier oil profile and increased oil stability. Plenish® high oleic soybean oil has 0g trans fat, less saturated fat and the highest amount of heart-healthy monounsaturated fat available in soy.

And with the abundant supply of soybean acres in North America and the solid yields and agronomics of Pioneer brand soybeans, Plenish high oleic soybeans will be a cost-effective and reliable trans fat solution.

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EVENTS | RESOURCES | PRESS

▸ Ohio Farm Science Review

September 17, 2013
London, Ohio

▸ VIEW MORE EVENTS

DUPONT

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The DuPont Oval Logo is a registered trademark

PIONEER® brand products are provided subject
concepts described are subject to full regulatory

Em Uso Comercial no US
High Oleic Soybean

Desde 2003, Bilhões de U$ e Litros de Fungicidas são usados no controle da Ferrugem da Soja

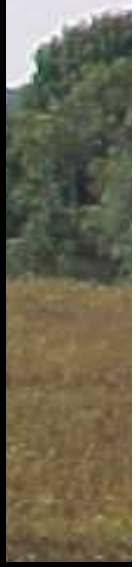
Fe
(F

comissão técnica nacional CTNBio de biossegurança

Ministério da Ciência, Tecnologia, Inovações e Comunicações - MCTIC
Comissão Técnica Nacional de Biossegurança - CTNBio
Secretaria Executiva

comissão técnica nacional CTNBio de biossegurança

195ª REUNIÃO ORDINÁRIA DA COMISSÃO TÉCNICA NACIONAL DE BIOSSEGURANÇA – CTNBio
Data: 01 de setembro de 2016
Horário: 9h às 13h
Local: ***Setor Policial*** *– Área 5 Quadra 3 –* ***Auditório*** *- Centro de Convenções da Policia Rodoviária Federal em Brasília*
Agenda Proposta
A. Abertura da Reunião.
B. Aprovação da Agenda.
C. Aprovação da Ata da 194ª Reunião Ordinária da CTNBio.
D. Itens em conjunto com as quatro Subcomissões Setoriais Permanentes (SSP):
Legenda de decisões:



1.37. **(URGENTE) (Com informação confidencial)** BASF S/A. Processo 01200.001210/2016-05. Liberação planejada no meio ambiente (RN8) de soja geneticamente modificada: "SOJA GM 16/17 – Avaliação da soja GM resistente a fungo". Os ensaios serão conduzidos nas Estações Experimentais da requerente localizadas nos municípios de Santo Antônio de Posse/SP e Uberlândia/MG. Data do Protocolo: 12/04/2016. Prótons: 20307/16 (ostensivo) e 20314/16 (sigiloso). Extrato Prévio: nº. 5212/2016 publicado em 30/06/16. Relatoria definida em julho/2016: Dra. Vania Moda Cirino e Dr(a). Welington Luiz de Araújo. Assessoria Marcos Bertozo;

Sendo testado a mais de 6 anos no Brasil

REUTERS EDITION

Comercial nos EUA desde 2013

U.S. approves Monsanto drought-tolerant GM corn

Recommend 147 people recommend this.

WASHINGTON Tue Dec 27, 2011 2:30pm EST

(Reuters) - Monsanto's genetically engineered, drought resistant corn is deregulated, the U.S. Agriculture Department said Thursday, clearing the variety for sale.

USDA approved the variety after reviewing environmental and risk assessments, public comments and research data from Monsanto.

Corn is the most widely grown U.S. crop and farmers grew 91.9 million acres of the feed grain this year, the second-largest area since World War Two.

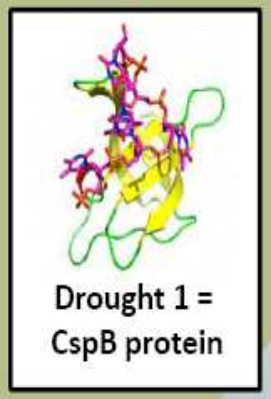
Related News

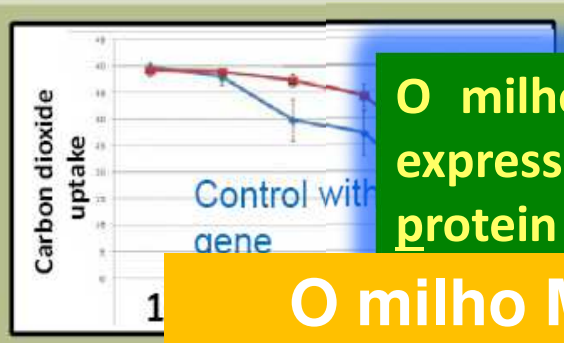
Monsanto ups guidance, cites Sou American sales
Wed, Dec 7 2011

MF Global fallout delays U.S. farm seed, land deals
Tue, Dec 6 2011

Killer mold too risky

Como Funciona o Milho Tolerante a Seca da Monsanto?





O milho MON 87460 é um milho GM expressando a proteína CspB - Cold shock protein B (CspB) obtida da bactéria se liga a rmitindo m ativos

eased
Under
r-Deficit
tress

O milho MON 87460 em condições de restrição hídrica demonstrou aumento da ordem de 16,5% em produtividade em relação ao milho controle sem o gene de tolerância à seca.

CspB enhances the way the plant uses its genetics

IN COLLABORATION WITH BASF

Source: Monsanto, 2012

Extension of Collaboration With BASF Continues Promising Discoveries of Higher-Yielding and Stress Traits – Wheat Added

Source: BASF, 2006; Monsanto, 2012.

Gene SAT2 Sugarcane
An Embrapa/JIRCAS/CTC partnership

Soja GM Tolerante à Seca

Testes a Campo

Embrapa Soja, Londrina, PR, Brasil

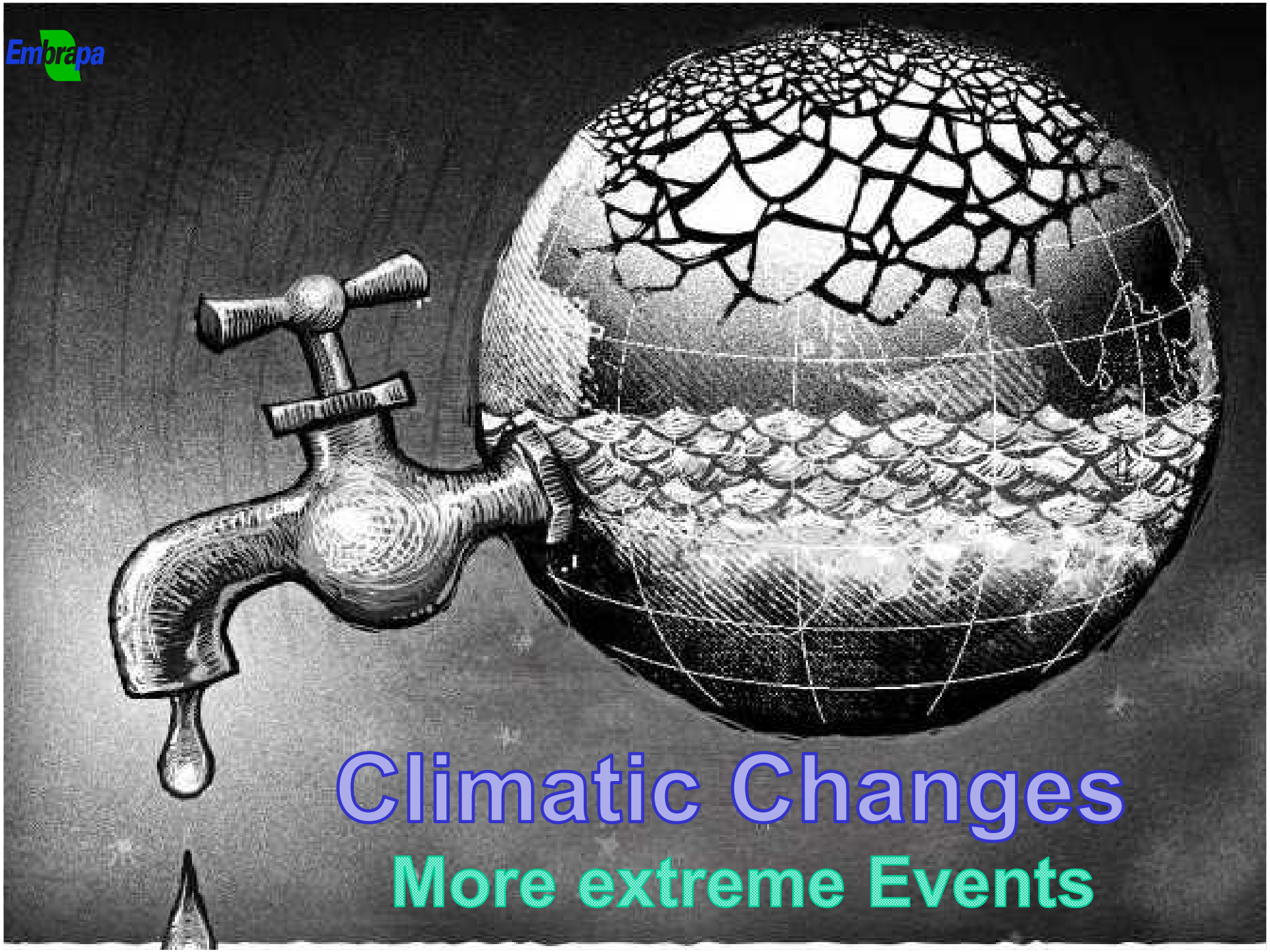
Milho Gene Sat3 GM

Café
Brachiaria
Eucaliptus
Feijão
Algodão

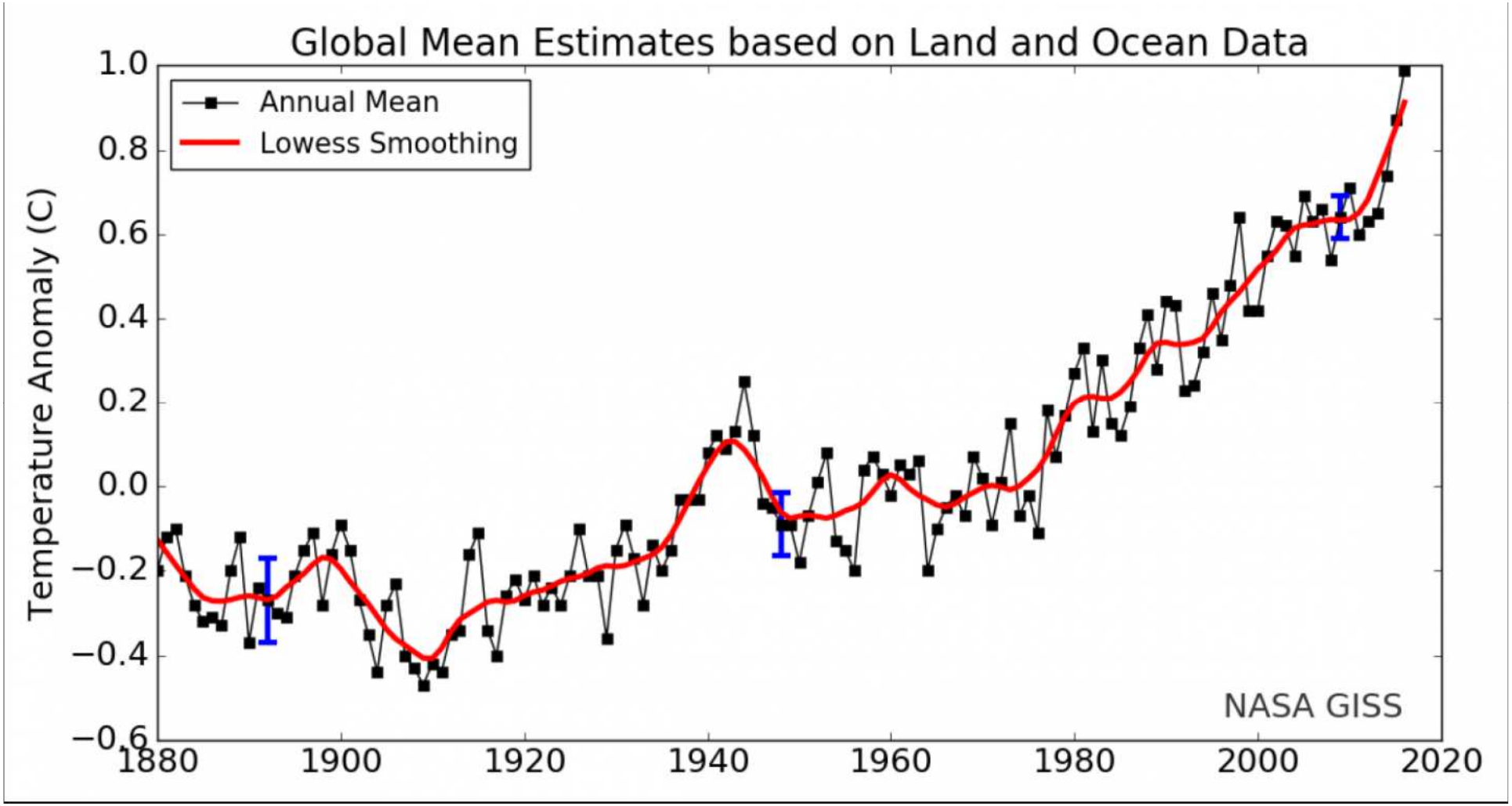
60 Dias com 50% irrigação

120 Dias com 50% irrigação

Source: Newton Carneiro, Embrapa Maize and Sorghum, 2013.


Embrapa
Climatic Changes
More extreme Events

Anomalias nas Temperaturas do Planeta



Source: NASA, 2016

Embrapa

Projetos com Eng.Genética em Instituições Públicas e Privadas Brasileiras

Espécies:

Citrus
Algodão
Hortaliças
Coco
Mamão
Pinhão Manso
Mamona
Mandioca
Cana
Soja
Milho
Trigo
etc...

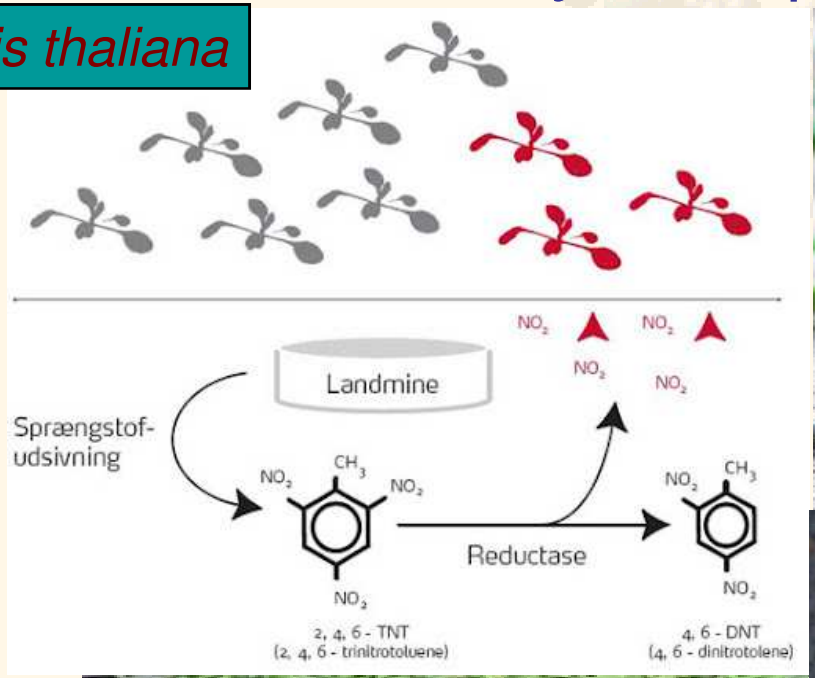
Problemas em Foco:

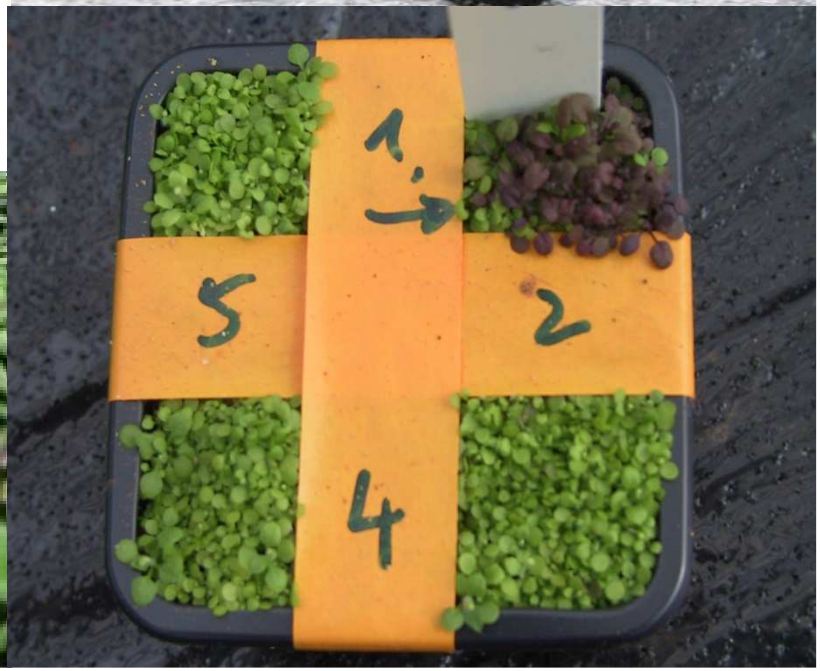
Seca
Doenças
Alagamento
Valor Nutricional
Produtividade
Nematóides
Insetos
etc...

