

# **SEMINAR ON THE ROLE OF PLANT BREEDING AND PLANT VARIETY PROTECTION IN ENABLING AGRICULTURE TO MITIGATE AND ADAPT TO CLIMATE CHANGE**



## **Report on thematic session 2: Strategies to address climate change in agriculture**

*Mr. Yehan CUI, Vice-President of the Council, UPOV*

## Thematic session 2: Five presentations

### *European Union strategy to address climate change in agriculture*

Mr. Herwig Ranner, Team Leader - Climate change and agriculture, Unit for Sustainable Agriculture, Directorate General for Agriculture and Rural Development (DG AGRI), **European Commission**

### *Climate change: an opportunity for innovation in agriculture*

Mr. Solomon Gyan Ansah, Director of Agriculture & Head of the Seed Unit, Directorate of Crop Services, Ministry of Food and Agriculture, **Ghana**

### *The role of plant breeding for adaptation to climate change in Mexico*

Ms. Sol Ortiz García, General Director of Prospective Policies and Climate Change, Ministry of Agriculture, **Mexico**

### *Mitigation of climate change in agriculture*

Mr. Alexandre Lima Nepomuceno, Researcher, Brazilian Agricultural Research Corporation (EMBRAPA), **Brazil**

### *Adaptation of agriculture/ farming systems to climate change: exploring genetic options*

Mr. George Prah, Deputy Director, Directorate of Crop Services, Ministry of Food and Agriculture, **Ghana**



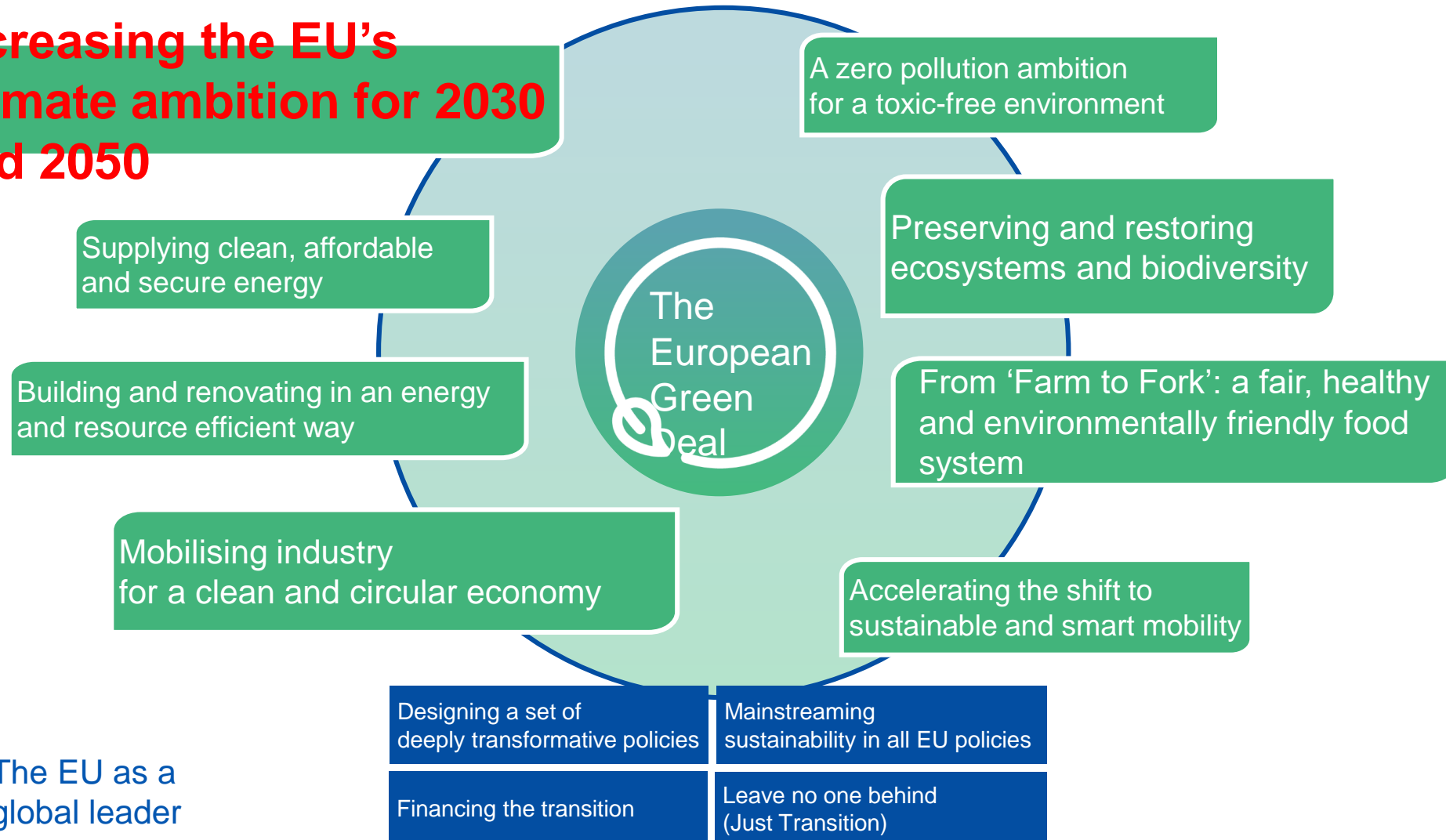
# The EU Strategy to address climate change in Agriculture

