



# Mejoramiento Genético empleando herramientas de la Biotecnología

Foro Regional de Aprovechamiento e Innovación de Agricultura Sostenible

Yuri Peña

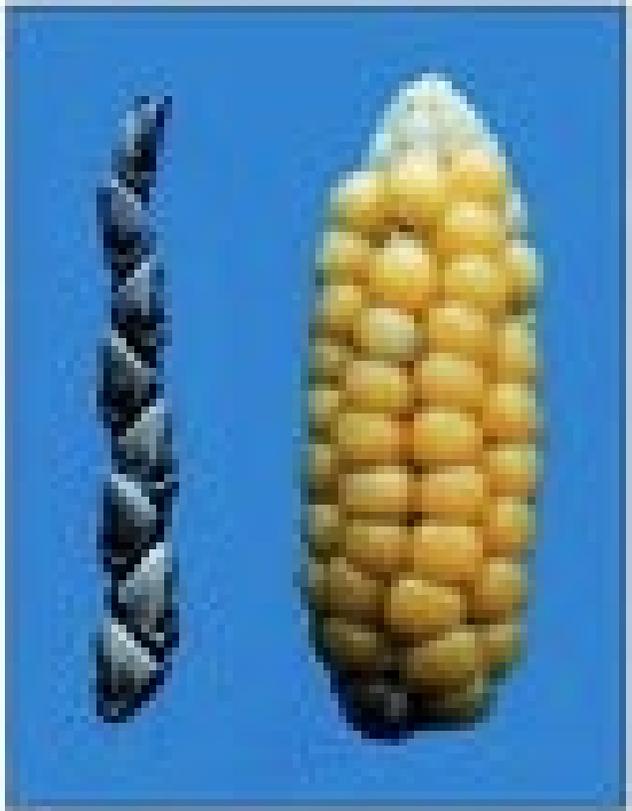
ECOSUR Campeche

Departamento de Ciencias de la Sustentabilidad

# Biotecnología Vegetal. Una larga historia



Domesticación y  
selección



# La Domesticación: Ganancias



Rendimiento  
Sabores  
Colores  
Homogeneidad



# La Domesticación: Pérdidas



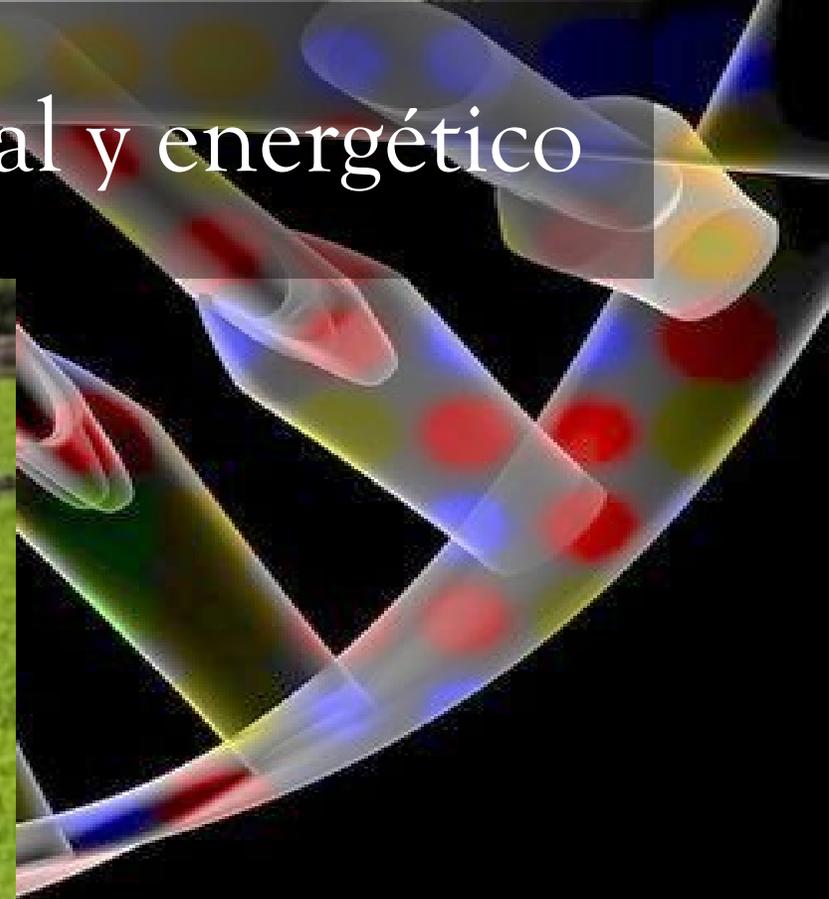
Resistencia a plagas, a bacterias, a virus, etc.

Tolerancia a sequía, a frío, etc.