Plantas Sentinelas para detecção de Minas Terrestres

Aresa cia.- University of Copenhagen, Denmark

Arabidopsis thaliana





Source: *Aresa, Jan, 2010.*

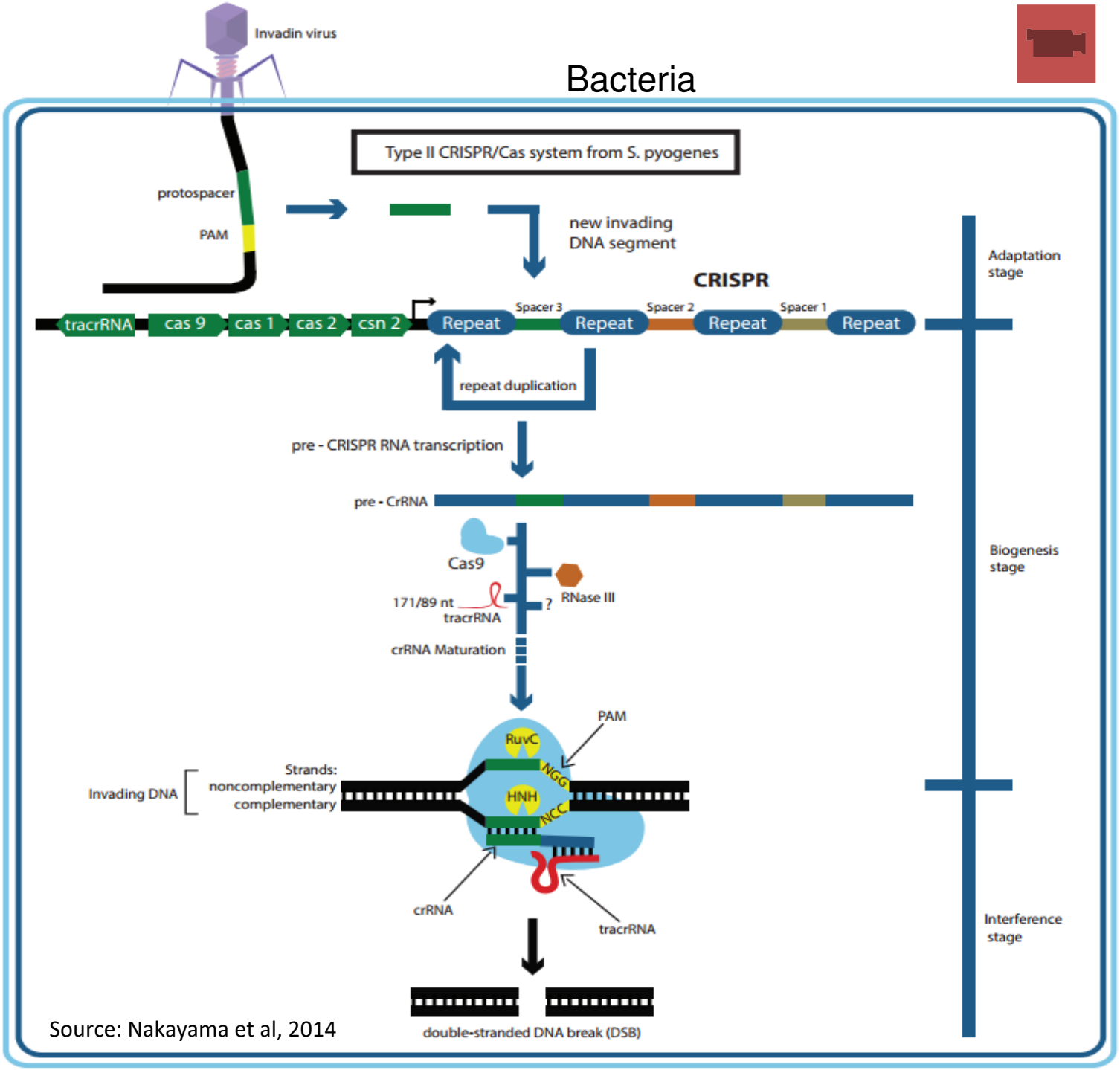
Novas Tecnologias que irão mais uma vez mudar paradigmas na Agricultura, Medicina e Indústria

Embrapa


New Breeding Technologies
NBTs
Edição de Genomas
ou
Engenharia Genética de Precisão
Embrapa

Clustered Regularly Interspaced Short Palindromic Repeats

CRISPR/CAS9 (Mechanism)



Source: Nakayama et al, 2014

Embrapa

Plant Biotechnology Journal
Open Access
aab
SEB Society for Experimental Biology
Explore this journal >

Resistência ao Cancro Cítrico

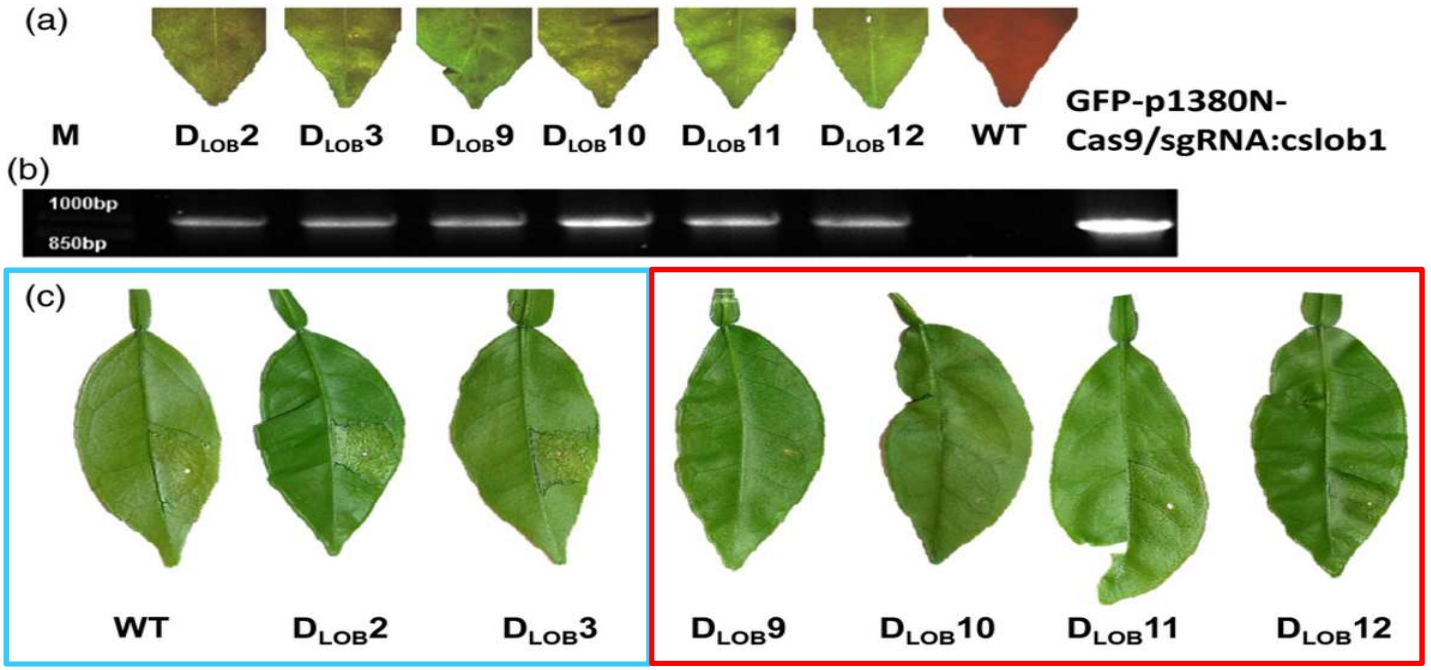
Research Article

Genome editing of the disease susceptibility gene *CsLOB1* in citrus confers resistance to citrus canker

Hongge Jia, Yunzeng Zhang, Vladimir Orbović, Jin Xu, Frank F. White, Jeffrey B. Jones, Nian Wang

First published: 4 January 2017

DOI: 10.1111/pbi.12677



A specific effector (PthA4) protein from *Xanthomonas citri* binds to the promoter region of the canker susceptibility gene CsLOB1 to induce disease symptoms. By utilizing CRISPR techniques, they target the promoter region or the coding region of the citrus susceptibility gene to mutate it in such a way to prevent binding of bacterial transducers."

Development of Powdery Mildew Resistant Tomato via CRISPR-Cas9

Section: New Breeding Technologies

In tomato (*Solanum lycopersicum*), there are sixteen *Mlo* genes, with *SlMlo1* being the major contributor to the susceptibility to the powdery mildew caused by *Oidium neolycopersici*. Natural loss-of-function *slmlo1* mutants are available in tomato, however, introgression of such mutations is a lengthy process. The team of Vladimir Nekrasov from the Sainsbury Laboratory, Norwich Research Park in the UK aimed to generate a transgene-free genetically edited *slmlo1* tomato using the CRISPR-Cas9 system.

The team targeted the *SlMlo1* locus using the double sgRNA strategy. Transformants were analyzed and eight out of ten tested T0 transformants indicated the presence of mutations. Assays using the powdery mildew fungus revealed that all the generated T0 *slmlo1* mutant plants were resistant to the pathogen, while wild-type plants were susceptible.

Furthermore, the *slmlo1* mutant plants were morphologically similar to the wild type and also produced harvested fruit weight similar to the wild types. The team named the generated variety Tomelo. This study presents evidence for CRISPR-Cas9 being a highly precise tool for genome editing in tomato.

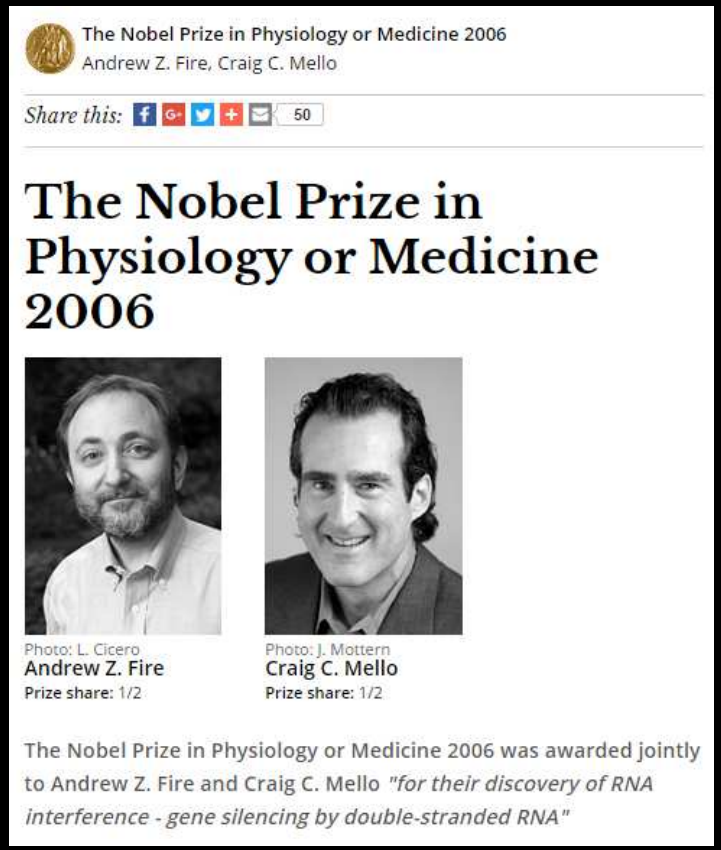
For more on this study, read the article in *Nature*.

RNA interferente (RNAi)

Conceito: **Mecanismo Natural de Silenciamento Gênico**

Descrito em 1998, e uma das maiores descobertas na biotecnologia atual, que permite que genes sejam desligados de forma específica e precisa.

Em 2006 Craig Mello e Andrew Fire ganham o Premio Nobel pela descoberta do RNAi


The Nobel Prize in Physiology or Medicine 2006
Andrew Z. Fire, Craig C. Mello

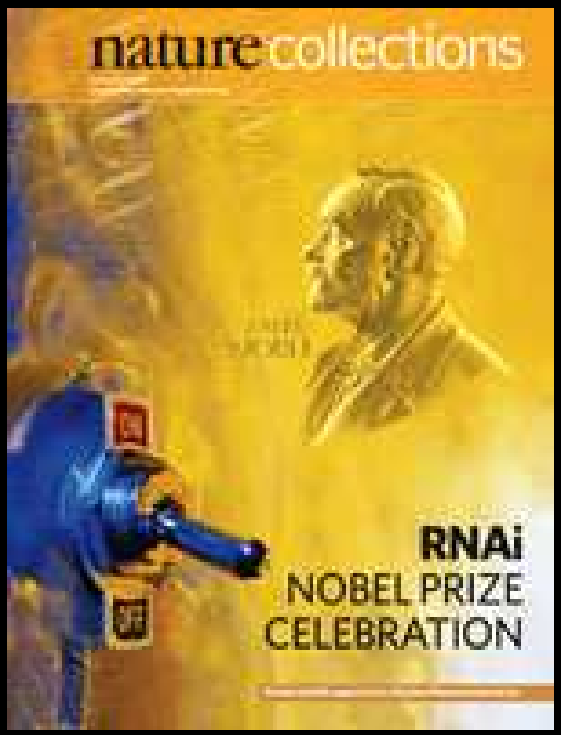
Share this: 50

The Nobel Prize in Physiology or Medicine 2006

Photo: L. Cicero
Andrew Z. Fire
Prize share: 1/2

Photo: J. Mottern
Craig C. Mello
Prize share: 1/2

The Nobel Prize in Physiology or Medicine 2006 was awarded jointly to Andrew Z. Fire and Craig C. Mello *"for their discovery of RNA interference - gene silencing by double-stranded RNA"*



Embrapa

PLoS One. 2012;7(10):e47534. doi: 10.1371/journal.pone.0047534. Epub 2012 Oct 11.

Characterizing the mechanism of action of double-stranded RNA activity against western corn rootworm (Diabrotica virgifera virgifera LeConte).

Bolognesi R[1], Ramaseshadri P, Anderson J, Bachman P, Clinton W, Flannagan R, Ilagan O, Lawrence C, Levine S, Moar W, Mueller G, Tan J, Uffman J, Wiggins E, Heck G, Segers G.