Herwig Ranner, DG Agriculture, European Commission

11.10.2022

# The European Green Deal

## Increasing the EU's Climate ambition for 2030 and 2050



The EU as a  
global leader



European Commission

1.134.199 follower

2 giorni • 🌐

Deal on the Climate Law!

The European Climate Law turns our European Green Deal targets into legal obligations:

- 📉 reducing net greenhouse gas emissions by at least 55% by 2030
- 🌍 reaching climate neutrality by 2050

Today's deal between the co-legislators also introduces:

- ✅ a process for setting a 2040 climate target
- ✅ a commitment to negative emissions after 2050
- ✅ the establishment of European Scientific Advisory Board on Climate Change
- ✅ stronger provisions on adaptation to climate change

Climate neutrality will shape the EU's green recovery and a socially just green transition.

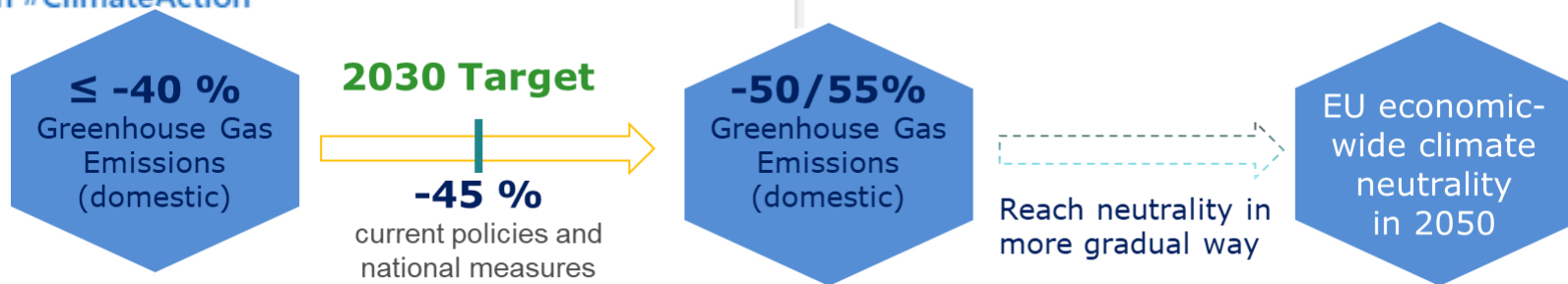
More here → <https://europa.eu/!dn66PW>

#EUGreenDeal #EuropeanUnion #ClimateAction



## 'Fit for 55'

On 14 July 2021, the Commission presented proposals for revision of main pieces of legislations to deliver EU's 2030 Climate Target (-55%) on the way to climate neutrality.