Diversidad genética

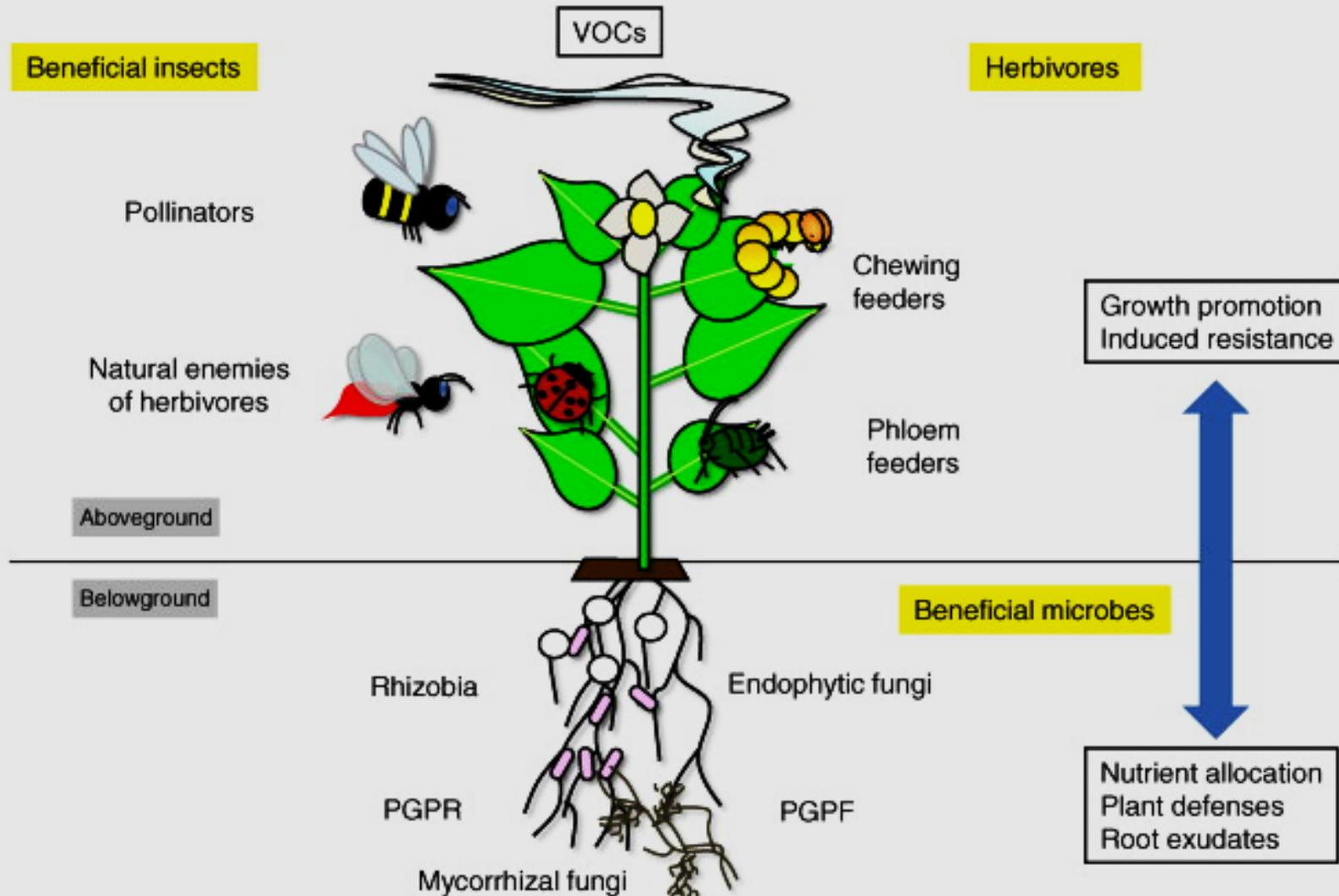


# Monocultivos intensivos. Costo ambiental y energético



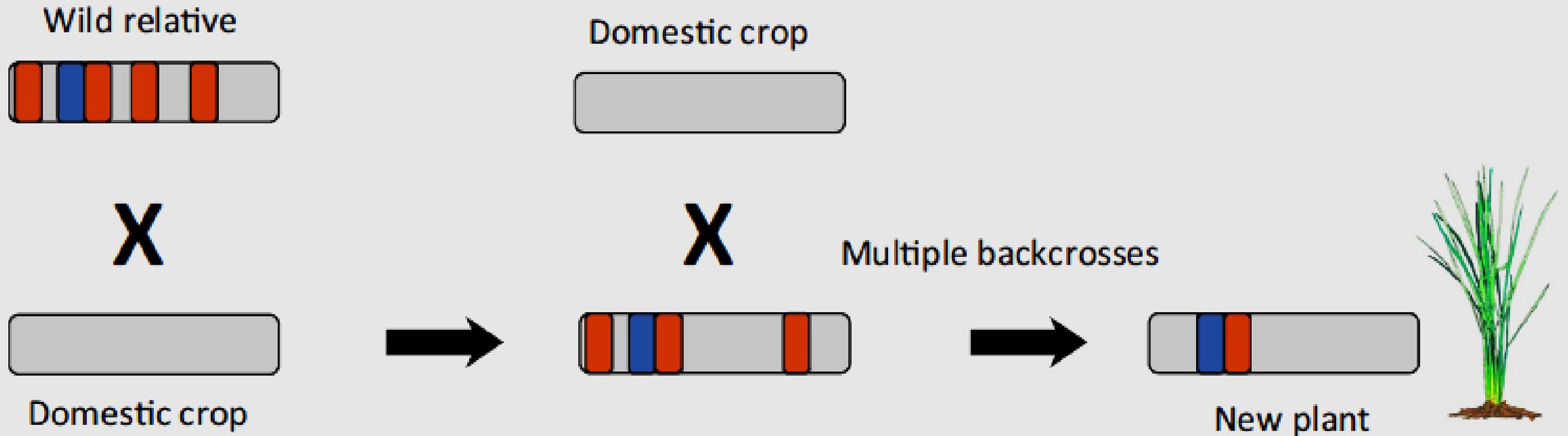
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# Plantas diseñadas para Manejo Integrado de Plagas



