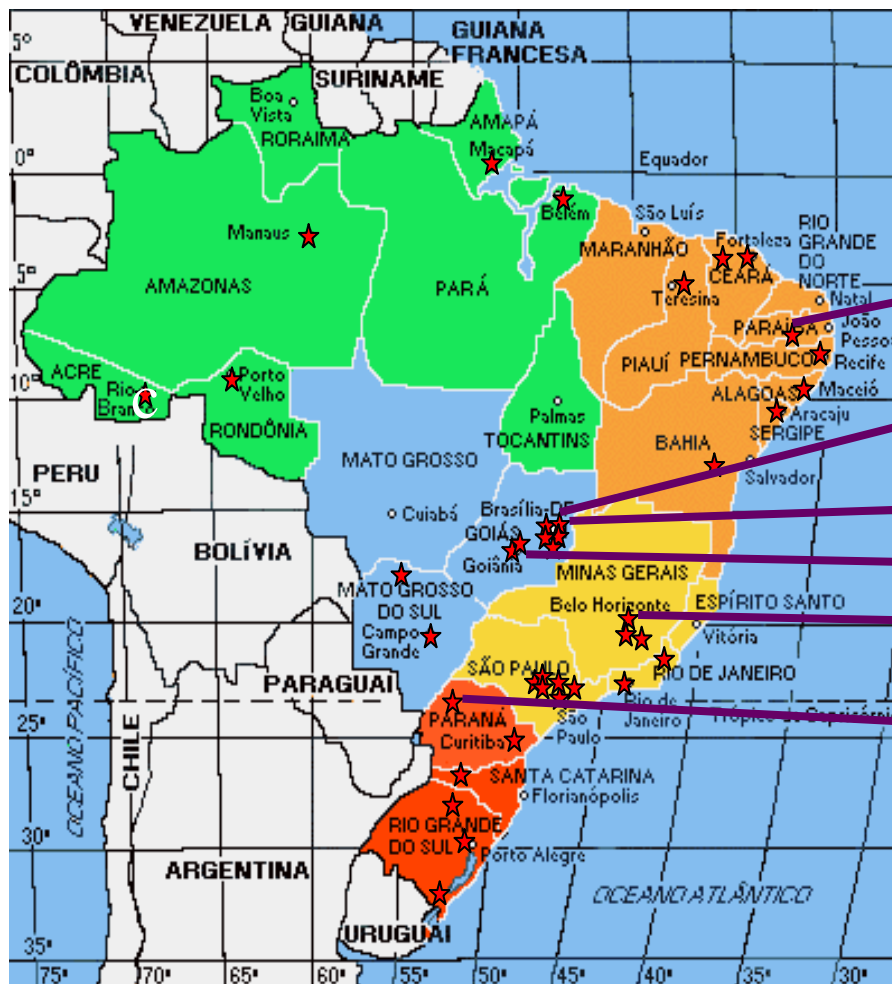




**Development of transgenic technologies:
generation of the first commercial transgenic
varieties in Brazil**

**Francisco J. L. Aragão
Embrapa/Cenargen, Brazil**

aragao@cenargen.embrapa.br



Cotton

Genetic Resources and Biotechnology (1986)