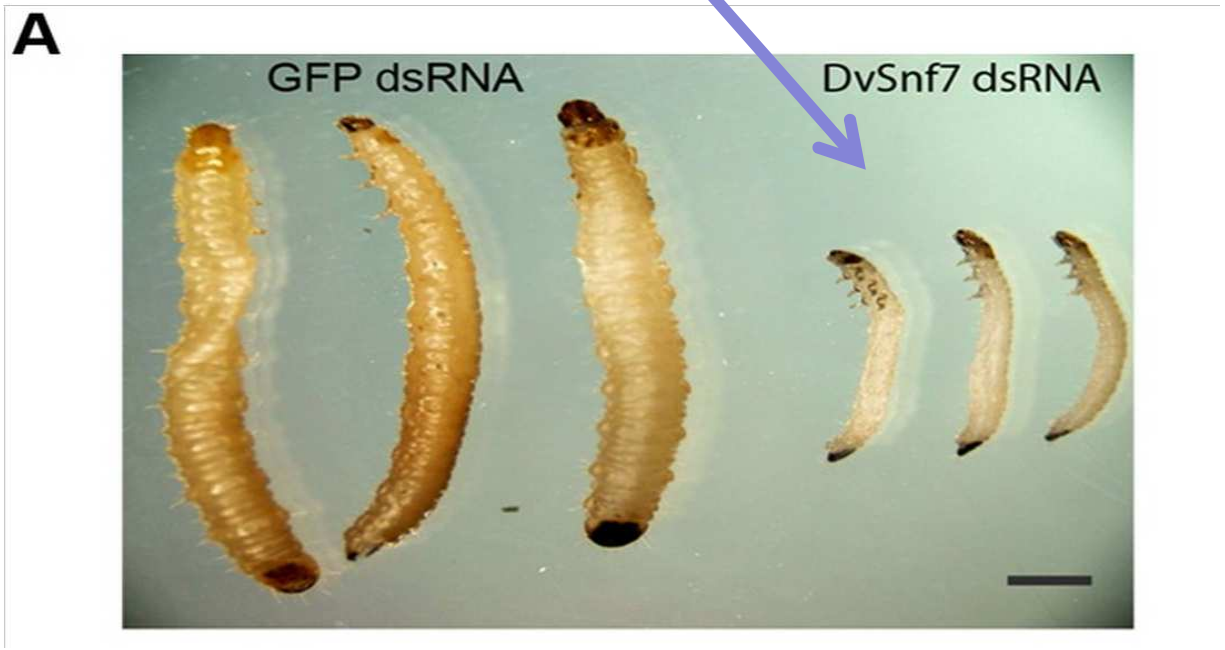
Author information

Abstract

RNA interference (RNAi) has previously been shown to be effective in western corn rootworm (WCR, Diabrotica virgifera virgifera LeConte) larvae via oral delivery of synthetic double-stranded RNA (dsRNA) in an artificial diet bioassay, as well as by ingestion of transgenic corn plant tissues engineered to express dsRNA. Although the RNAi machinery components appear to be conserved in Coleopteran insects, the key steps in this process have not been reported for WCR. Here we characterized the sequence of events that result in mortality after ingestion of a dsRNA designed against WCR larvae. We selected the Snf7 ortholog (DvSnf7) as the target mRNA, which encodes an essential protein involved in intracellular trafficking. Our results showed that dsRNAs greater than or equal to approximately 60 base-pairs (bp) are required for biological activity in artificial diet bioassays. Additionally, 240 bp dsRNAs containing a single 21 bp match to the target sequence were also efficacious, whereas 21 bp short interfering (si) RNAs matching the target sequence wer
uptake of 240 bp dsRNA was evident in WCR midgut cells while a 21 bp siR
bioassays. DvSnf7 suppression was observed in a time-dependent manner w
level when a 240 bp dsRNA was fed to WCR larvae. DvSnf7 suppression wa
dsRNA ingestion. These events (dsRNA uptake, target mRNA and protein suppression, systemic spreading, growth inhibition and eventual mortality) comprise the overall mechanism of action by which DvSnf7 dsRNA affects WCR via oral delivery and provides insight as to how targeted dsRNAs in general are active against insects.

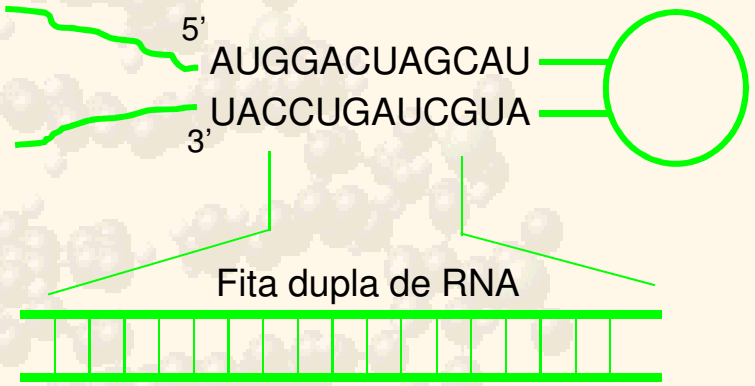
Tecnologia RNAi

Milho MON 87411



Embrapa

RNAi Novos Usos: *Aplicação Tópica*

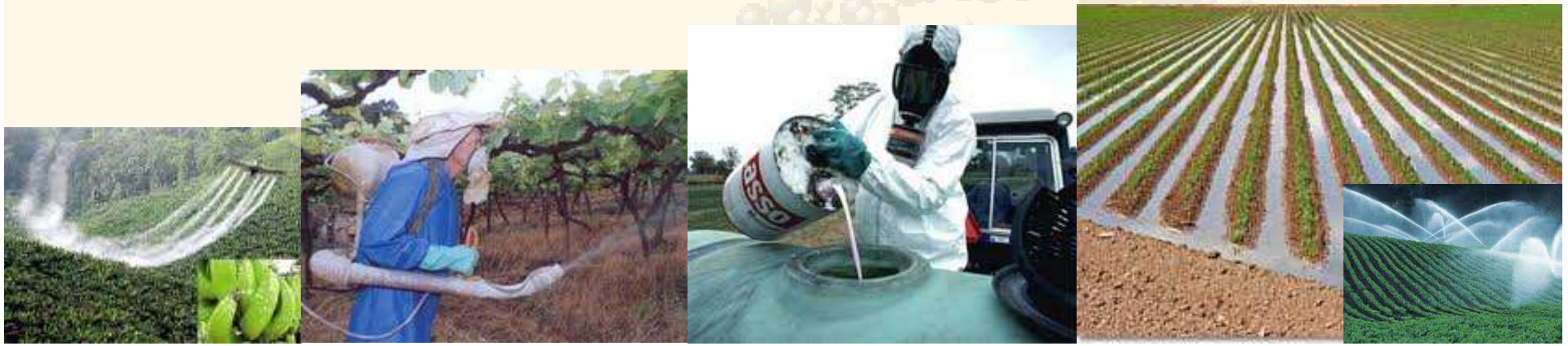


Gargalos:

Produção em Larga Escala

Estabilidade em Condições de Campo

Modo de Aplicação



Big deal: Bayer getting Monsanto for $66B

Nathan Bomey, USA TODAY 5:13 p.m. EDT September 14, 2016

From the food on our tables to the medicines in our cabinets, Bayer and Monsanto are behind more products than many people realize.

Germany-based health and agricultural giant Bayer reached a deal to acquire seed and

Products

Product Overview

Our Brands

Agricultural Seeds

Traits, Technologies & Partnering

Vegetable Seeds

Weed Control Products

Research & Development

Corn Product Pipeline

Soybean Product Pipeline

Cotton Product Pipeline

Specialty Crop Product Pipeline

Vegetable Product Pipeline

Agronomic Solutions Pipeline

New Platforms Pipeline

Agricultural Biologicals

- BioDirect
- Microbials

Roundup Ready Xtend Crop System

Home / Products / Research Development / Agricultural Biologicals / BioDirect

BioDirect

Leveraging Monsanto's expertise in genomics, BioDirect technology uses molecules found in nature that we expect to develop for use in topically applied crop protection and other products. BioDirect technology may enable specific and effective products with a wide range of applications – including weed, insect and virus control.

Agricultural biologicals are used to complement or replace agricultural chemical products. Examples of agriculture biologicals include microbial pesticides, such as Bt sprays to control worms.

Monsanto is committed to supporting farmer and consumer demand for sustainable agricultural practices. BioDirect technology uses molecules found in nature. While we're just beginning to explore this technology we have the potential to enable specific and effective products with a wide range of applications – including weed, insect and virus control. We believe this topical alternative could provide pest control products that would expand farmers' choices.

The company currently has four BioDirect projects in its research and development pipeline:

- BioDirect Virus Control: Tospovirus Control (Phase 1)
- BioDirect Insect Control: Colorado Potato Beetle (Phase 1)
- BioDirect Weed Control: Palmer Amaranth + Waterhemp (Phase 1)
- BioDirect: Bee Health (Phase 1)

Commercialization of Monsanto's pipeline products is dependent on many factors, including successful conclusion of the regulatory process.

BioDirect™ Demonstrates Control of Glyphosate Resistant Palmer Amaranth & Waterhemp in the Field 2013

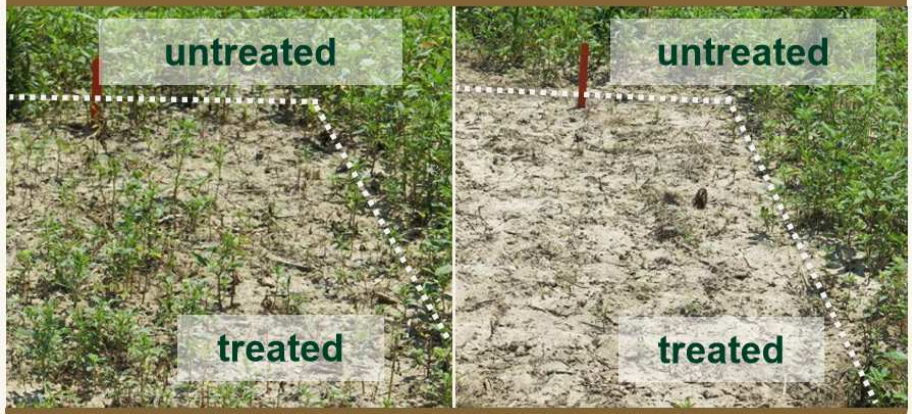
Glyphosate-Resistant Palmer Amaranth

Illinois, 2013

Roundup WeatherMAX® | Roundup WeatherMax ® + BioDirect

Glyphosate-Resistant Waterhemp

Illinois, 2013



Roundup WeatherMAX® | Roundup WeatherMAX® + BioDirect

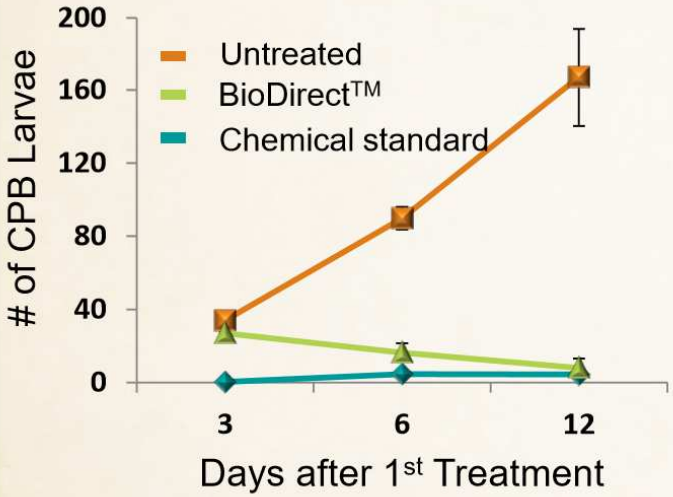
- Goal: BioDirect can be used with existing herbicides to create new value through improved weed control
- Target gene sequences common to Palmer and Waterhemp were selected, produced as double stranded RNA, and shown to be effective against both species

PROOF OF PHASE 1 CONCEPT

Embrapa

Plant protection against Colorado Potato Beetle with BioDirect™ technology treatment

BioDirect™ Controls Colorado Potato Beetle Larvae



Wisconsin, 2013

BioDirect™ Protects Crops from CPB Damage

Virginia, 2014

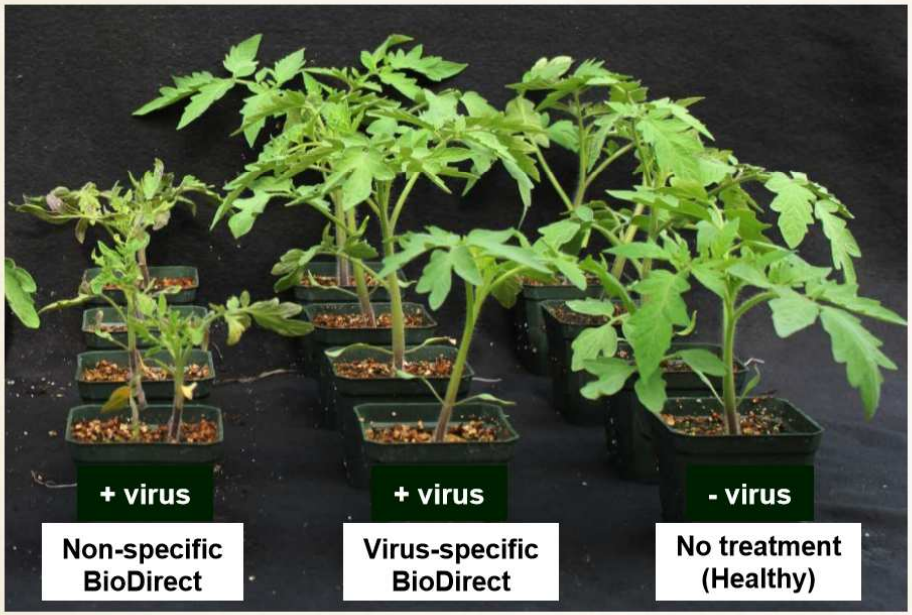
Complete Defoliation | **Protection**

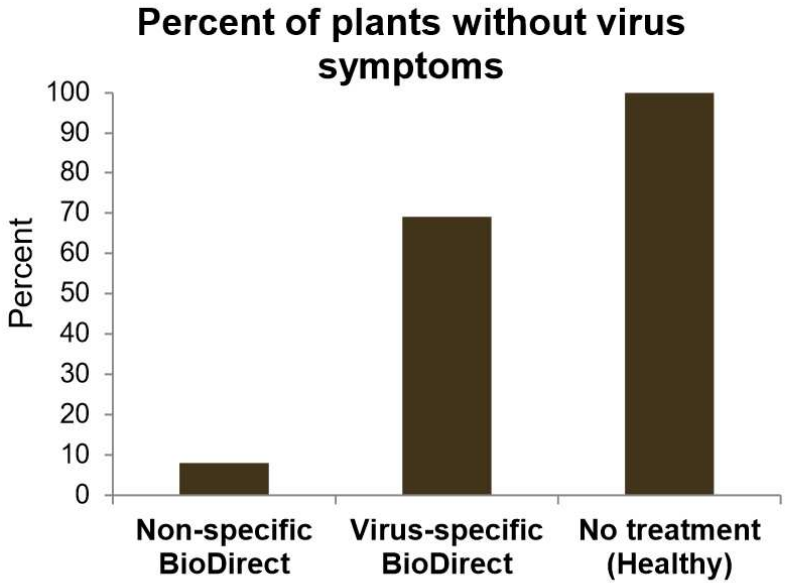
- **Goal: Colorado Potato Beetle control on potato and other solanaceous crops**
- **CPB is a highly destructive defoliator causing significant yield loss**
- **BioDirect treatments reduced CPB larval infestation comparable to synthetic insecticides, decreased adult emergence, and lessened plant defoliation across multiple field trial locations**
- **Similar work in progress and planned for corn rootworm and other beetles**

PROOF OF PHASE 1 CONCEPT

Embrapa

BioDirect™ technology demonstrates improved plant health by targeting Tomato Spotted Wilt Virus in tomato





Greenhouse trials with an aggressive strain of TSWV on a commercial tomato hybrid show early progress towards Tospovirus control