# Resilvestrización: Reintroducir genes silvestres

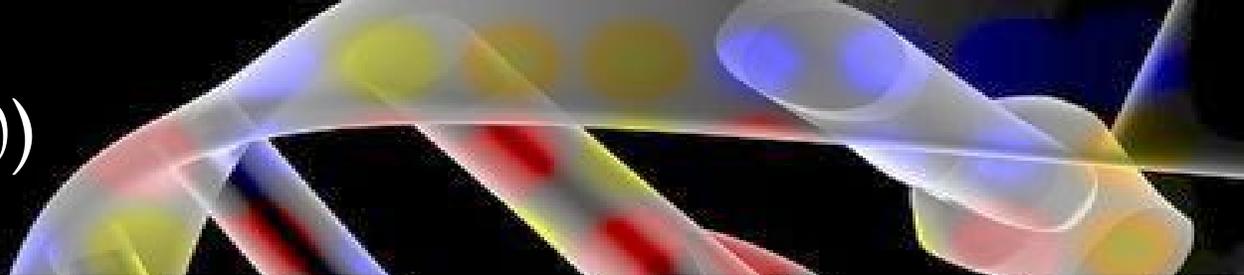
## (A) Introgression breeding



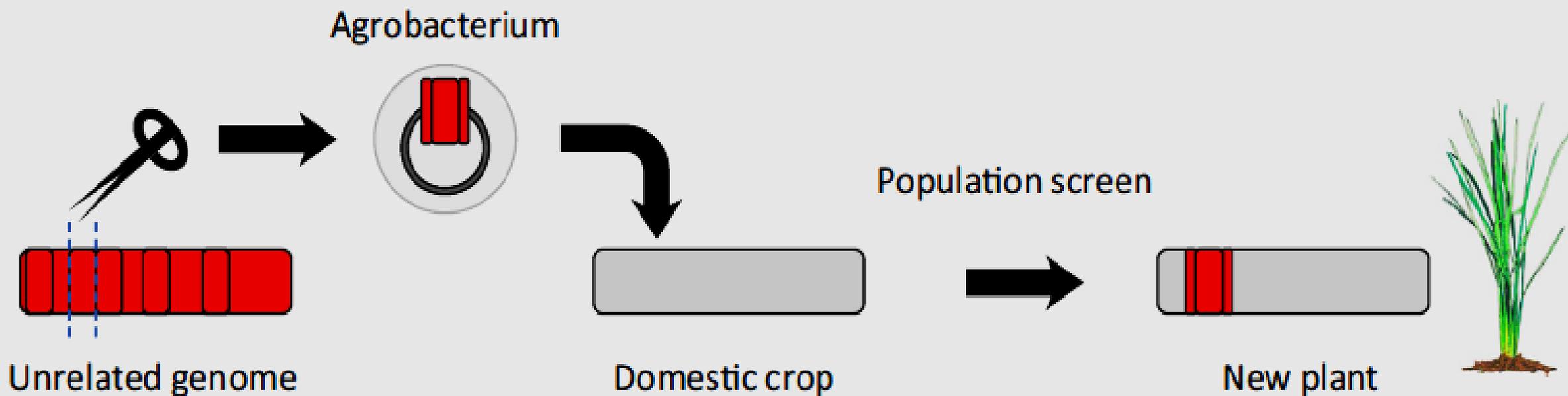
No GM techniques used in process

Product not GMO

# Biotecnología moderna (1980-2000)



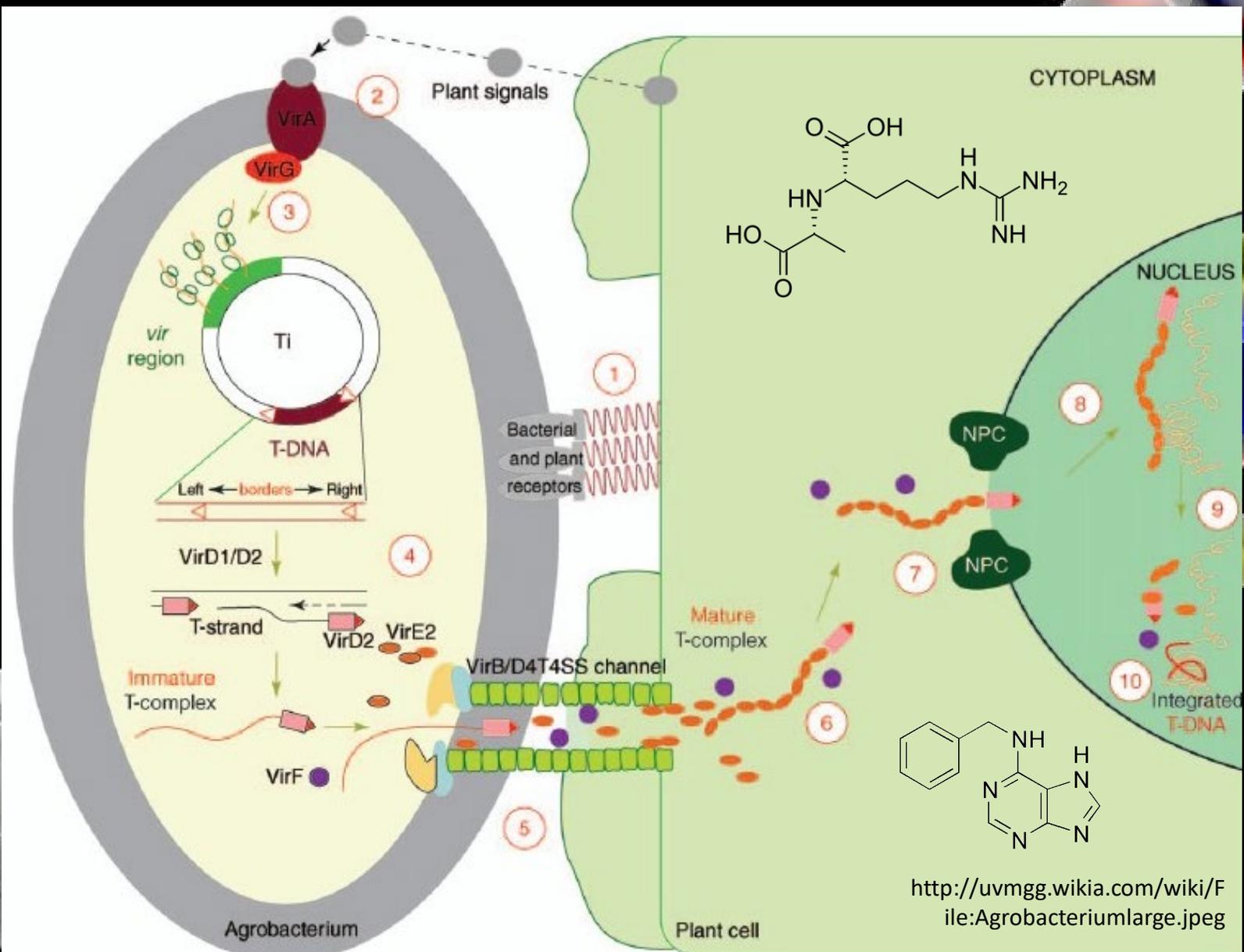