Vegetables

Bean and Rice

Corn and Sorghum

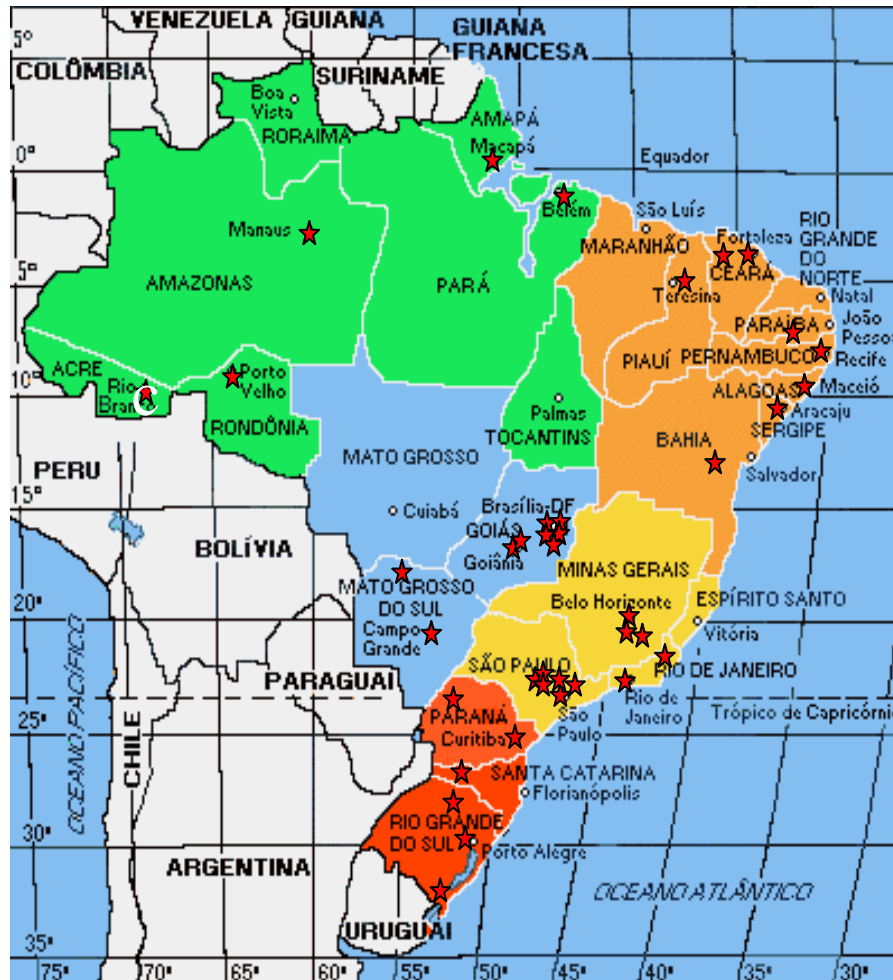
Soybean

42 Research Units
2,500 PhD researchers

1986 - Agricultural Biotechnology Program

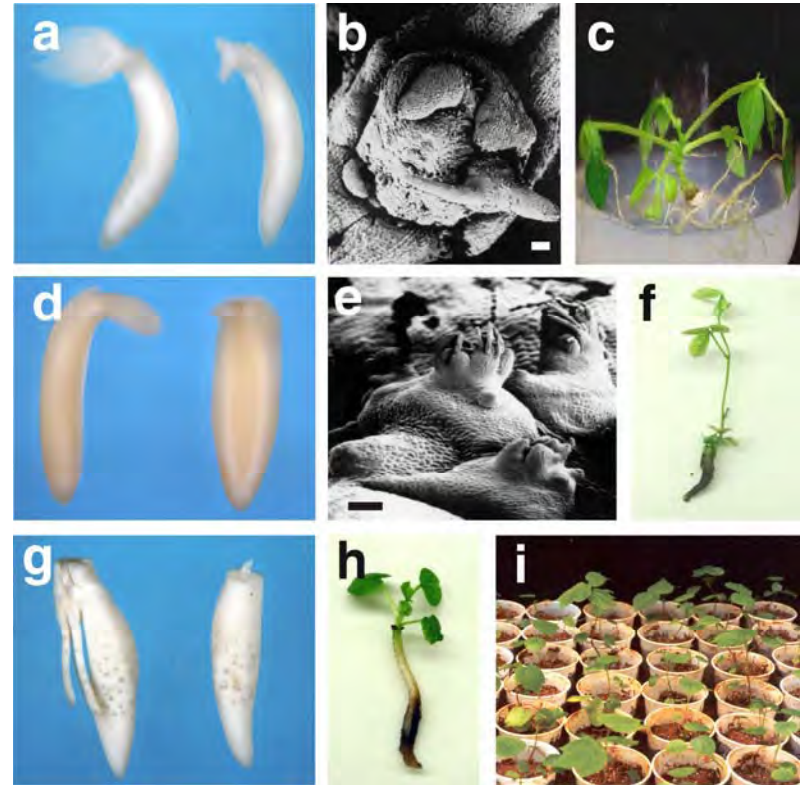
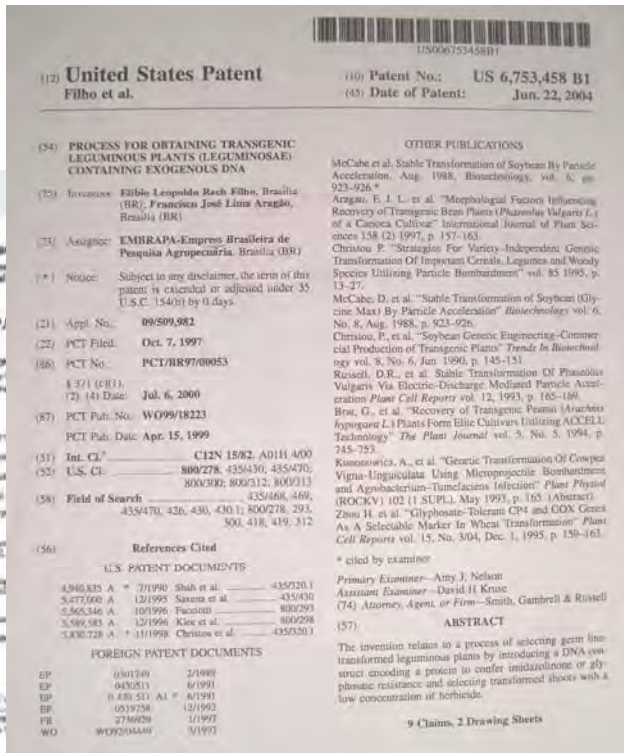
Biotechnology Unit - Brasília



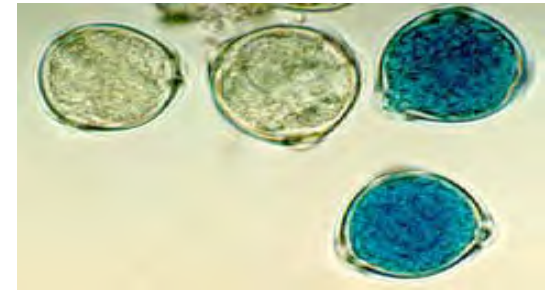
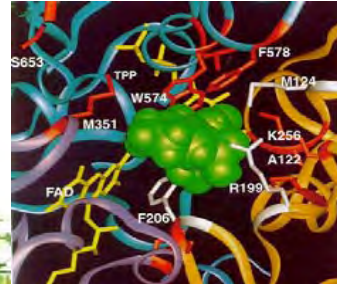


Lettuce
 Cotton
 Dry Bean
 Soybean
 Potato
 Banana
 Papaya
 Brachiaria
 Tomato
 Coffee
 Maize
 Castor Bean
 Cowpea

1996 - Embrapa/BASF - Development of a Production system (Cultivance®) for soybean



1996 - Production system Cultivance® 2003 - Second Elite Event (CV127)