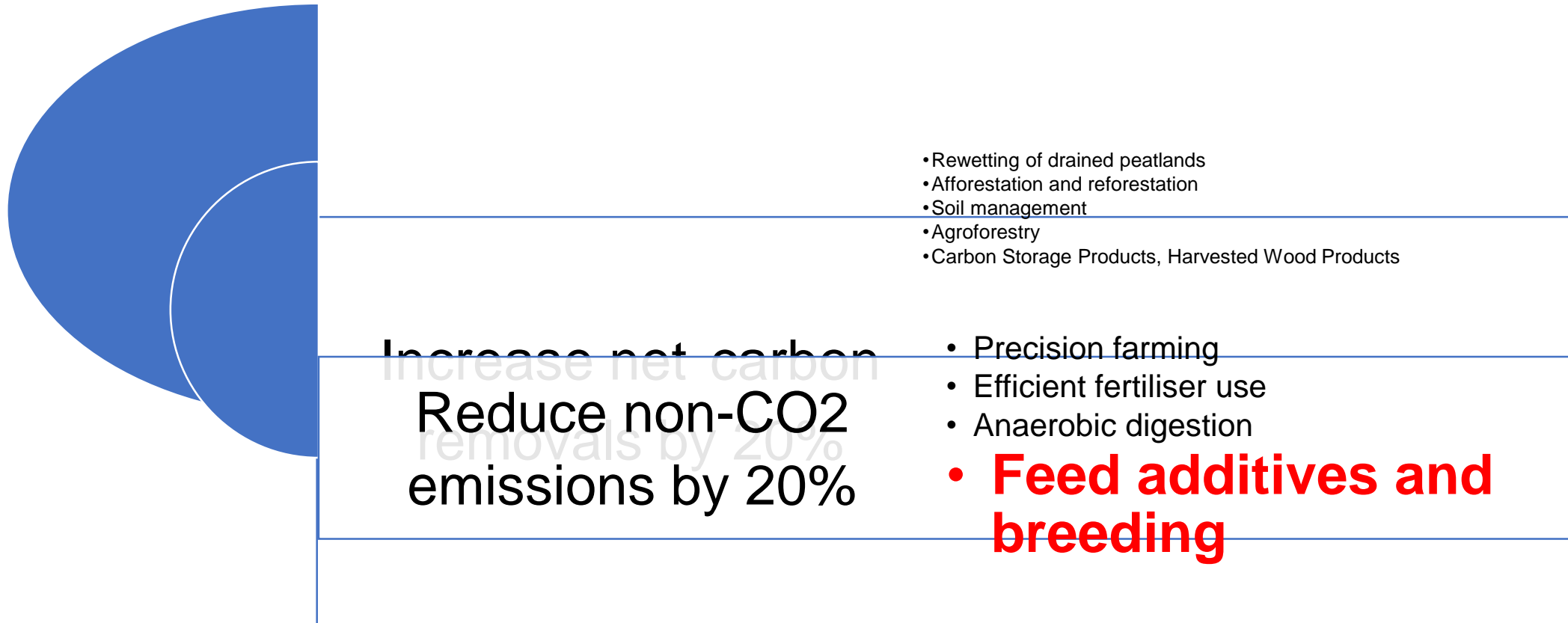
# Climate neutral EU land sector by 2035

Neutrality can be reached by different **combinations** between LULUCF and non-CO2 agricultural mitigation practices.

Different mitigation potentials are related to **carbon price**.

Carbon removals with **NBS** have low mitigation costs (EUR 10 per ton).

For examples, following histosols shows high mitigations already at low carbon price.



# Carbon farming



A **green business model** rewarding land managers for improved land management practices, resulting in carbon sequestration in ecosystems and reducing the release of carbon to the atmosphere.

Dual opportunity for the [redacted]:

- New business around carbon **sequestration** in soils and vegetation
- New value chains offering long-term carbon **storage** in bio-based products

## Benefits of carbon farming:



Increased carbon removals



Additional income for land managers



More biodiversity and nature



Increased climate resilience of farm and forest land



# From **'Farm to Fork'** designing a fair, healthy and environmentally-friendly food system

## Main targets in the Farm to Fork strategy



**The use of pesticides in agriculture** contributes to pollution of soil, water and air. The Commission will take actions to:

- ✓ **reduce by 50%** the use and risk of chemical pesticides by 2030.
- ✓ **reduce by 50%** the use of more hazardous pesticides by 2030.



The **excess of nutrients** in the environment is a major source of air, soil and water pollution, negatively impacting biodiversity and climate. The Commission will act to:

- ✓ **reduce nutrient losses by at least 50%**, while ensuring no deterioration on soil fertility.
- ✓ **reduce fertilizer use by at least 20%** by 2030.



**Antimicrobial resistance** linked to the use of antimicrobials in animal and human health leads to an estimated 33,000 human deaths in the EU each year. The Commission will **reduce by 50% the sales of antimicrobials for farmed animals and in aquaculture by 2030**.



**Organic farming** is an environmentally-friendly practice that needs to be further developed. The Commission will boost the development of EU organic farming area with the aim to achieve **25% of total farmland under organic farming by 2030**.