## (B) Transgenesis



GM techniques used in process  
(new gene material inserted)

Product GMO

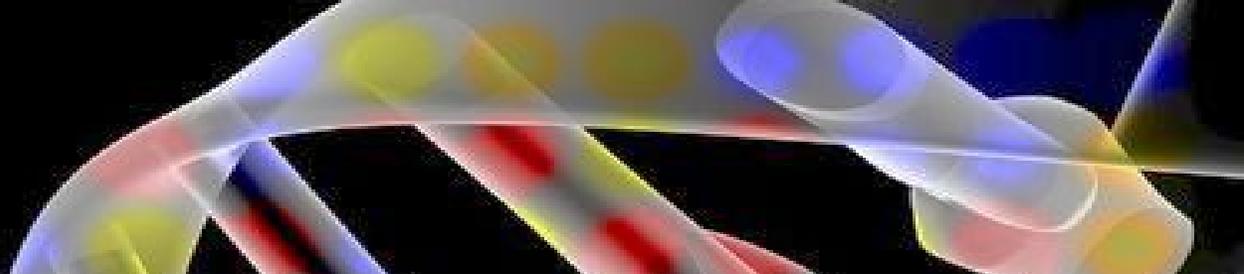
# Agrobacterium tumefaciens



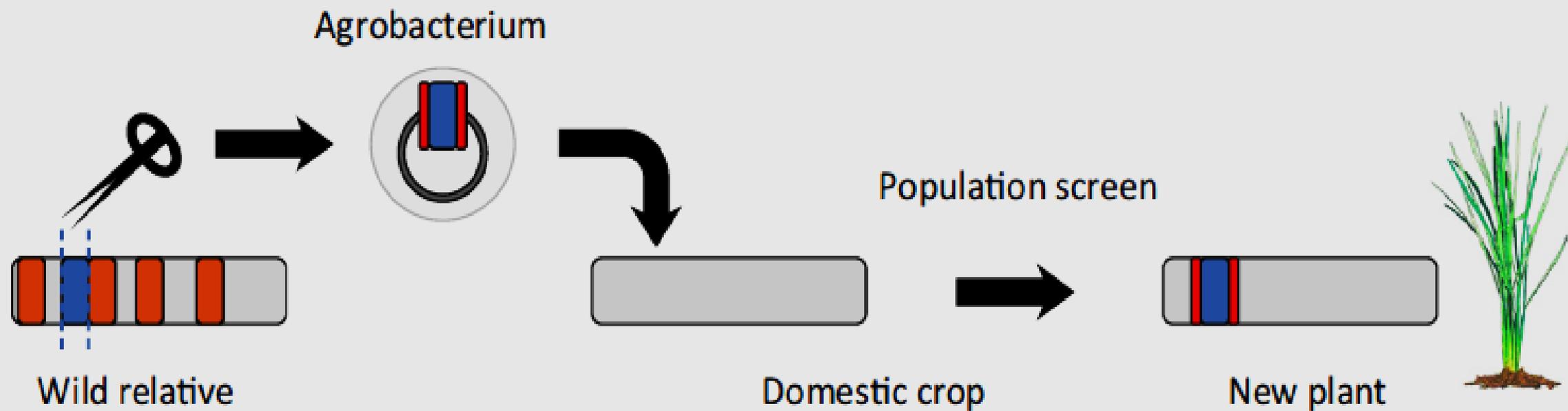
<http://uvmgg.wikia.com/wiki/File:Agrobacteriumlarge.jpeg>