Microspores



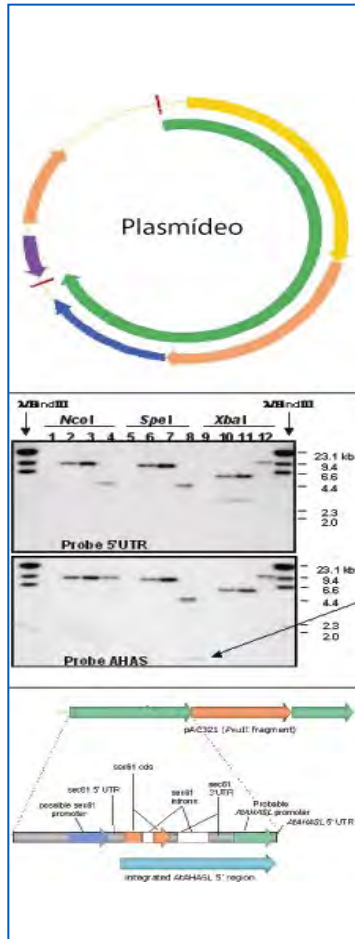
*Mendelian segregation
3:1*

1. Non-transgenic
2. Transgenic (line 8-19) after pulverization with the herbicide
3. Transgenic (line 7-15) after pulverization with the herbicide
4. Non-transgenic plant after pulverization with the herbicide

Imidazolinone tolerant soybean - Embrapa/BASF



Biosafety: safe or safer



Biosafety analysis by Embrapa and BPS

Molecular characterization

- **Number of DNA inserts, insert stability**
- **Number of copies of genetic elements within the insert**
- **Integrity of gene cassettes**
- **Presence of additional DNA (backbone)**
- **Sequence of genomic flanking DNA**
- **Sequence of the inserted DNA**
- **DNA LandMarks**

Protein characterization, Food / Feed safety

- **Protein characterization and equivalence**
- **Protein level in plant tissues**
- **Gram quantity protein production, purification, characterization**
- **Allergenicity assessment**
- **Toxicity assessment**

Agronomic equivalence, Environmental safety

- **Agronomic / phenotypic assessments**
- **Weediness assessment (HT)**
- **Fitness**
- **Environmental safety**
- **Environmental fate**

Composition equivalence, Nutritional equivalence

- **Grain samples from multi-location, multi-year, replicated field trials**
- **Secondary metabolites**
- **Pilot scale processing, nutrient / antinutrient analysis (validated methods)**
- **Confirmation of food/feed safety**
- **Animal feeding studies**