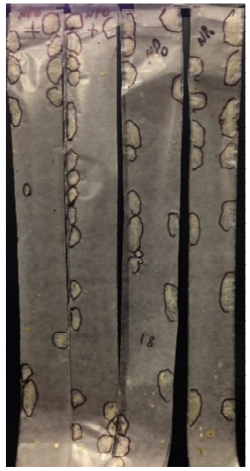
- **Goal: protect susceptible cultivars and broaden germplasm resistance against TSWV and other tospoviruses that cause >$1B annual losses.**
- **BioDirect treaments have suppressed virus concentration, decreased disease symptomology, and improved plant health in tomato and pepper.**
- **Focused on improved active ingredient design and delivery optimization.**

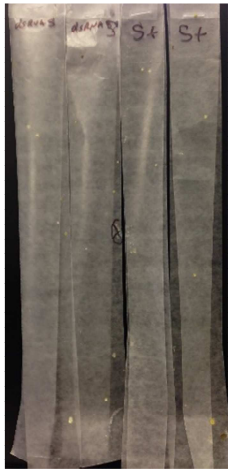
Aplicação Foliar de RNAi para controle de Insetos

Insect mortality

Embrapa

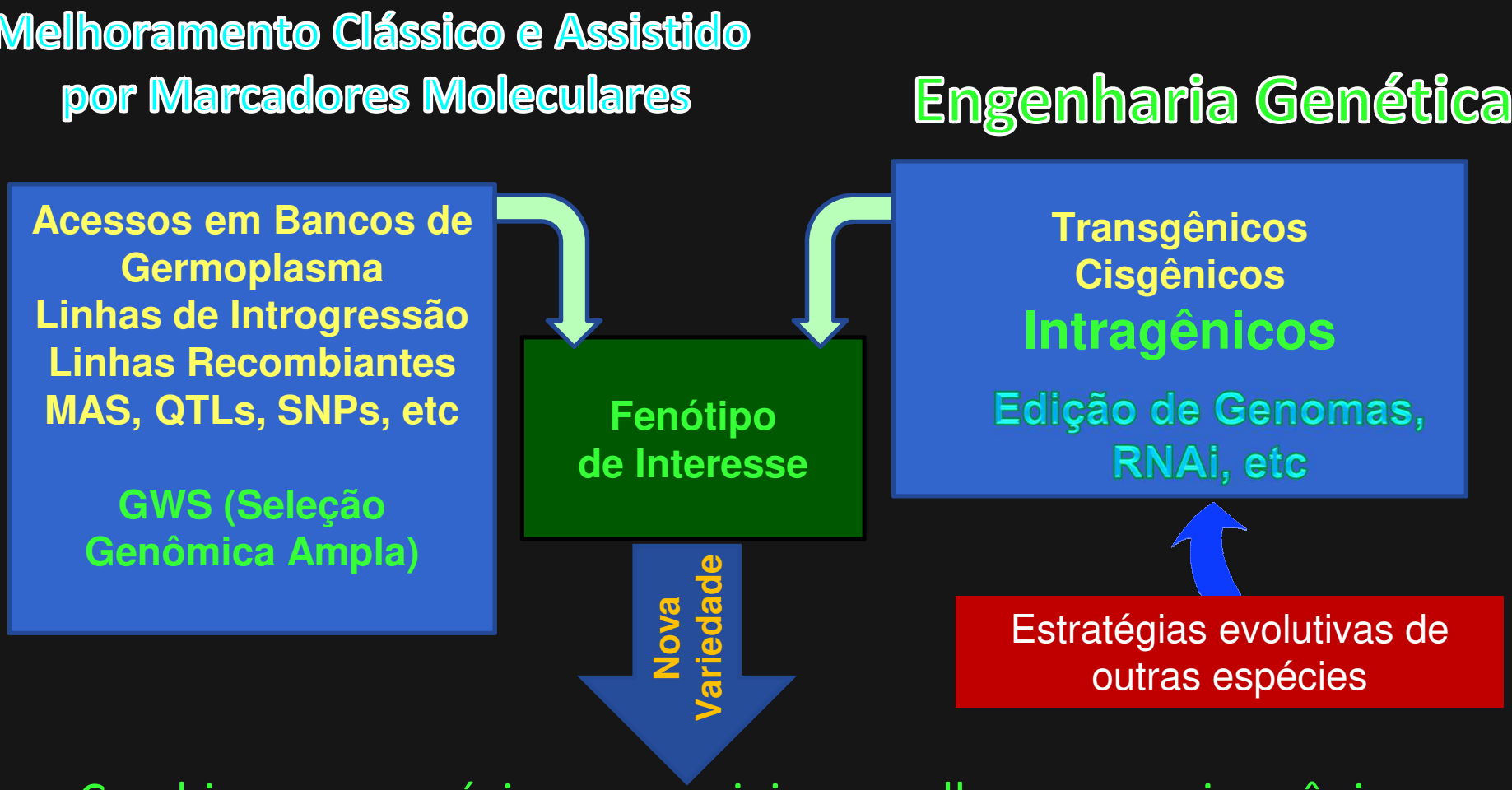
Leaf damage





Reduced oviposition

Como Novas Variedades Comerciais estão sendo Geradas?



Combinar em espécies comerciais os melhores arranjos gênicos específicos utilizando a base genética da espécie, mas também agregando características de tolerancia a estresses abioticos/bioticos gerados em linhas evolutivas de outras espécies.

Embrapa

De onde vem a informação genética para o desenvolvimento de Organismos Geneticamente Modificados com Características de interesse para a Agricultura, Medicina e Industria?

Embrapa

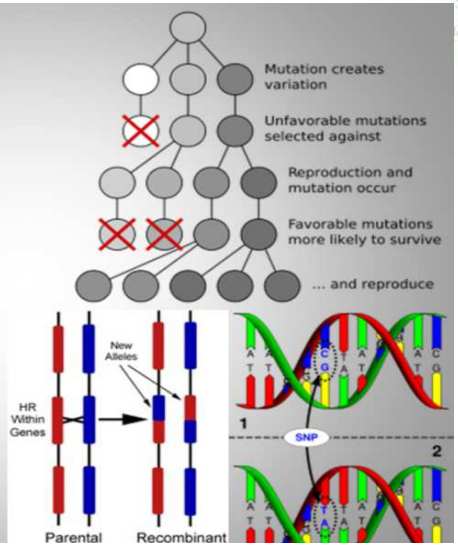
Diversidade Biológica do Planeta

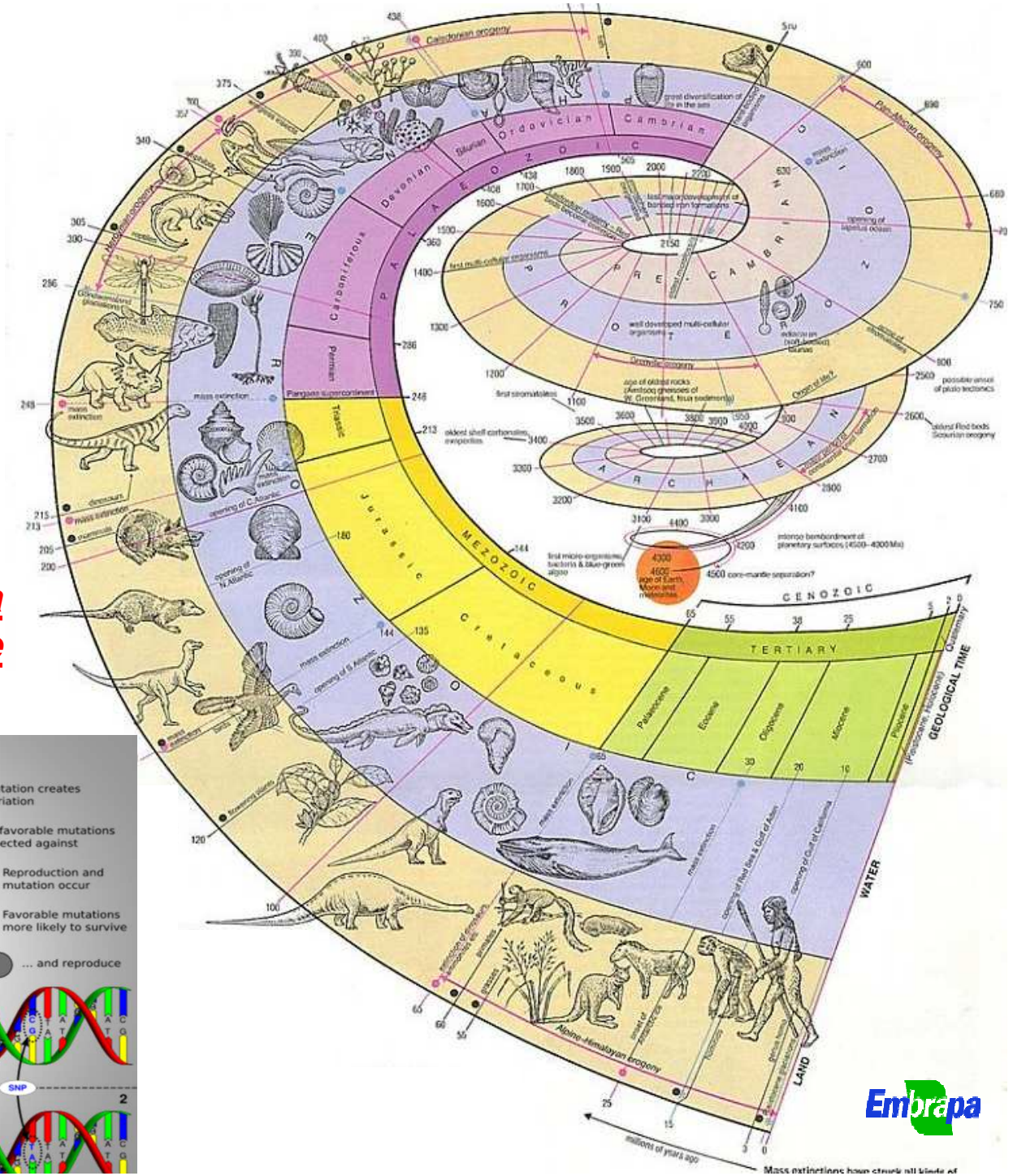
Evolução

3,8 Bilhões de anos de uma única célula à diversidade de espécies que temos hoje

Neo-Darwinism

- Refined version Darwin's theory
- Combines Mendel's genetics
- Evolution is driven by chance
- 2 ways
  - Small scale mutations (single nucleotide polymorphisms)
  - Large scale mutations (recombination)
- Creates new DNA by lucky accidents

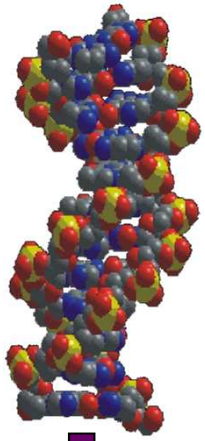




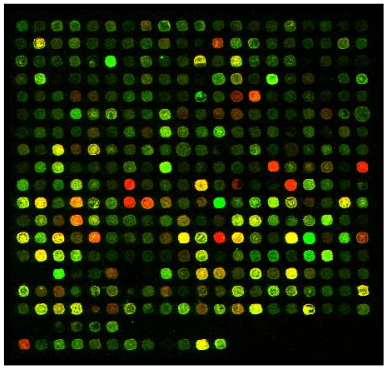
Corrida para Sequenciar o Genoma de todas Espécies

Vivemos uma Revolução na Genética

Structural Genomics

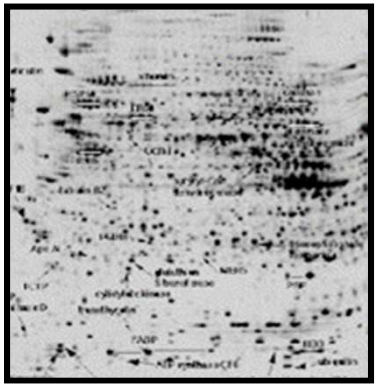


Transcriptomics



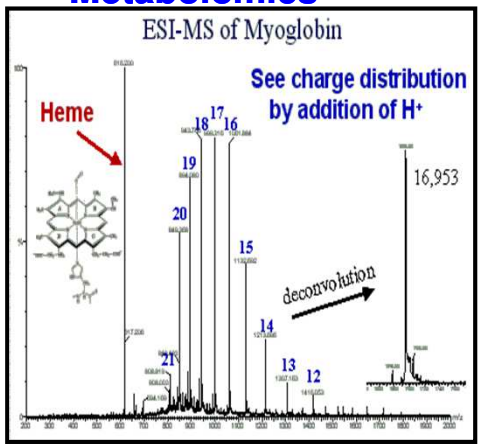
Expressed RNAs

Proteomics



Translated Proteins

Metabolomics



Interactions among different compounds

Bioinformatics

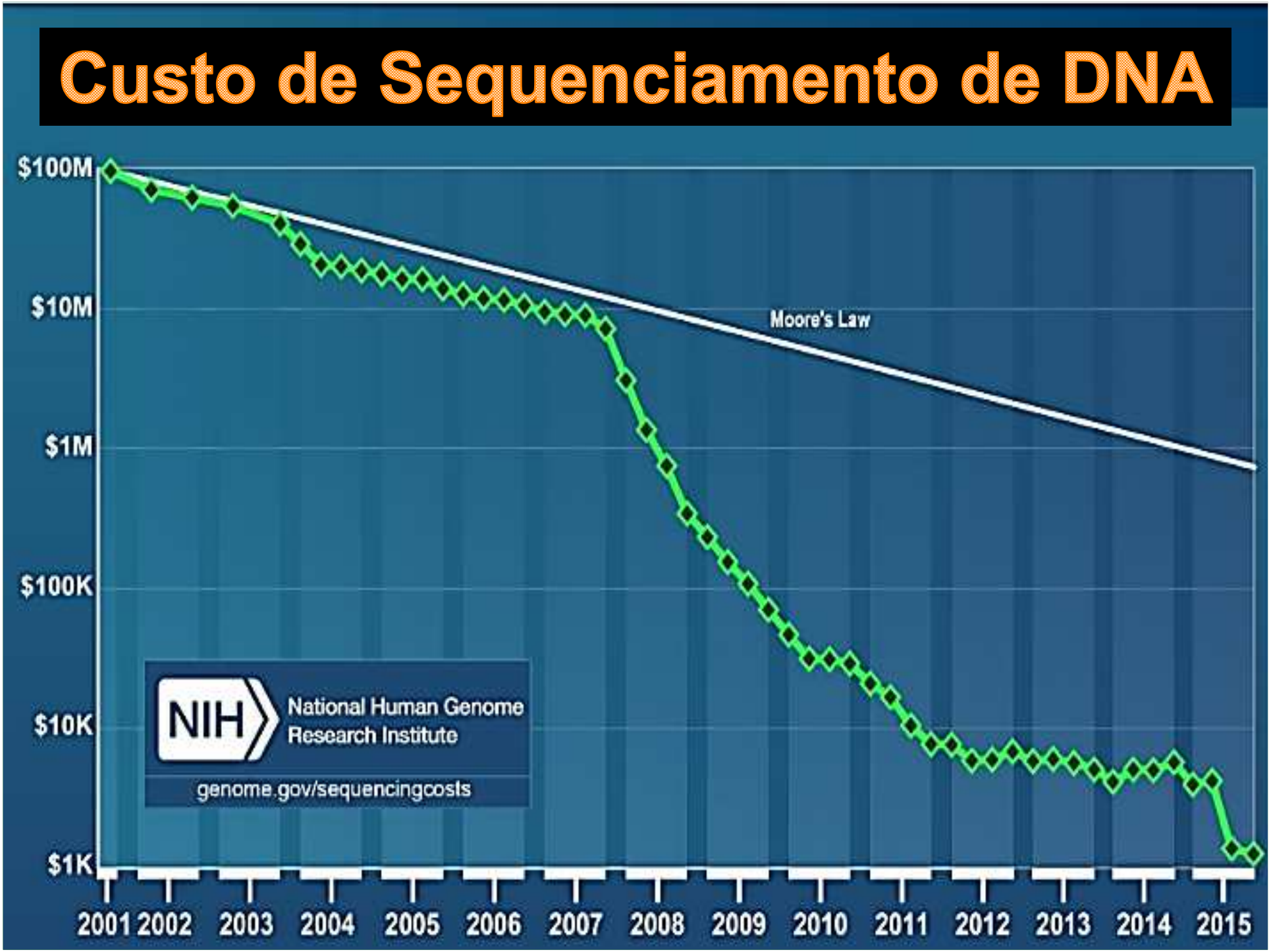
Databases DNA Sequences

The relation between genes and their products - Gene Function and Metabolic pathways