# Biotecnología moderna (2000)



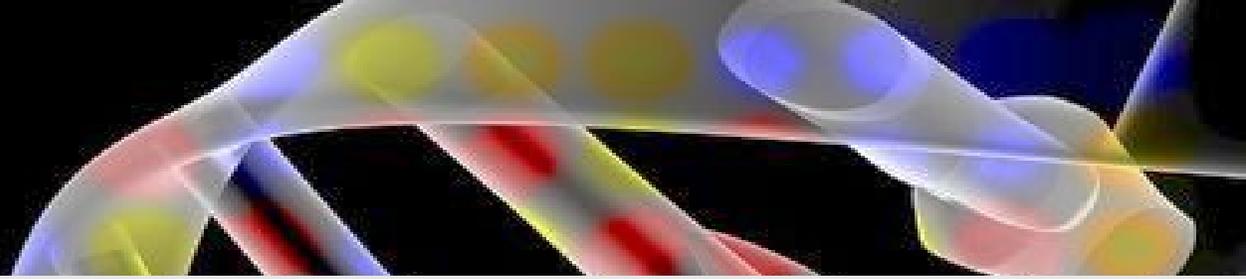
## (C) Cisgenesis



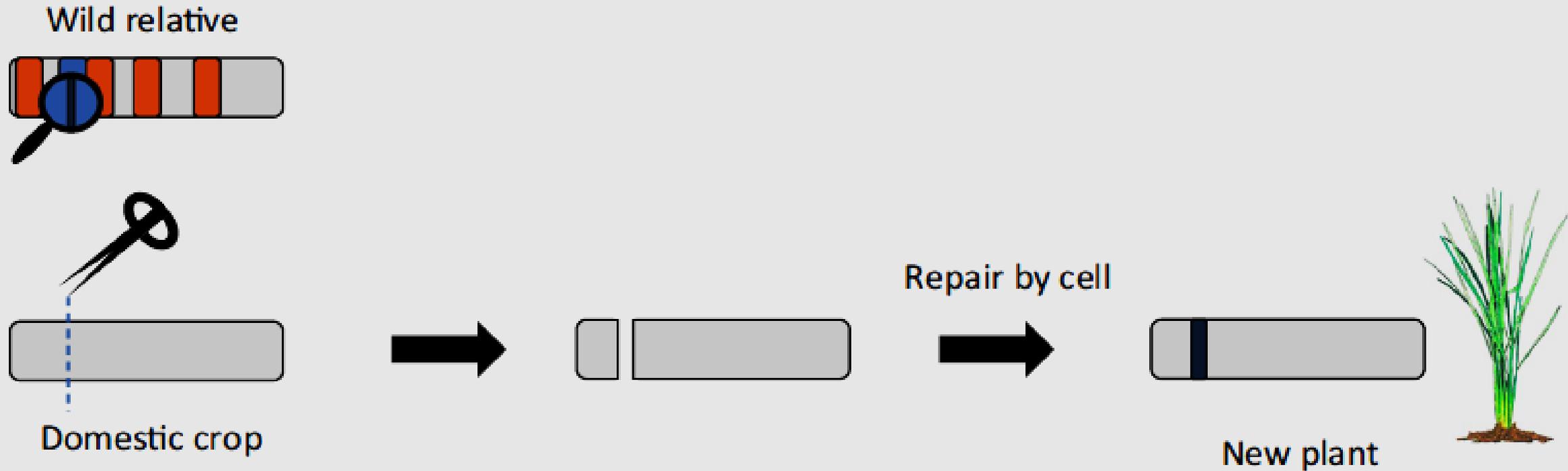
GM techniques used in process  
(new gene material inserted)

Product GMO

# Biotecnología moderna (2015-?)



## (D) Precision breeding



**GM techniques used in process**  
(no new gene material inserted in product)

**Product GMO ?**

# Gene-edited CRISPR mushroom escapes US regulation

A fungus engineered with the CRISPR–Cas9 technique can be cultivated and sold without further oversight.