# CLIMATE CHANGE: AN OPPORTUNITY FOR INNOVATION IN AGRICULTURE.

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**Solomon Gyan Ansah (PhD)**  
**Directorate of Crop Services**  
**Ministry of Food and Agriculture**  
**Accra-Ghana**

*Seminar to explore the role of plant breeding and plant variety protection in enabling agriculture to adapt to, and mitigate, climate change, October 11 and 12 (virtual), October 26, 2022 (hybrid)*



# SOME FOCUS AREAS WHERE INNOVATION IS APPLIED TO **CLIMATE SMART AGRICULTURE**

These include:

- a. Early maturity, drought tolerant, Nitrogen and water use efficient crop varieties
- b. Resistance to existing and new emerging diseases and pests (eg cassava brown streak virus, maize lethal necrotic virus disease, fall army worm etc)
- c. Conservation Agriculture;
- e. Artificial Intelligence
- f. **Meteorological** data to predict rainfall or drought, pest evasion etc
- g. Investment in irrigation and water harvesting structures

Seminar on the role of plant breeding and plant variety  
protection in enabling agriculture to mitigate and adapt  
to climate change

# The role of plant breeding for adaptation to climate change in Mexico

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Sol Ortiz García

General Director of Policies, Prospective and Climate Change

Secretary of Agriculture and Rural Development

Mexico



## AGRICULTURA

SECRETARÍA DE AGRICULTURA Y DESARROLLO RURAL



**2022** *Ricardo Flores*  
Año de *Magón*

PRECURSOR DE LA REVOLUCIÓN MEXICANA



# Public policies to achieve food security



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## Mexico. Sectorial Program for Agriculture and Rural Development 2020-2024

- 1.- Achieve food self-sufficiency by **increasing production and productivity** of agriculture, livestock, and aquaculture-fishing.
- 2.- Contribute to the well-being of the rural population through the **inclusion of historically excluded farmers** in rural and coastal productive activities, taking advantage of the potential of the territories and local markets.
- 3.- **Increase sustainable production practices in the agricultural and aquaculture-fishing sector in the face of agro-climatic risks.**



# Importance of plant breeding



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## Actions to promote plant breeding and seed quality to face climate change



**1**

**Take advantage of existing varieties**

**2**

**Adopt and use new varieties**

**3**

**Generate varieties according to needs**



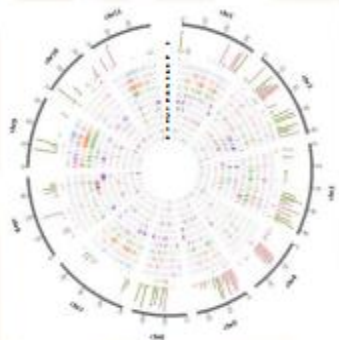
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PRECURSOR DE LA REVOLUCIÓN MEXICANA



# Genomes of Mexican crops



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Genomics to accelerate  
the characterization and  
improvement of  
strategic crops in Mexico

Crop		Genome	
Common name	Species	Size	Status
Agave	<i>Agave tequilana</i>	2.7 Gbp	Finished
Avocado	<i>Persea americana</i>	920 Mbp	Published
Chili*	<i>Capsicum annum</i>	3. 5 Gbp	Published
Beans	<i>Phaseolus vulgaris</i>	590 Mbp	Published
Mexican lime	<i>Citrus aurantifolia</i>	350 Mbp	Finished
Maize	<i>Zea maize</i>	2.3 Gbp	Published
Papaya	<i>Carica papaya</i>	507 Mbp	Finished
Vainilla	<i>Vanilla planifolia</i>	3.2 Gbp	Finished
Blackberry	<i>Rubus ulmifolius</i>	246 Mbp	Finished



**Cinvestav**  
UGA - LANGEBIO



**2022 Flores**  
Año de  
**Magón**  
PRECURSOR DE LA REVOLUCIÓN MEXICANA

\*Not generated by Mexicans



# What else is needed for adaptation to climate change



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- **In situ conservation** of genetically diverse populations to allow evolution to continue and the generation of adaptive traits;
- **Ex situ conservation** to ensure the maintenance of diversity of species, populations and varieties, including those from areas expected to be highly affected by climate change;
- **Diversified farming systems:** management practices that increase diversity tend to increase resilience to the various effects of climate change;
- **Sustainable soil management** practices that also contribute to mitigation;
- Knowledge, coordination, communication, collaboration, connection & commitment (6C).