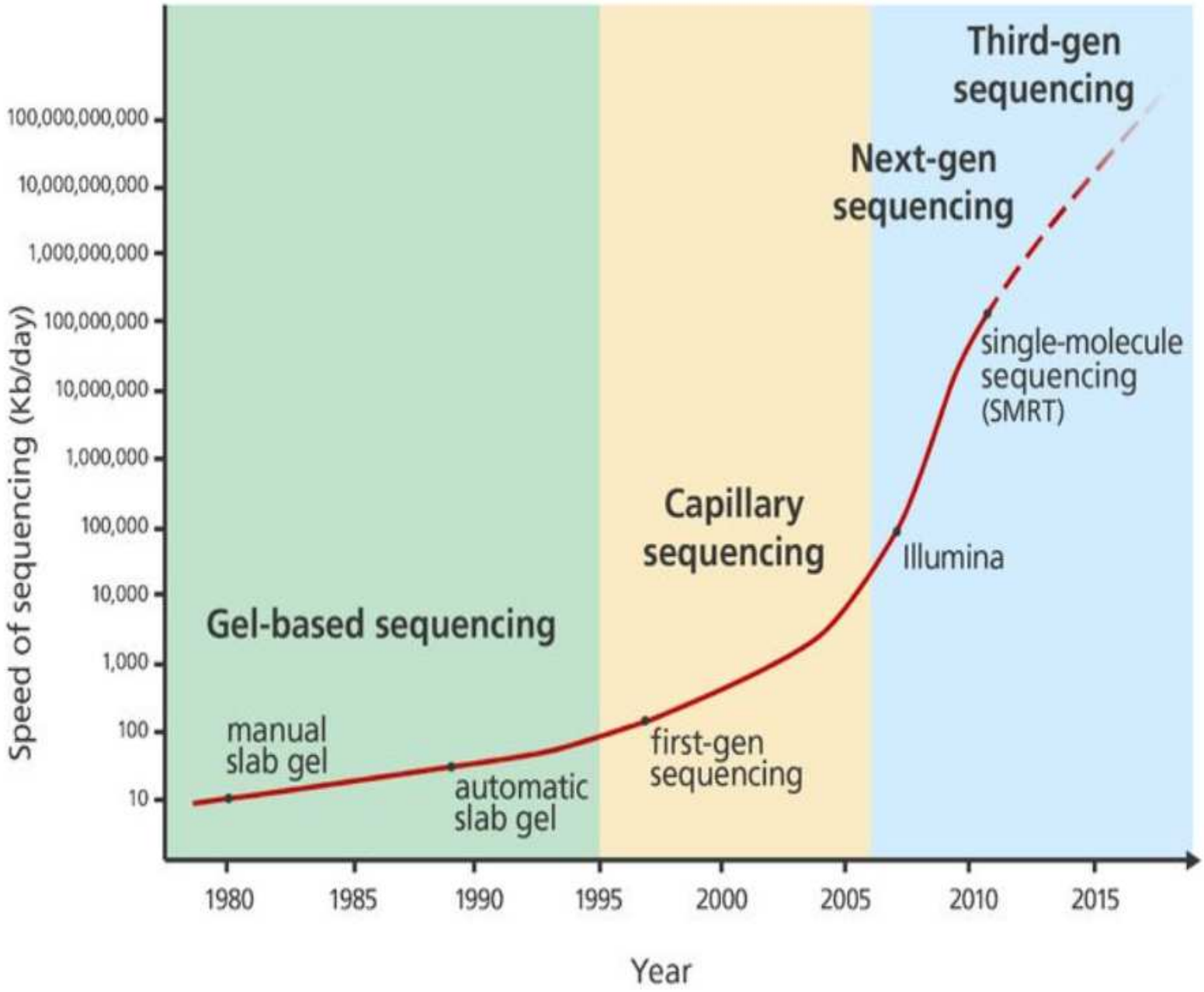
Biology, Plant Breeding, Genetic and Metabolic Engineering

Embrapa

Custo de Sequenciamento de DNA



Velocidade no Sequenciamento de DNA



Illumina

bioinformatics

biology

genetics

Bio

Popular Posts

Elon Musk says The Boring Company's first car elevator is nearly operational

4 days ago

Cabin secures $3.3M for its "moving hotel"

4 days ago

Pornhub now supports interactive toys, proving porn paves the way

5 days ago

Microsoft is laying off 'thousands' of staff in a major global sales reorganization

Illumina wants to sequence your whole genome for $100

Posted Jan 10, 2017 by Sarah Buhr (@sarahbuhr)

The first sequencing of the whole human genome in 2003 cost roughly $2.7 billion, but DNA sequencing giant Illumina has now unveiled a new machine that the company says is "expected one day" to order up your whole genome for less than $100.

Crunchbase

Illumina –

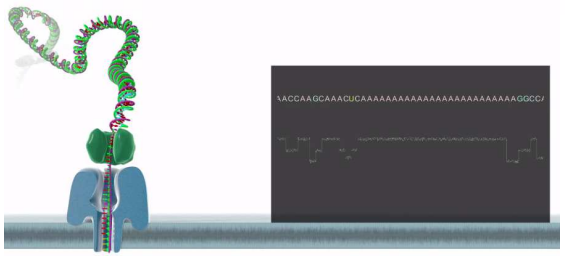
FOUNDED
1998

OVERVIEW
At Illumina, their goal is to apply innovative technologies and revolutionary assays to the analysis of genetic variation and function, making studies possible that were not even imaginable just a few years ago. These studies will help make the

Com este equipamento é possível sequenciar o DNA de qualquer espécie em poucas horas e custo baixo

Oxford NANOPORE Technologies

www.nanoporetech.com/rna



MinION

- Pocket-sized, portable device for biological analysis
- Up to 512 nanopore channels
- Simple 10-minute sample prep available
- Real-time analysis for rapid, efficient workflows
- Adaptable to direct DNA or RNA sequencing

Rapid *de novo* assembly of the European eel genome from nanopore sequencing reads

Hans J. Jansen[1], Michael Liem[2], Susanne A. Jong-Raadsen[1], Sylvie Dufour[3], Finn-Arne Weltzien[4], William Swinkels[5], Alex Koelewijn[5], Arjan P. Palstra[6], Bernd Pelster[7], Herman P. Spaink[2], Guido E. van den Thillart[1], Ron P. Dirks[1] & Christiaan V. Henkel[2,8,9]

We have sequenced the genome of the endangered European eel using the MinION by Oxford Nanopore, and assembled these data using a novel algorithm specifically designed for large eukaryotic genomes. For this 860 Mbp genome, the entire computational process takes two days on a single CPU. The resulting genome assembly significantly improves on a previous draft based on short reads only, both in terms of contiguity (N50 1.2 Mbp) and structural quality. This combination of affordable nanopore sequencing and light weight assembly promises to make high-quality genomic resources

Mais de 70 species de Plantas sequenciadas

Species name	Common name	Release version	Gene number	Access	Reference
Arabidopsis lyrata	Lyrate rockcress	Version 1.0 (Apr 2011)	32670	JGI	*Nature Genetics*
Arabidopsis thaliana	Arabidopis	TAIR 9.0 (Jun 2009)	27,379	TAIR	*Nature*
Brachypodium distachyon	Purple false brome	Phytozome v6.0	32,255	JGI	*Nature*
Brassica rapa	Chinese cabbage	Version 1.1	22,285	BRAD	*Nature Genetics*
Cajanus cajan	Pigeonpea	Nov 2011	48,680	IIPG	*Nature Biotechnology*
Carica papaya	Papaya	Dec 2007	25,536	Hawaii	*Nature*
Chlamydomonas reinhardtii	Green algae	Version 4.2	16,036	JGI	*Science*
Cucumis sativus	Cucumber	Phytozome v6.0	21,491	JGI	*Nature Genetics*
Fragaria vesca	Strawberry	Dec 2010	34,809	PFR	*Nature Genetics*
Glycine max	Soybean	Release 1 (Dec 2008)	66,153	JGI	*Nature*
Lotus japonicus	Lotus	Release 2.5	42,399	Kazusa	*DNA research*
Malus x domestica	Apple	Aug 2010	57,386	IASMA	*Nature Genetics*
Medicago truncatula	Barrel medic	Mt3.5 v3 (Jun 2011)	45,108	JCVI	*Nature*
Oryza sativa	Rice	RAP 2.0 (Nov 2007)	30,192	RAP	*Nature*
Physcomitrella patens	Moss	Version 1.6 (Jan 2008)	32,272	JGI	*Science*
Prunus persica *	Peach	Version 1.0	27,864	JGI	-
Populus trichocarpa	Western poplar	JGI 2.0 (Feb 2010)	45,778	JGI	*Science*
Ricinus communis	Castor bean	Release 0.1 (May 2008)	38,613	JCVI	*Nature Biotechnology*
Sorghum bicolor	Sorghum	Sbi 1.4 (Dec 2007)	34,496	JGI	*Nature*
Solanum tuberosum	Potato	Version 3.4	39,031	PGSC	*Nature*
Selaginella moellendorffii	Selaginella	Version 1.0 (Dec 2007)	22,273	JGI	*Science*
Theobroma cacao	Cacao	Release 0.9 (Sep 2010)	28,798	CIRAD	*Nature Genetics*
Vitis vinifera	Grape vine	Genoscope (Aug 2007)	26,346	Genoscope	*Nature*
Zea mays	Maize	Release 5a (Nov 2010)	32,540	AGI	*Science*
In queue (5 genome)					
Aquilegia coerulea *	Colorado blue columbine	Phytozome v6.0	25784	JGI	--
Mimulus guttatus *	Monkey flower	Version 1.1	26718	JGI	--
Setaria italica *	Foxtail millet	Version 1.1	32095	JGI	--
Volvox carteri *	Volvox	Phytozome v6.0	14491	JGI	--
Theobroma cacao *	Cacao	Release 0.9 (Sep 2010)	34997	MARS-USDA	--

Embrapa

Source: Phytozome (2017) (https://phytozome.jgi.doe.gov/)

CAS – Academia Chinesa de Ciências

CASSAVA
DATABASE · CHINA

Home | Genome Browser | Database | BLAST | Help | Sign In | Register Now |

Cassava (*M. esculenta* Crantz) is a staple food crop in tropic Africa, Asia and South America for over 700 million people and also a desirable source for renewable biofuel and biomaterials. There are about 98 species in the genus of *Manihot* that in situ distributed in Brazil and regions around southern America, and over 10,000 accessions conserved in gene bank of Brazil, CIAT and IITA. Cassava genome is diploid (2n=36) with high heterozygosity because of out-crossing and somatic propagation in over 7000 year's domestication. Cassava known as special biological characteristics which of own high photosynthesis and starch accumulation, and extremely tolerance to drought and other abiotic stresses. Very few knowledge on molecular mechanism of photosynthesis and starch synthesis, tolerance to drought and barren soil of cassava have been revealed. And heterozygostic genome bottlenecked the conventional breeding in cassava in past centuries. All of them will be found resolution based on our international collaborative union in the post genome era.

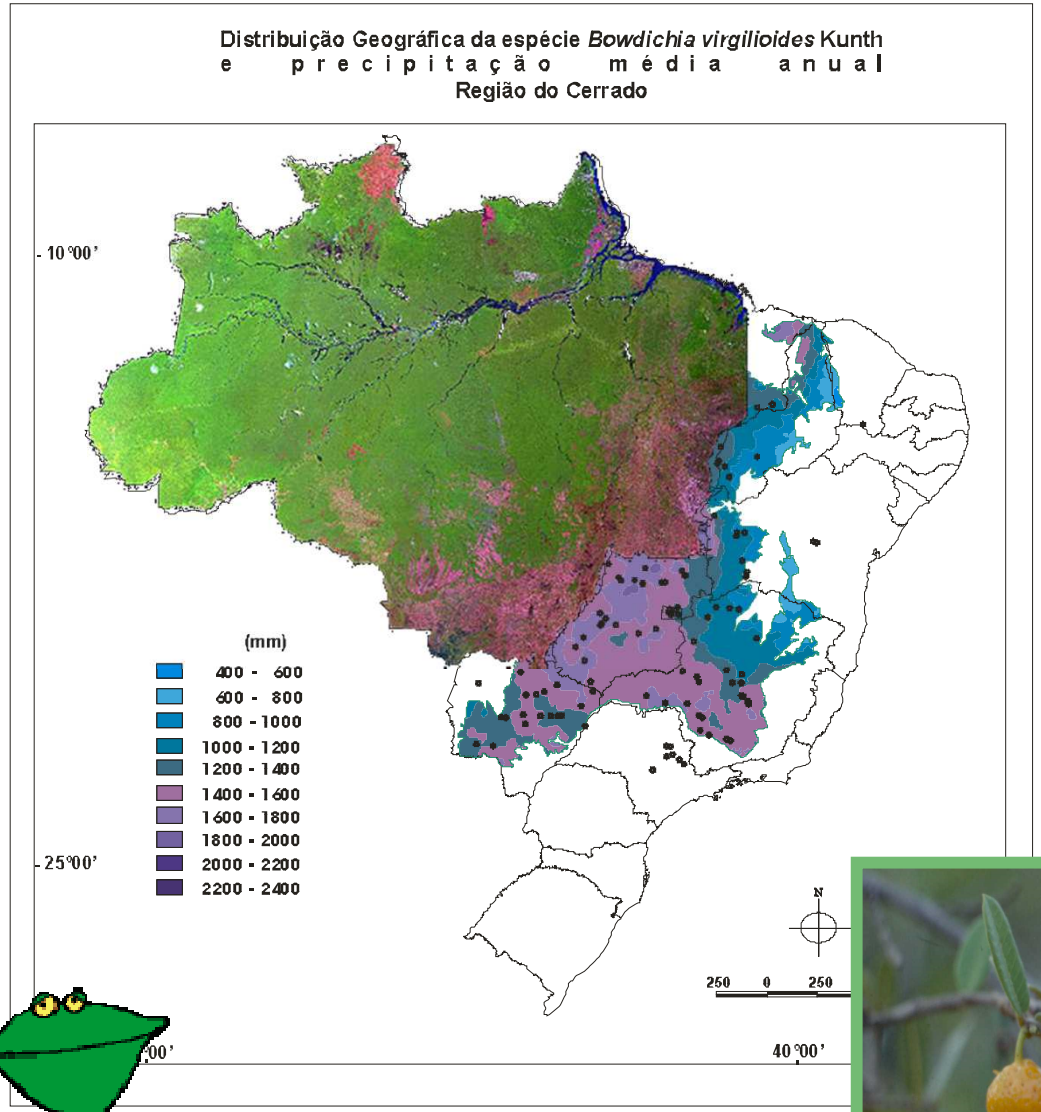
Chinese Cassava Genome Database (CCDB in short) was launched on July 14, 2011, with the official website www.cassava-genome.cn. It is owned by Chinese Cassava Genomics Consortium (CCGC) that was initialized in March 4, 2007 supported by over ten PIs come from Chinese Academy of Tropical Agriculture Sciences, Shanghai Institutes for Biological Sciences CAS, Beijing Institute of Genomics CAS, South China Botanical Garden CAS, Fudan University, Guangxi University and Washington University (St. Louis) . This database covered genome sequences and annotation, transcriptomics on photosynthesis, starch metabolism, drought and cold acclimation, gene discovery, structural genomics and molecular breeding, also other resources such as BAC libraries, cDNA libraries, genes, linkage groups and markers in cassava (*Manihot esculenta* Crantz), a crop for renewable biofuel and biomaterial in China, the sixth important food crop in the world especially in tropical Africa, Asia and South America. The CCDB will be continually updated. The database will systemically report discovery and achievement in cassava theoretically and technologically by the Chinese cassava team to share with international researchers. We will get linkage with all remarkable cassava database supply open equally service.