Emily Waltz

14 April 2016



PDF

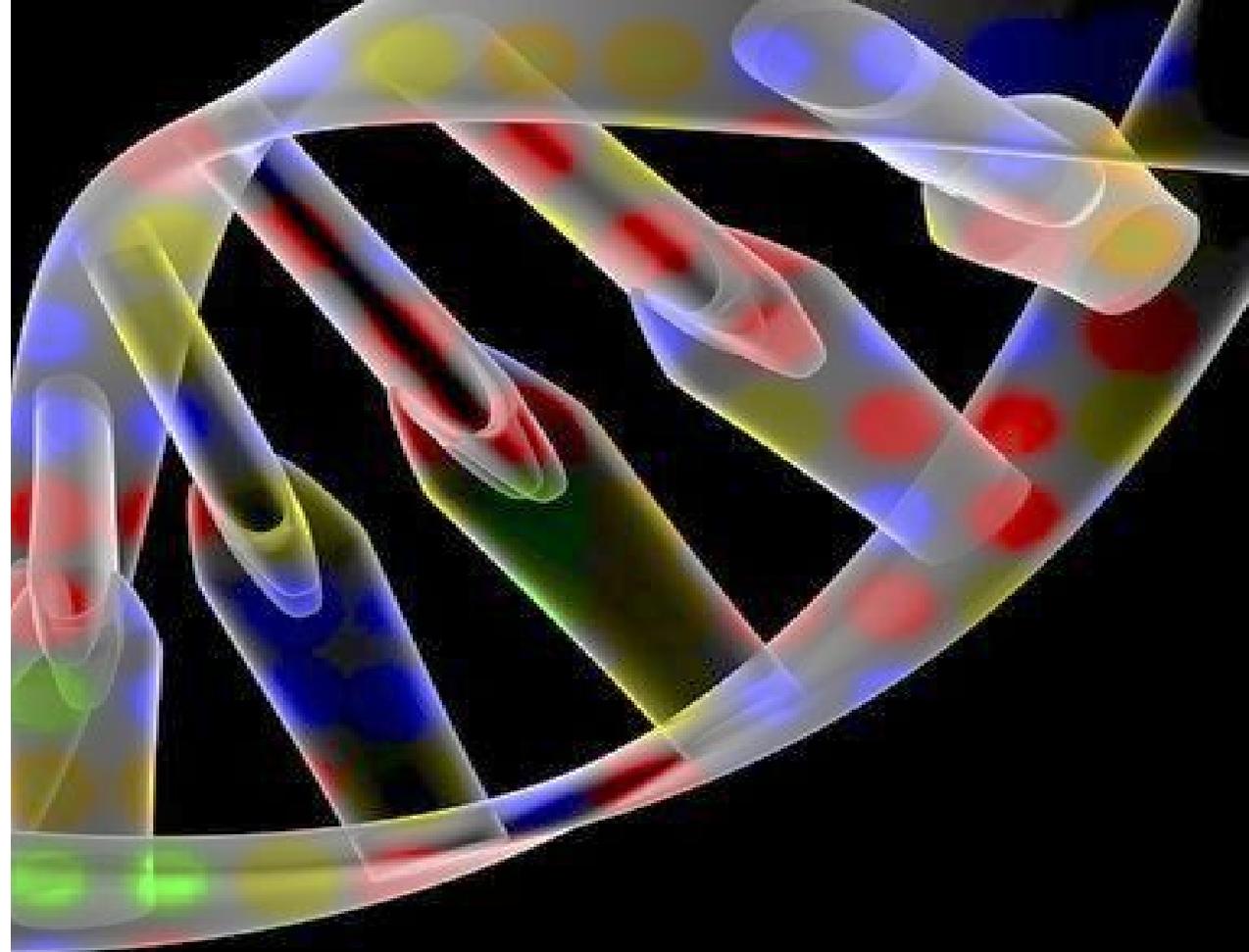


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Jose A. Bemat Bacete/Getty Images

The common white button mushroom (*Agaricus bisporus*) has been modified to resist browning.