Soybean CV127



Biosafety: safe or safer



Dec, 2008

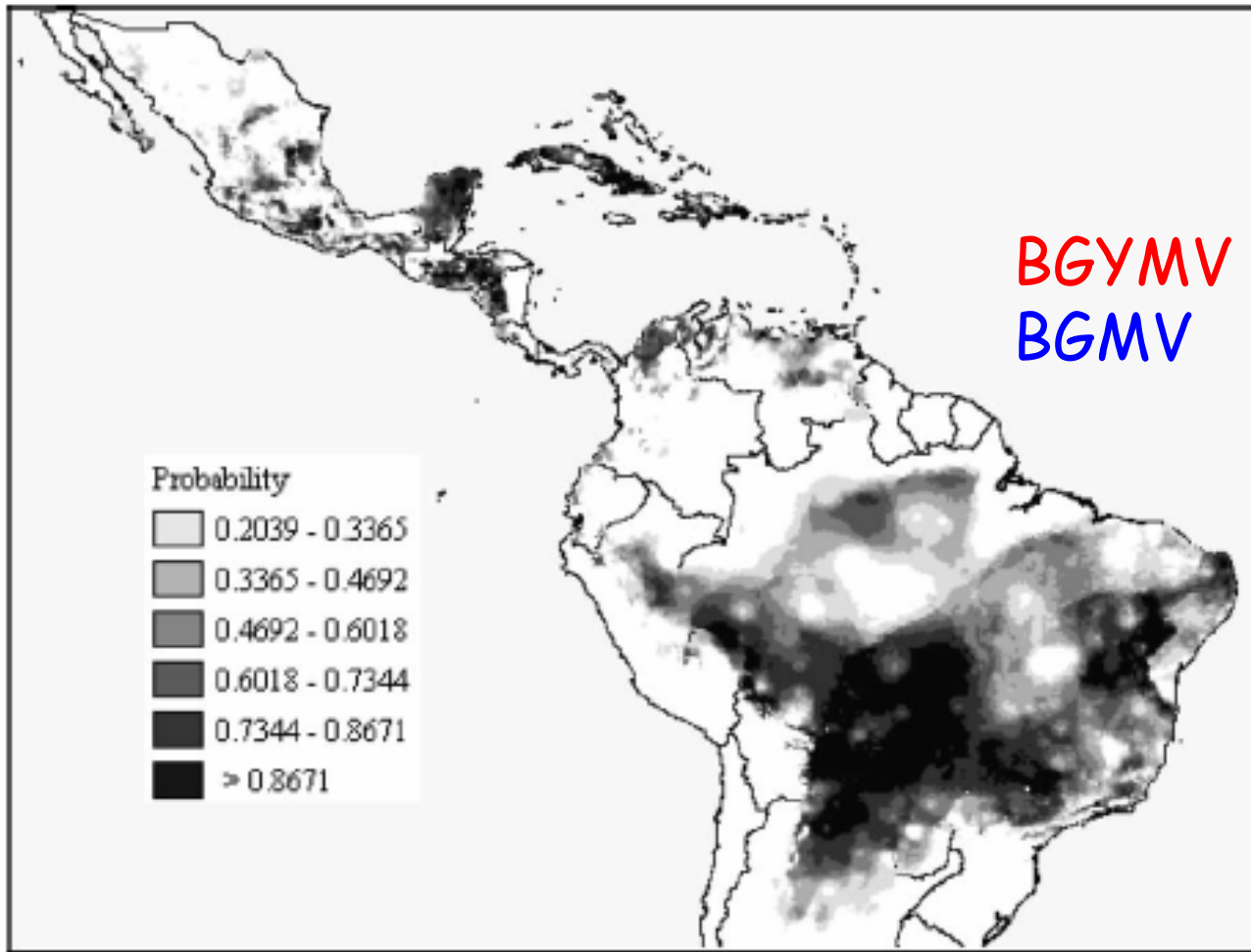
Commercial release proposal

Submitted: USA, Canada, EU, Japan, China, Philippines, Korea and **Brazil (Dec 2009)**