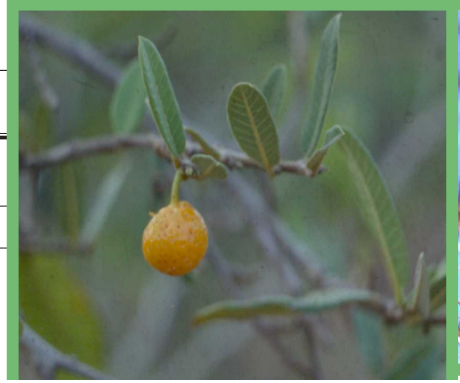
Institute of Tropical Biosciences & Biotechnology under Chinese Academy of Tropical Agricultural Sciences will deputy of CCGC supply sustainable funding and managed the intellectual property right (ITR) according to the Agreement on Intellectual Property Right of 973 Project (2010). CCDB presently has

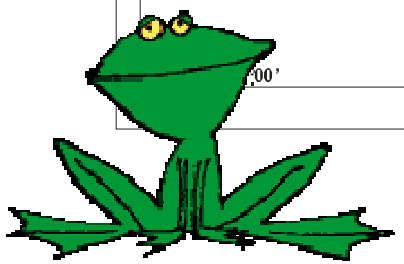
Developed by Research Center for Systems and Computational Biology, Fudan University,Shanghai 200433

Embrapa

Brasil possui entre 15 a 25% da Biodiversidade do Planeta







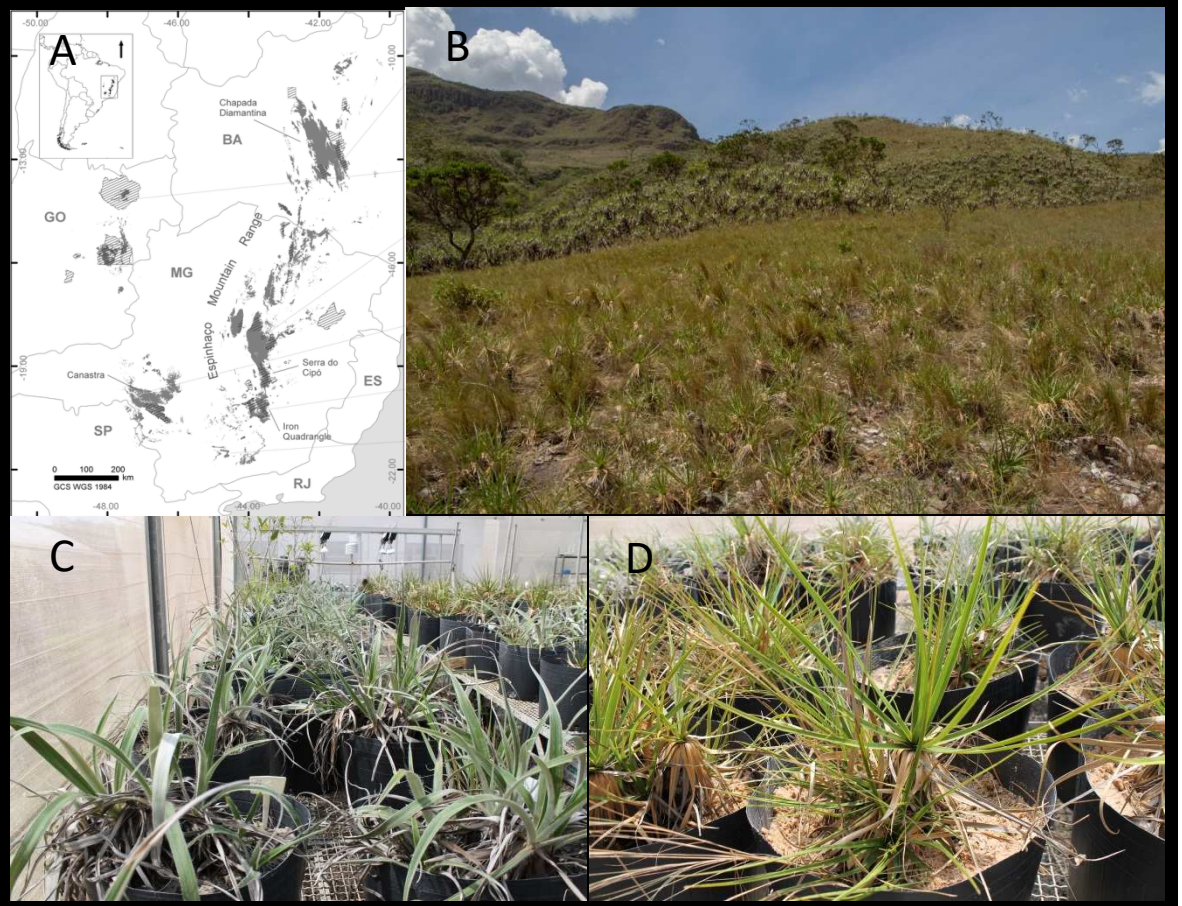
Genes for Drought Tolerance *Vellozia Project*

Resurrection Plant

Sequencing of *Vellozia* spp. genomes could reveal novel genetic variability and metabolic pathways involved in the tolerance to desiccation and drought.

The genome comparison between a desiccation-tolerant and an evergreen *Vellozia* species could reveal specific mechanisms associated with the dismantle and reconstruction of the photosynthetic apparatus during water loss and rehydration.

Sequencing of *Vellozia* genomes could reveal novel genetic variability and metabolic pathways involved in the acquisition and use of soil nutrients such as phosphorous, which is characteristically little available in campos rupestres' soils.



Campos rupestres and the Vellozia species targeted by this proposal. (**A**) Distribution of campos rupestres (grey) in Brazil (adapted from Silveira et al., doi 10.1007/s11104-015-2637-8, 2015). (**B**) Vellozia intermedia individuals on a campo rupestre landscape near Serra da Canastra National Park (MG, Brazil). (**C**) V. nivea and (**D**) V. intermedia individuals under cultivation in a greenhouse at the State University of Campinas (Brazil).

Fonte: Isabel Gerhardt, Embrapa

Embrapa KnowHow

Pode levar até 20 anos
Do descobrimento de um Gene(s)
a colocação de uma tecnologia de
Eng.Genética no Mercado.

Ex: *Soja Cultivance Parceria EMBRAPA/BASF*

Primeiras Plantas GM no Programa de Melhoramento da Embrapa em 1997

Entrada no Mercado Brasileiro

Safra 2015/16

Embrapa

Pipeline para Desenvolvimento de PGM

> U$75 milhões em desregulamentação

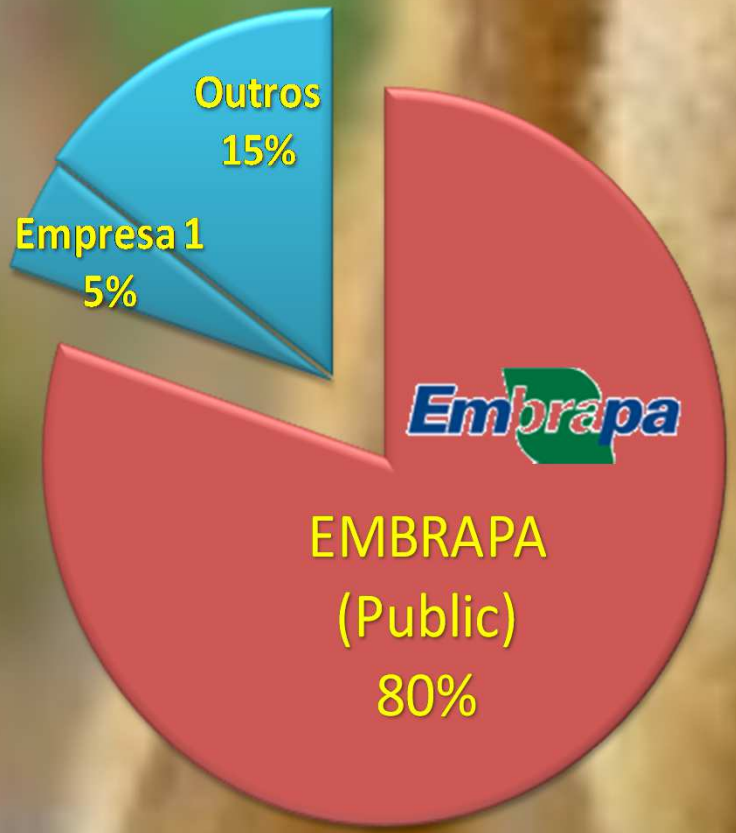
Prado et al., 2014

Custo Estimado Hoje: ~ U$140 milhões

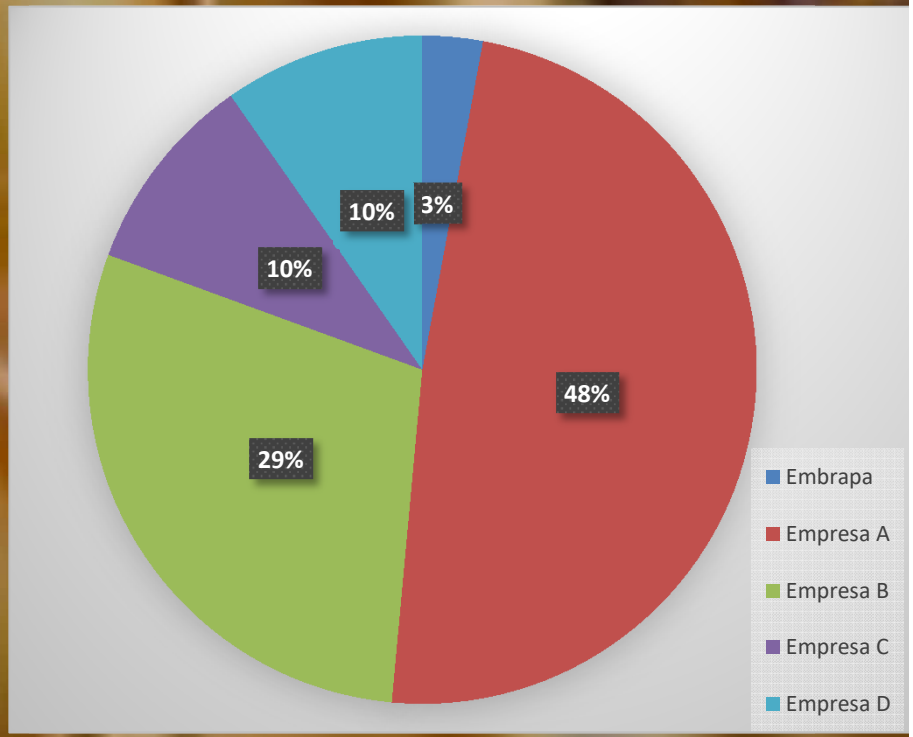
Mercado de Sementes no Brasil: SOJA

Impacto Lei Proteção Cultivares + PGM ?