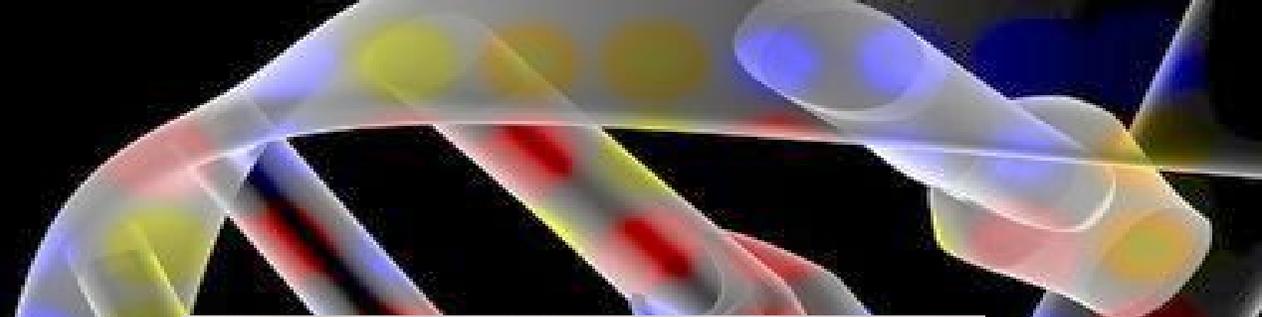


Indistinguishable de un  
mutante natural

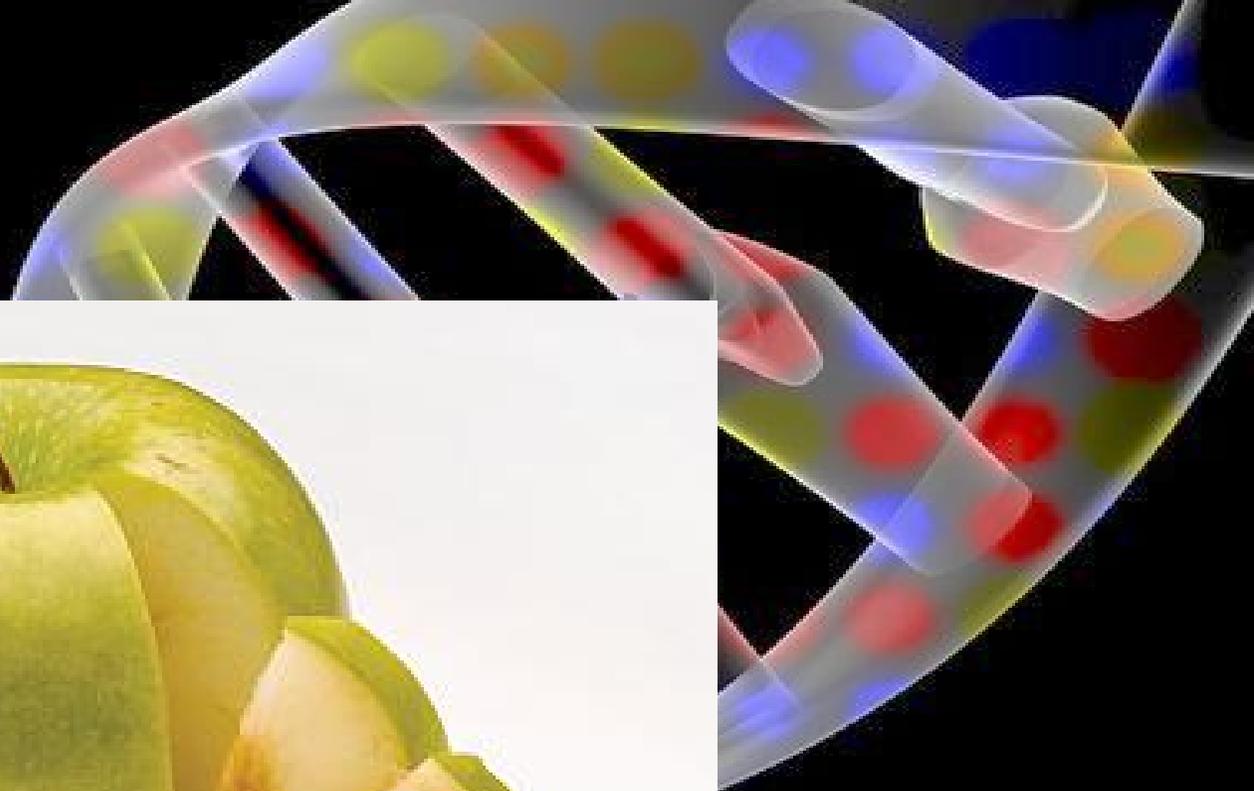


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# Arroz y plátano dorado



# Reducción de oxidación



# Reducción de acrilamidas



# Áreas de atención



Sequía y plagas

# Feasibility of new breeding techniques for organic farming

**Martin Marchman Andersen<sup>1</sup>, Xavier Landes<sup>1</sup>, Wen Xiang<sup>2</sup>, Artem Anyshchenko<sup>2</sup>, Janus Falhof<sup>3</sup>, Jeppe Thulin Østerberg<sup>3</sup>, Lene Irene Olsen<sup>3</sup>, Anna Kristina Edenbrandt<sup>4</sup>, Suzanne Elizabeth Vedel<sup>4</sup>, Bo Jellesmark Thorsen<sup>4,5</sup>, Peter Sandøe<sup>4,6</sup>, Christian Gamborg<sup>4</sup>, Klemens Kappel<sup>1</sup>, and Michael G. Palmgren<sup>3</sup>**

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<sup>2</sup> Centre for Public Regulation and Administration, Faculty of Law, University of Copenhagen, Studiestræde 6, DK-1455 Copenhagen K, Denmark

<sup>3</sup> Center for Membrane Pumps in Cells and Disease - PUMPKIN, Danish National Research Foundation, Department of Plant and Environmental Sciences, University of Copenhagen, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark

<sup>4</sup> Department of Food and Resource Economics, University of Copenhagen, Rolighedsvej 23, DK-1958 Frederiksberg C, Denmark

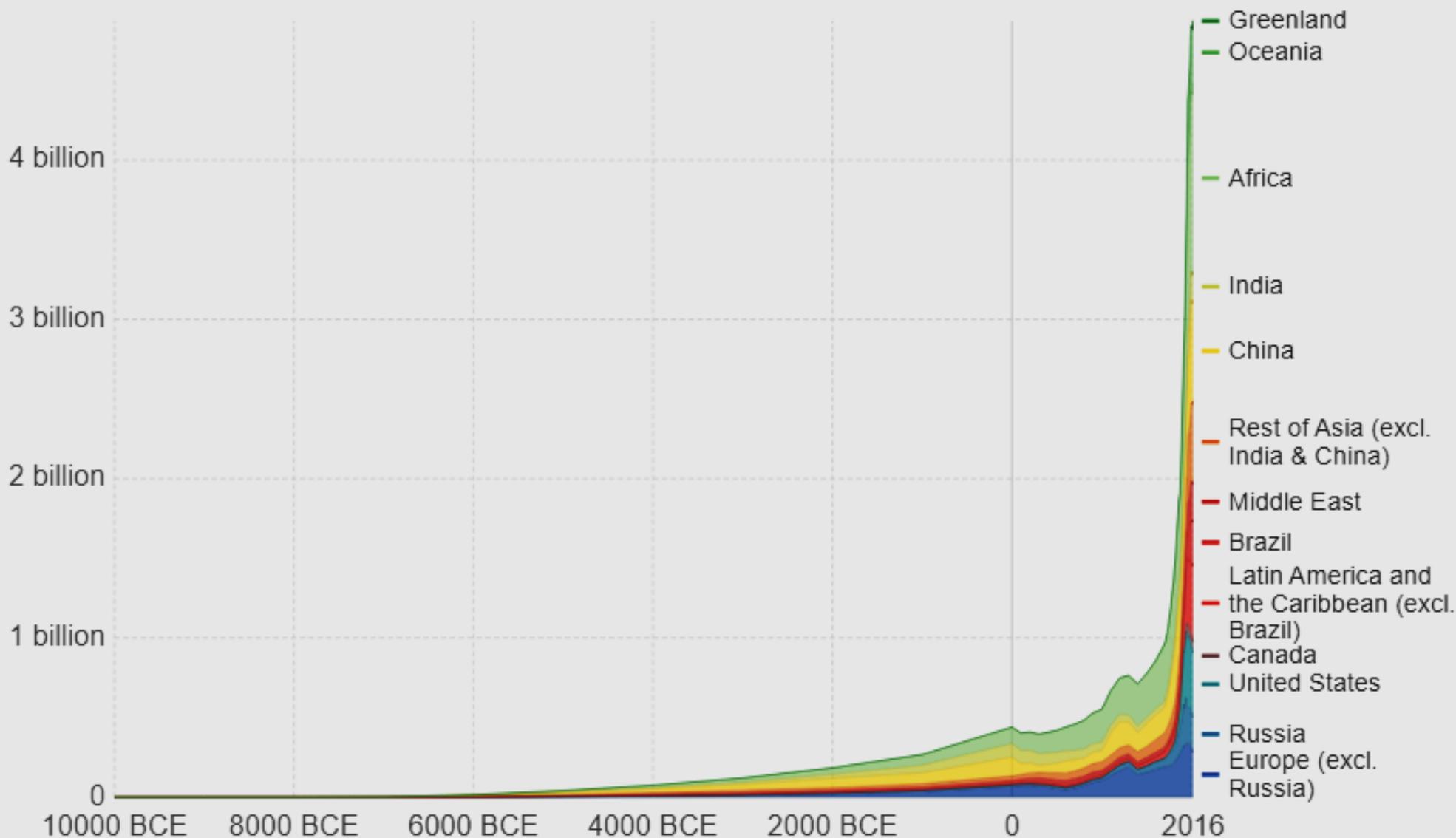
<sup>5</sup> Center for Macroecology, Evolution and Climate, University of Copenhagen, Rolighedsvej 23, DK-1958 Frederiksberg C, Denmark