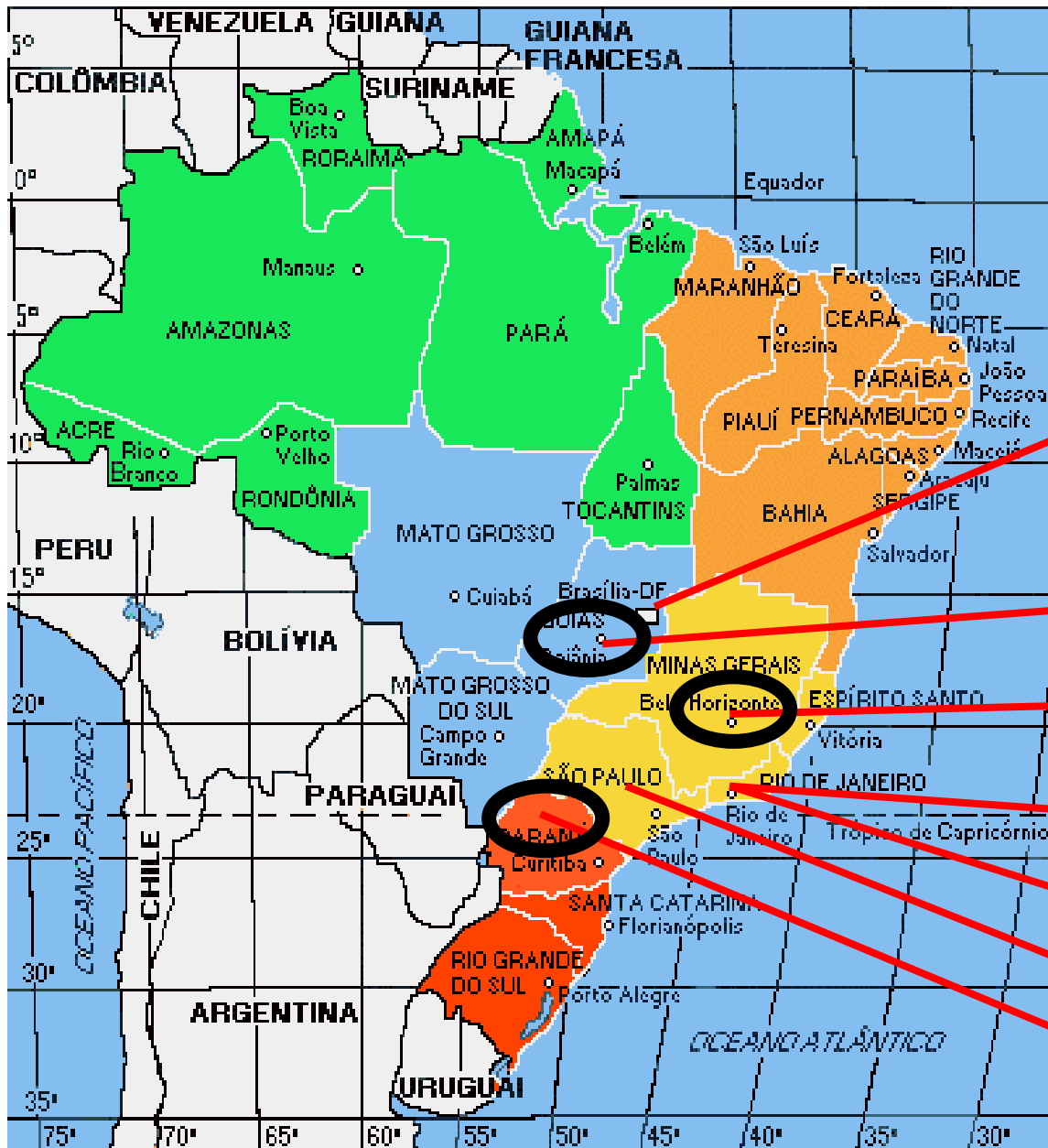
Submission in 2010: Argentina, Colombia, Taiwan, Australia, Russia, Mexico



Golden mosaic causes annual reductions in the range of 90,000 to 280,000 tons (Brazil)
Enough to feed 6 M to 20 M adults.