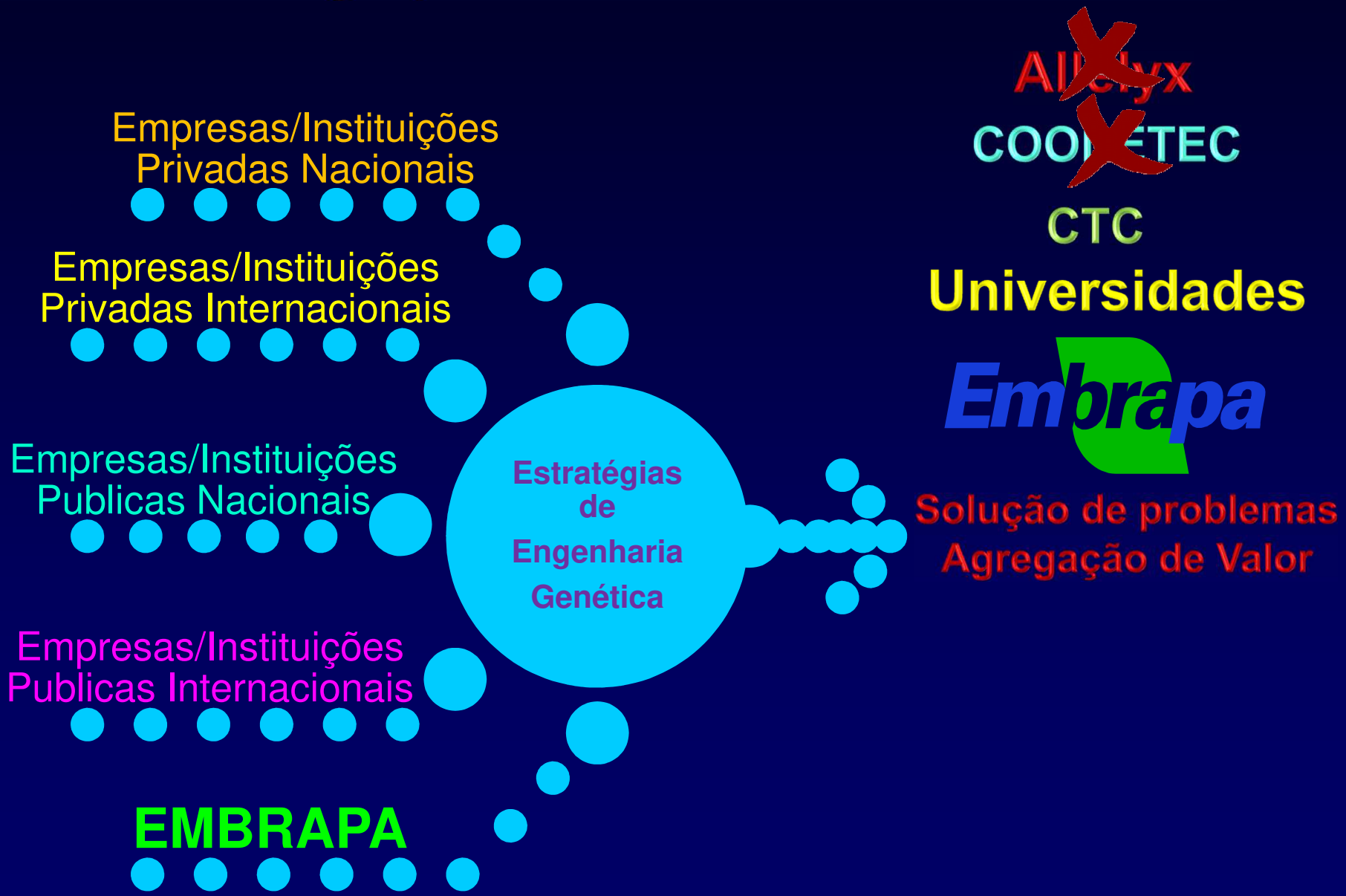
Até 1990



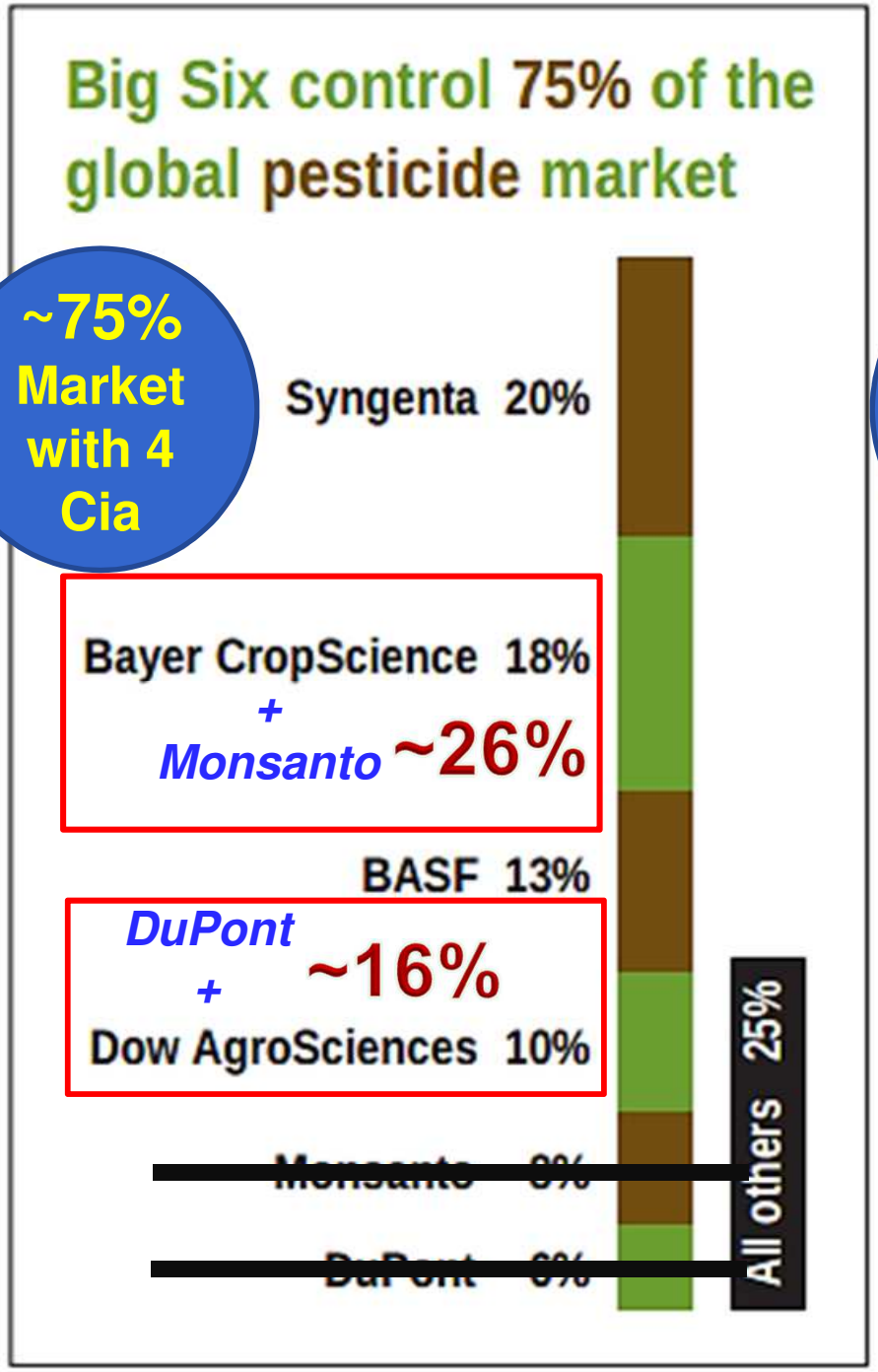
2017

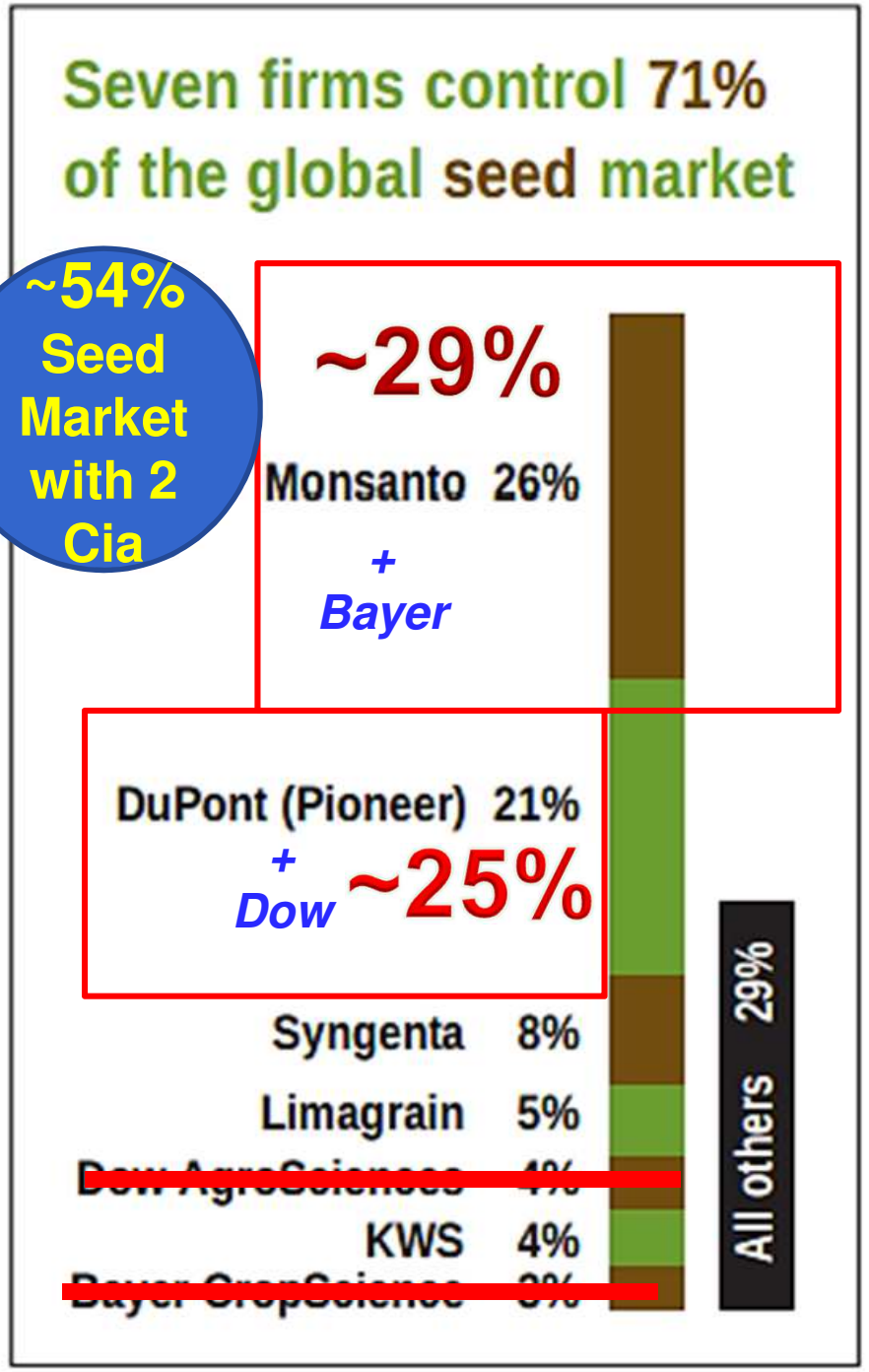


Quem Faz ("Fazia") Inovação em Biotecnologia Agropecuária no Brazil?

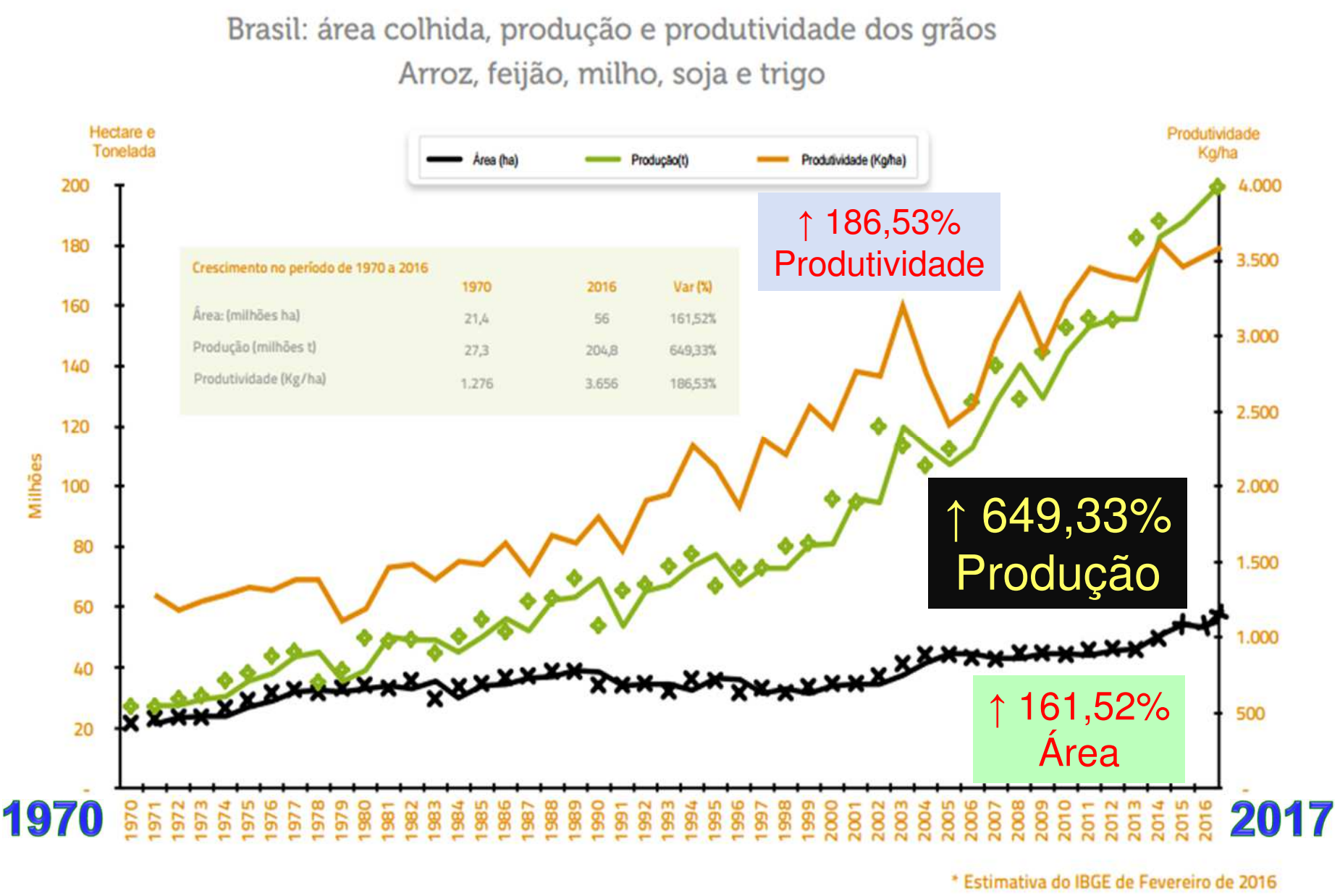



Oligopólio?


Big Six control 75% of the global pesticide market
~75% Market with 4 Cia
Syngenta 20%
Bayer CropScience 18%
+
Monsanto ~26%
BASF 13%
DuPont
+
Dow AgroSciences 10%
~16%
Monsanto 6%
DuPont 6%
All others 25%

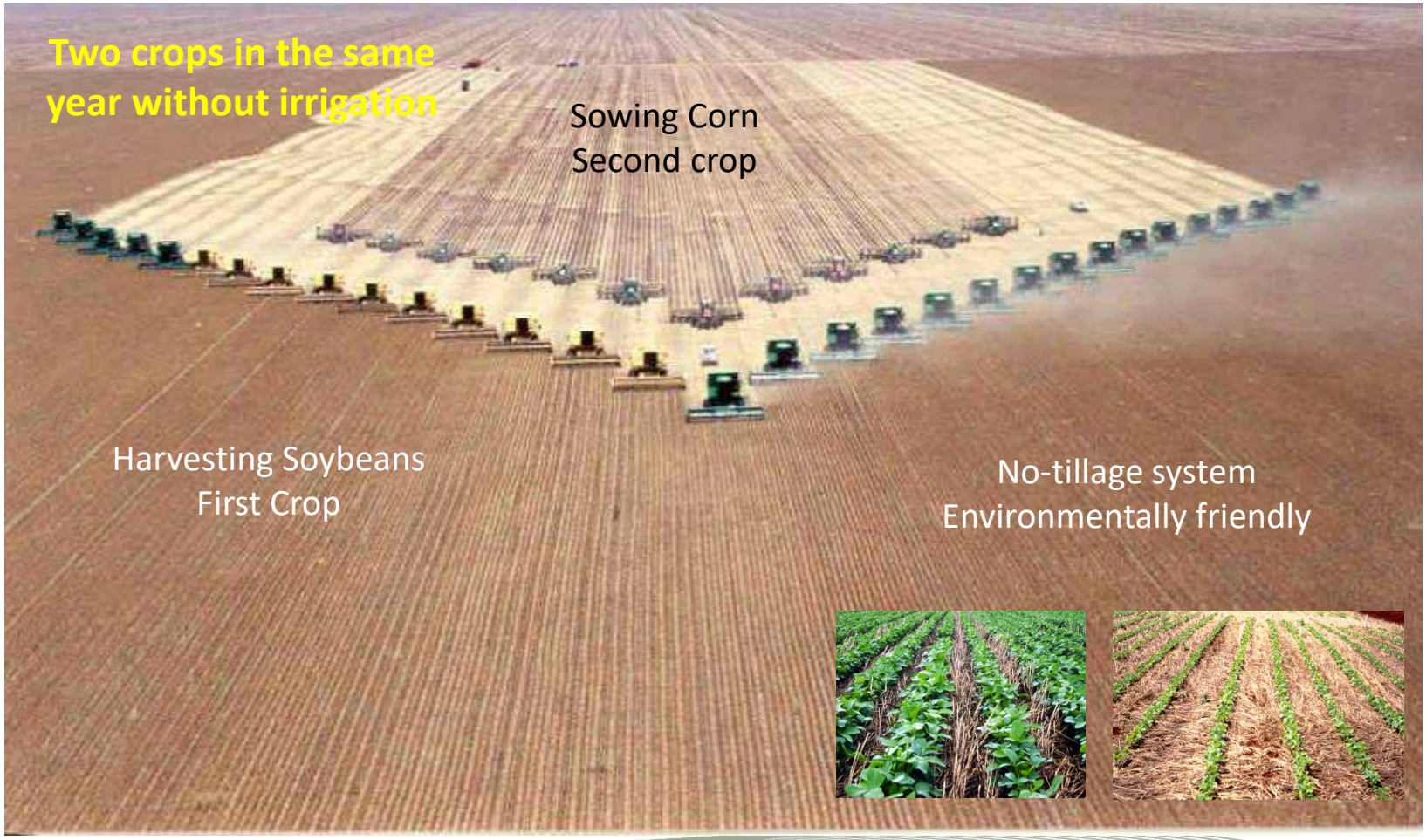

Seven firms control 71% of the global seed market
~54% Seed Market with 2 Cia
~29%
Monsanto 26%
+
Bayer
DuPont (Pioneer) 21%
+
Dow ~25%
Syngenta 8%
Limagrain 5%
Dow AgroSciences 4%
KWS 4%
Bayer CropScience 3%
All others 29%