<sup>6</sup> Department of Large Animal Sciences, University of Copenhagen, DK-1870 Frederiksberg C, Denmark

# Total agricultural area over the long-term

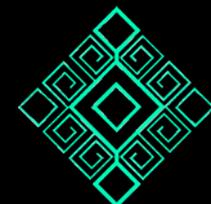
Total areal land use for agriculture, measured as the combination of land for arable farming (cropland) and grazing in hectares.

Our World  
in Data



Source: Land Use Data - HYDE (2017)

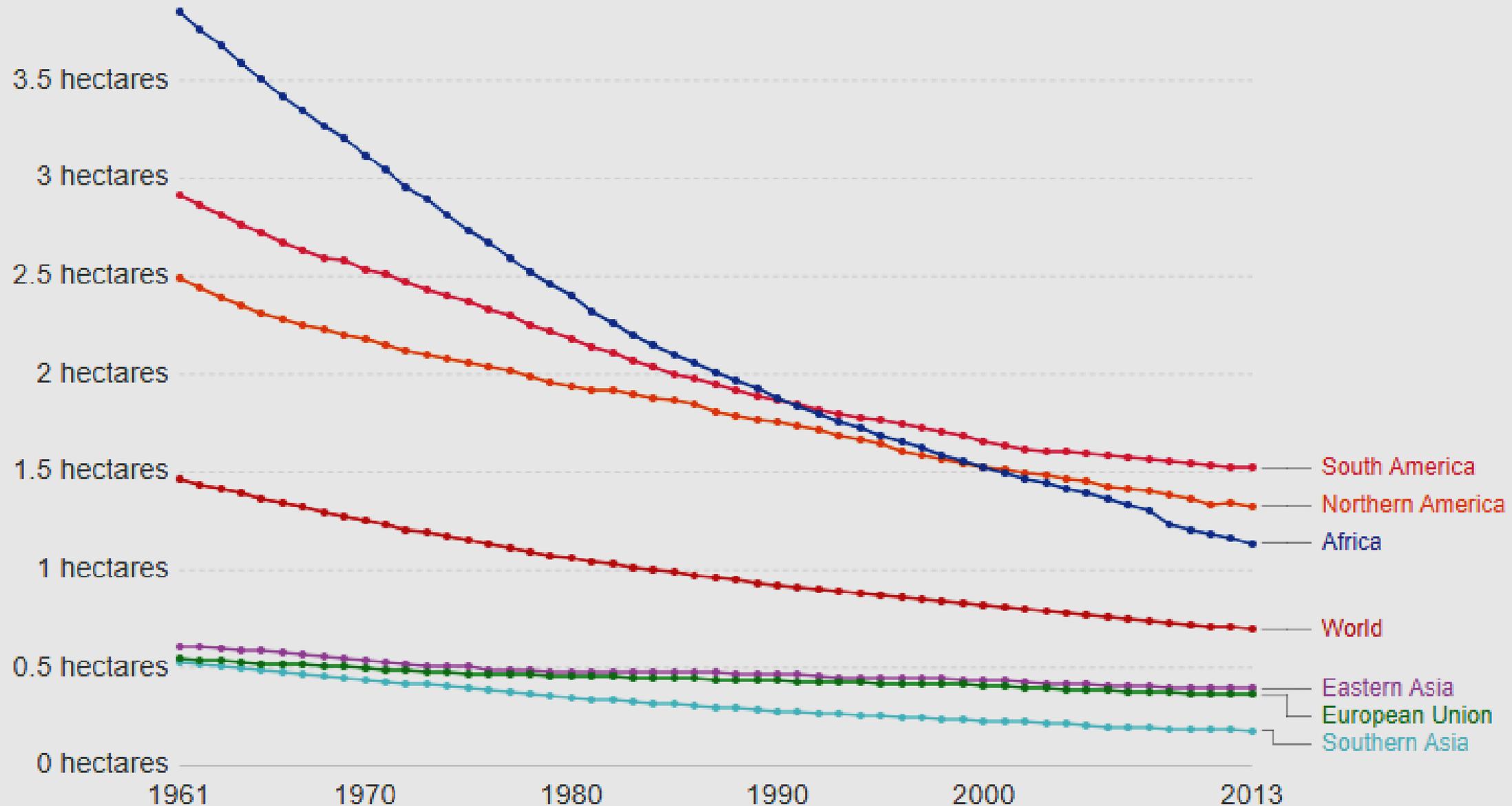
OurWorldInData.org/yields-and-land-use-in-agriculture/ • CC BY-SA



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# Agricultural area per capita

Agricultural land area per capita, measured in hectares per person. The UN Food and Agricultural Organization define 'agricultural area' as the sum of arable land, permanent crops, permanent meadows and pastures.





# Multi y trans disciplina para una agricultura sostenible

POR SU ATENCIÓN, MUCHAS GRACIAS!!!

Yuri Jorge Peña Ramírez

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