BGYMV-DR, -MX (83%), -FL 82%
44 bp sequence with no gaps



Common bean
F5.1

Genetic Resources
and Biotechnology

Rice and Bean

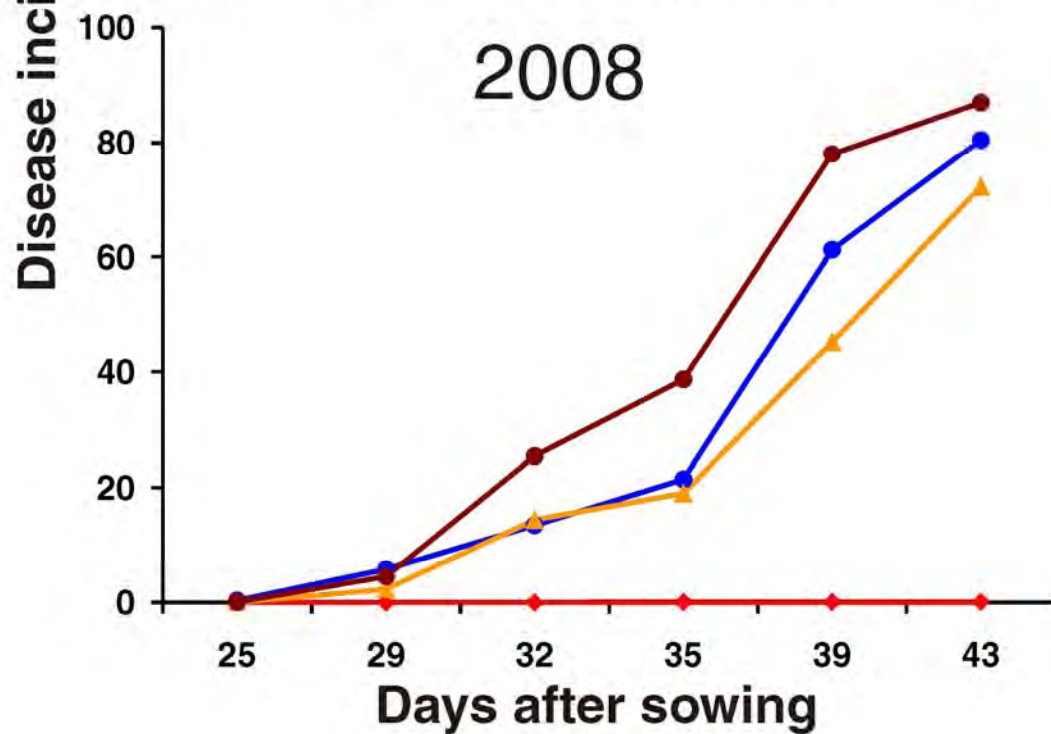
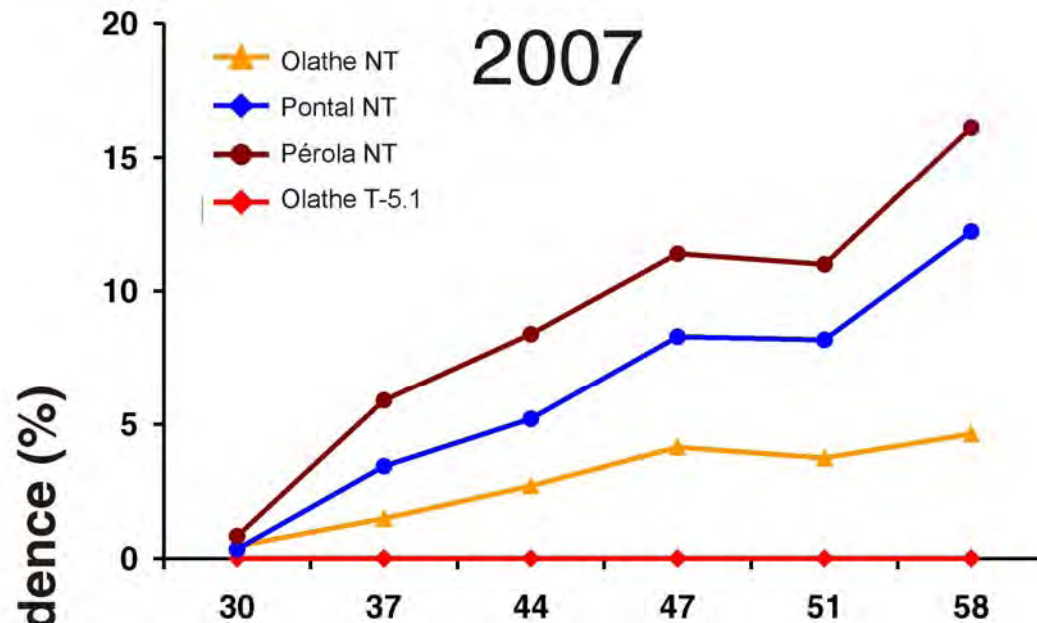
Maize and Shorgum

Agrobiology

Agroindustry

UNESP-Botucatu

Soybean







Thank you
Gracias