O Mundo de Olho no Brasil

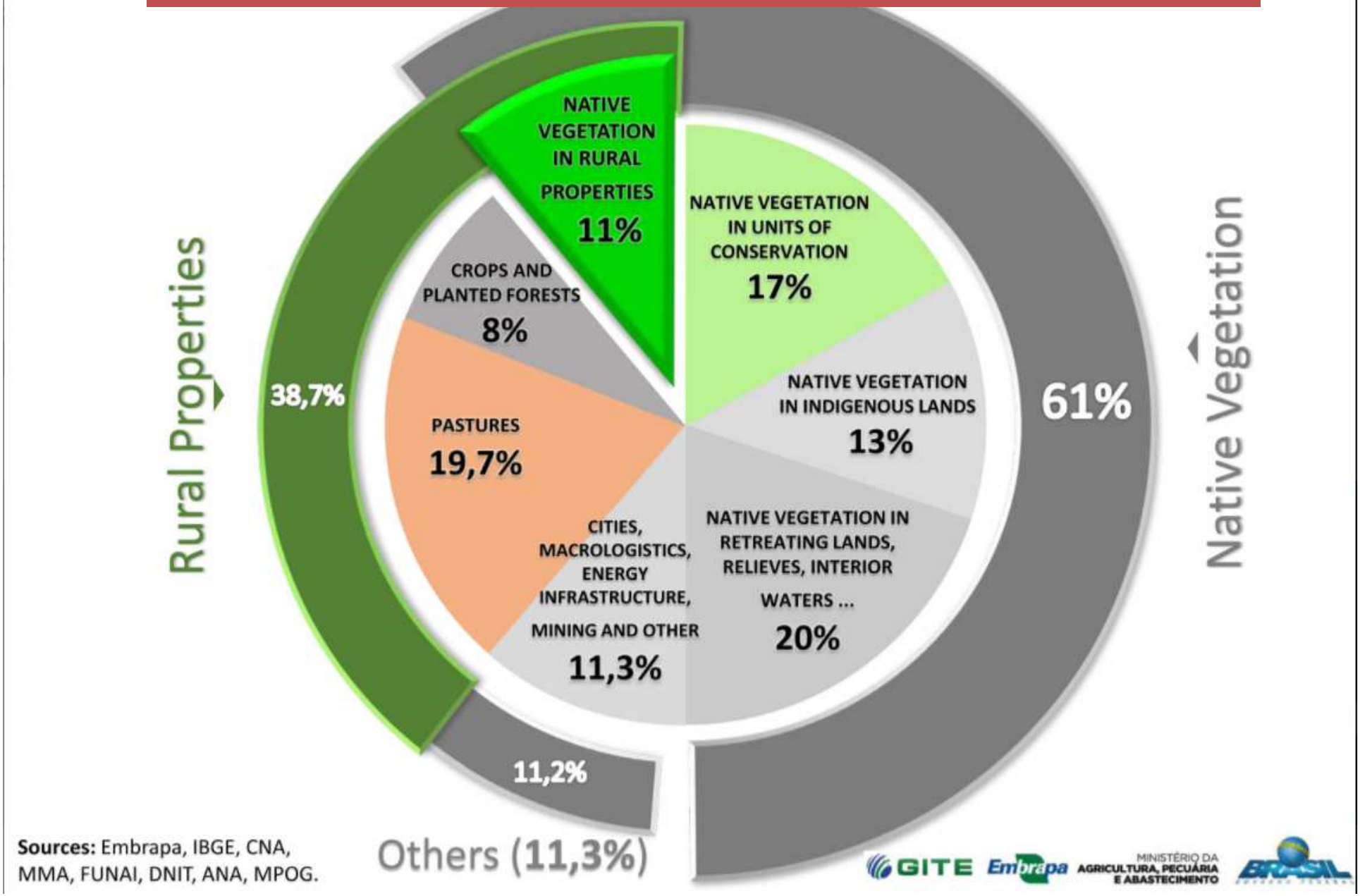


Conservation Agriculture in Brazil

Double Cropping Systems - Corn after Soybean



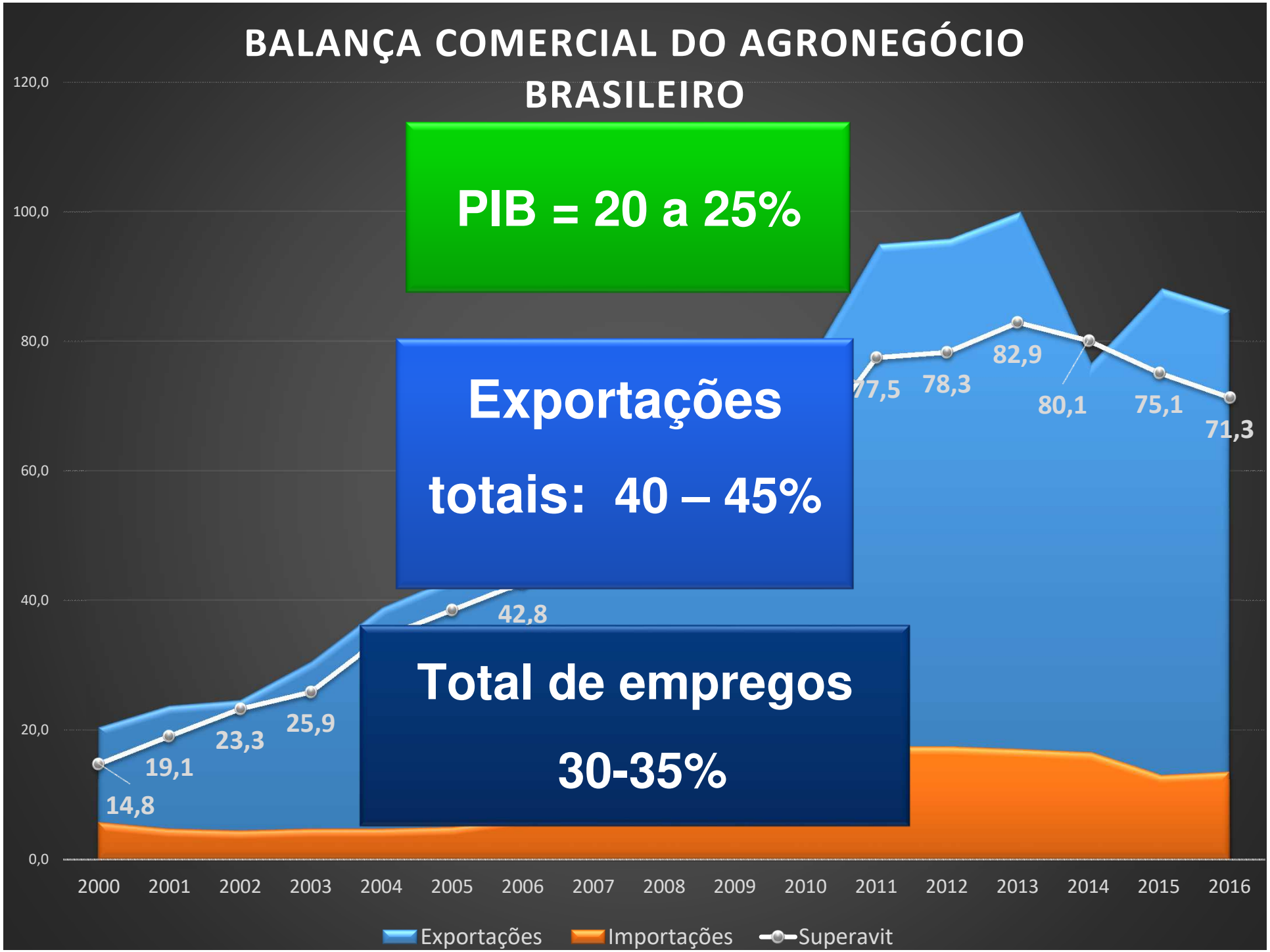
Uso da Terra no Brasil



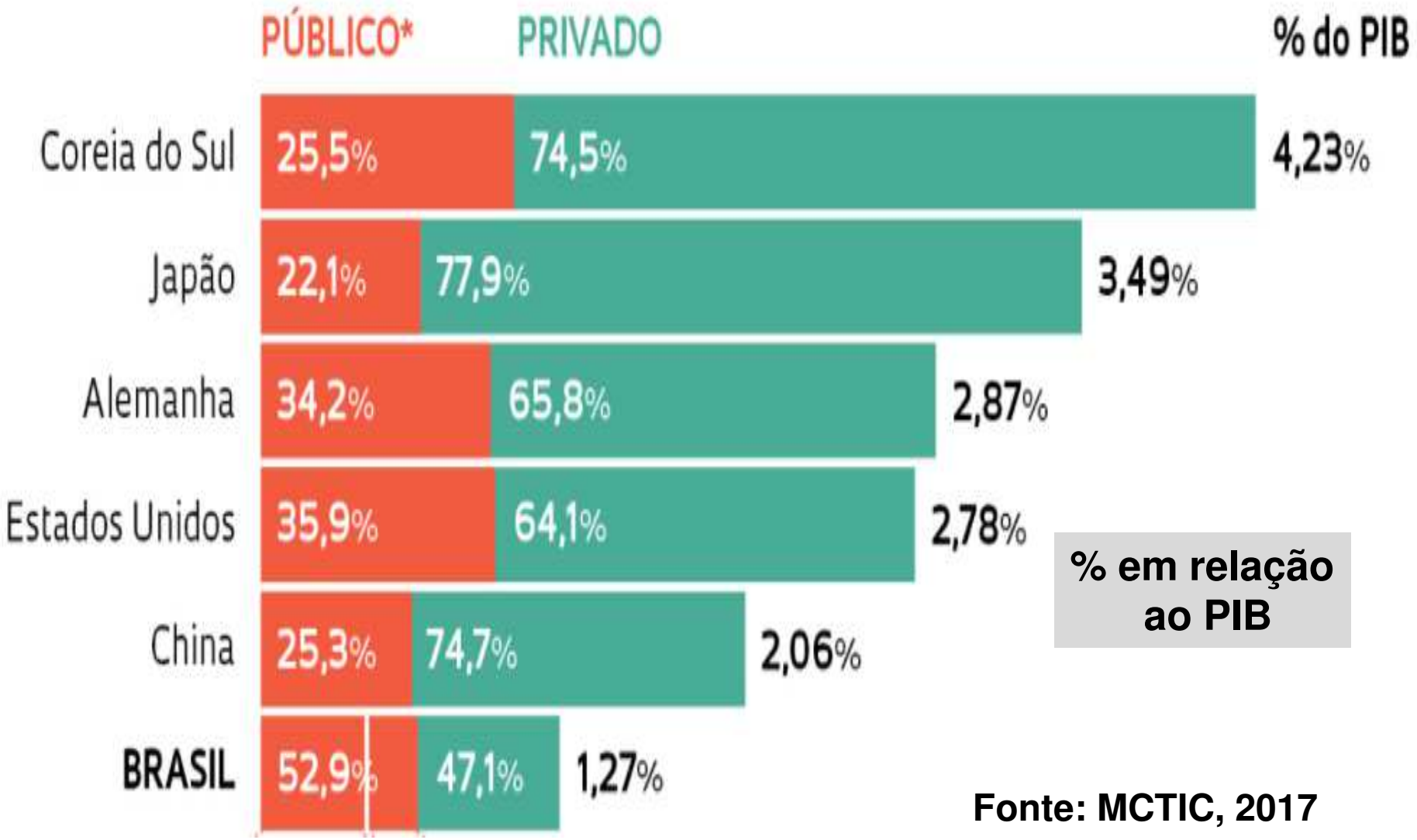
Human Population

- Since the early 1800s, the human population on Earth has been growing exponentially.

- Sept 2017 world population reached: **7,500,000,000.**


BALANÇA COMERCIAL DO AGRONEGÓCIO BRASILEIRO
PIB = 20 a 25%
Exportações totais: 40 – 45%
Total de empregos 30-35%
120,0
100,0
80,0
60,0
40,0
20,0
0,0
14,8
19,1
23,3
25,9
42,8
77,5
78,3
82,9
80,1
75,1
71,3
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Exportações
Importações
Superavit

Investimento em C&T: Setor Público e Privado

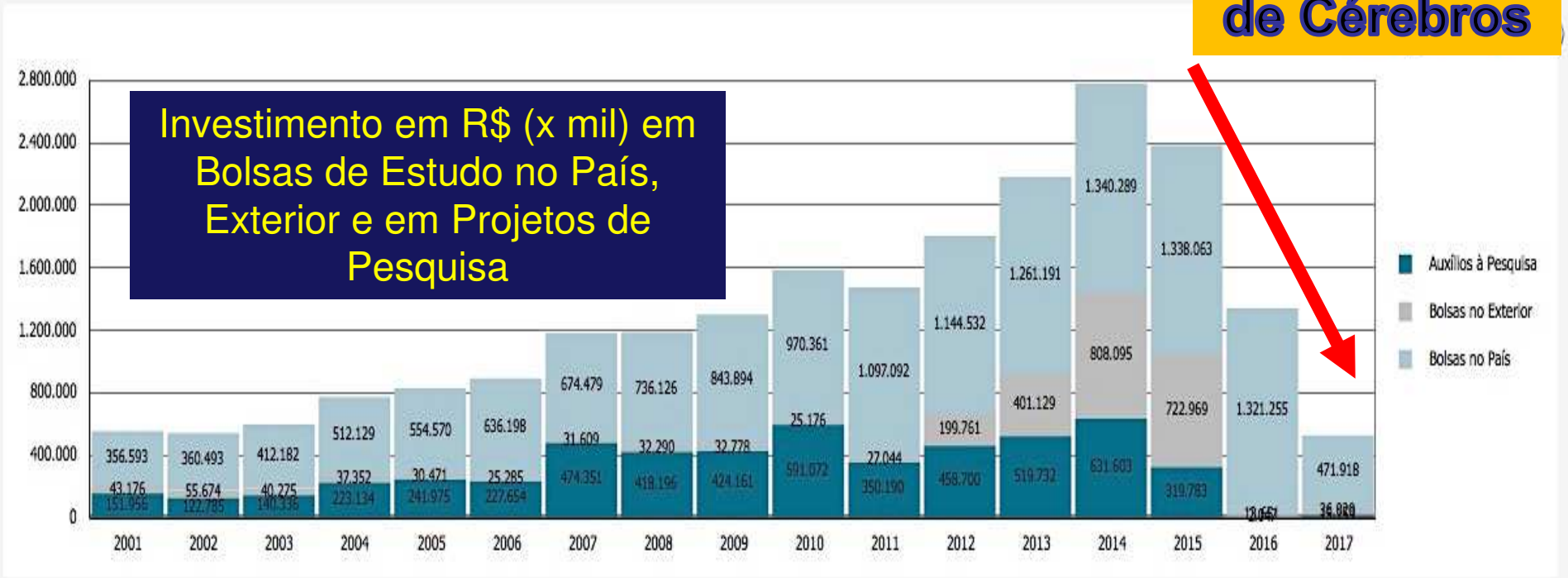


% em relação ao PIB

Fonte: MCTIC, 2017

Ciência Brasileira em Colapso

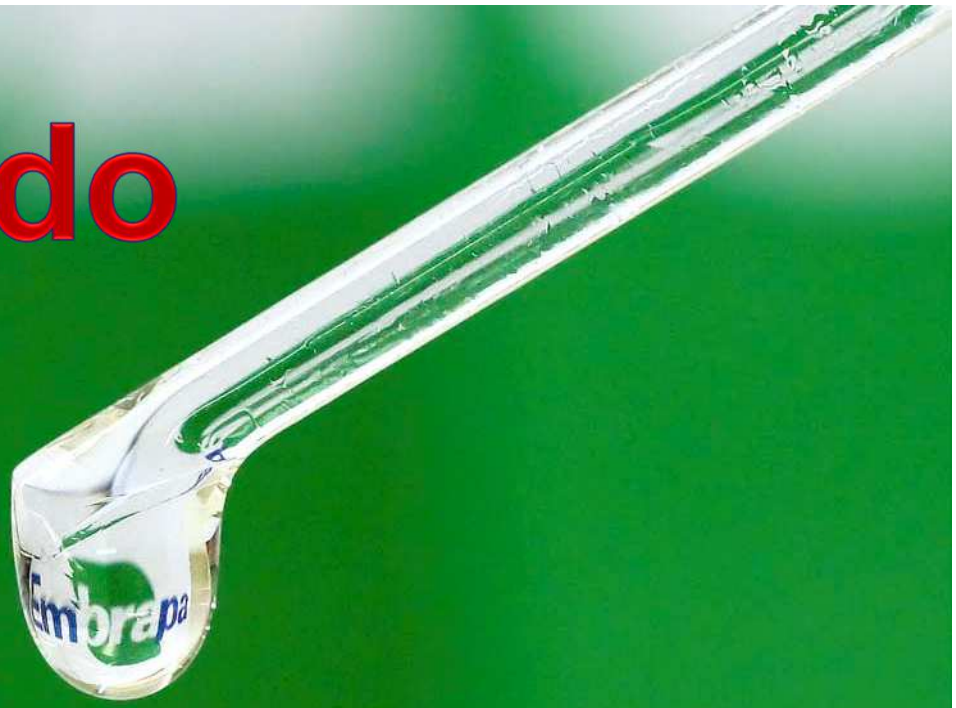
Fuga de Cérebros



2014 → 2017

Fonte: CNPq / Dados atualizados até junho/2017

Obrigado



"Meditai se só as nações fortes
podem fazer Ciência,
Ou se é a Ciência que as fazem fortes"

Oswaldo Cruz

Embrapa

Alexandre Nepomuceno

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