# “Mitigation of climate change in agriculture”

*ALEXANDRE NEPOMUCENO, Ph.D.  
Embrapa Soybean General Head*

*Brazilian Agricultural Research Corporation*

**Embrapa**

**Embrapa**

49 anos

MINISTÉRIO DA  
AGRICULTURA, PECUÁRIA  
E ABASTECIMENTO





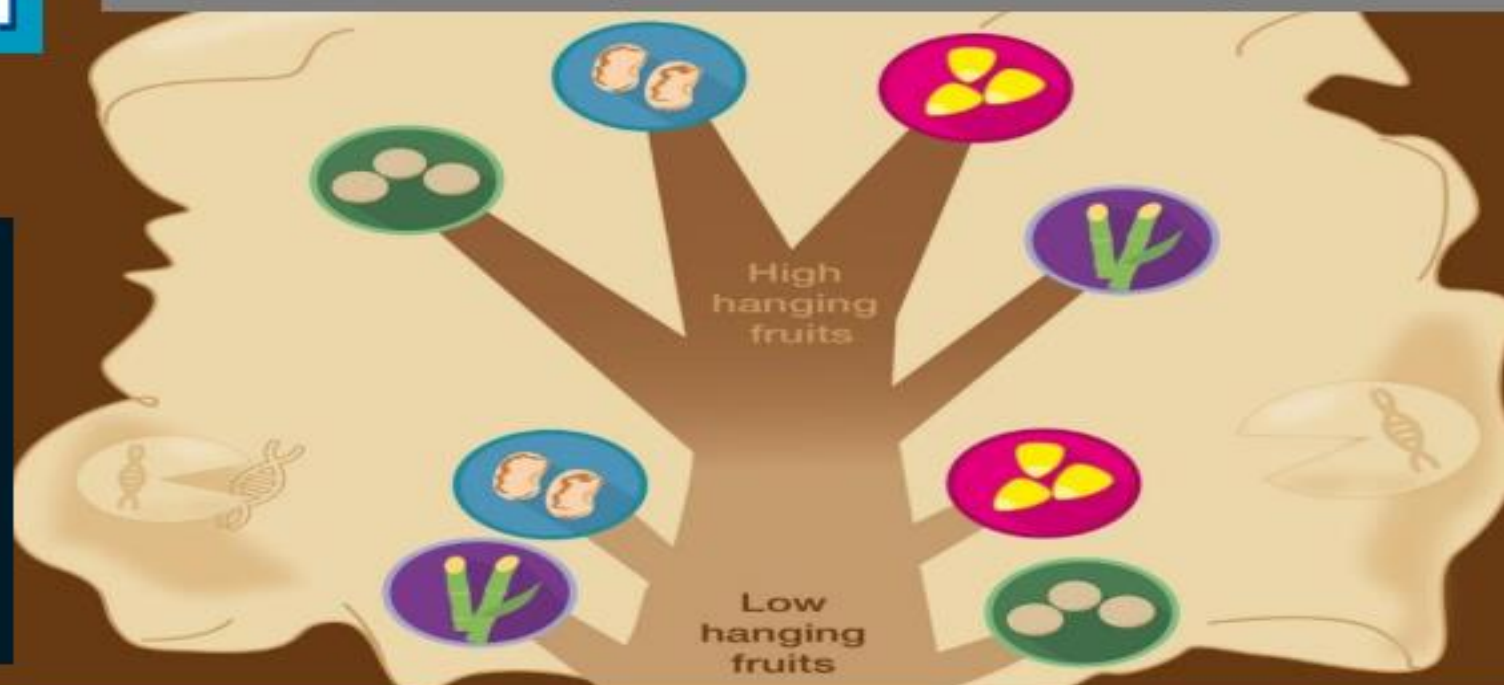
**How to deal with this  
Challenge?**



# CRISPRevolution

## Four Crops and Two Strategies

Leading project  
on Genome  
Edition at  
EMBRAPA



### Knock-out (SDN1)

**Soybean:** Anti-nutritional Factors/Drought  
**Sugarcane:** Cell wall structure (2G Ethanol)  
**Corn:** Cell wall structure (2G Ethanol)  
**Common Bean:** Tegument Color

### HDR (SDN2)

**Soybean:** Drought  
**Sugarcane:** Drought  
**Corn:** Drought  
**Common Bean:** Drought

Geneticamente editada para aumento da digestibilidade da biomassa

Geneticamente editado para aumento da digestibilidade da biomassa



MINISTRY  
OF  
FOOD AND AGRICULTURE

**GEORGE PRAH**  
DEPUTY DIRECTOR, DIRECTORATE OF CROP  
SERVICES

**Adaptation of agriculture/  
farming systems to climate  
change: *exploring genetic  
options***

MINISTRY  
OF  
FOOD AND AGRICULT

# Developing the appropriate strategies 1

**The adaptation of agriculture or making agriculture resilient to climate change requires the implementation of a myriad of complementary strategies:**

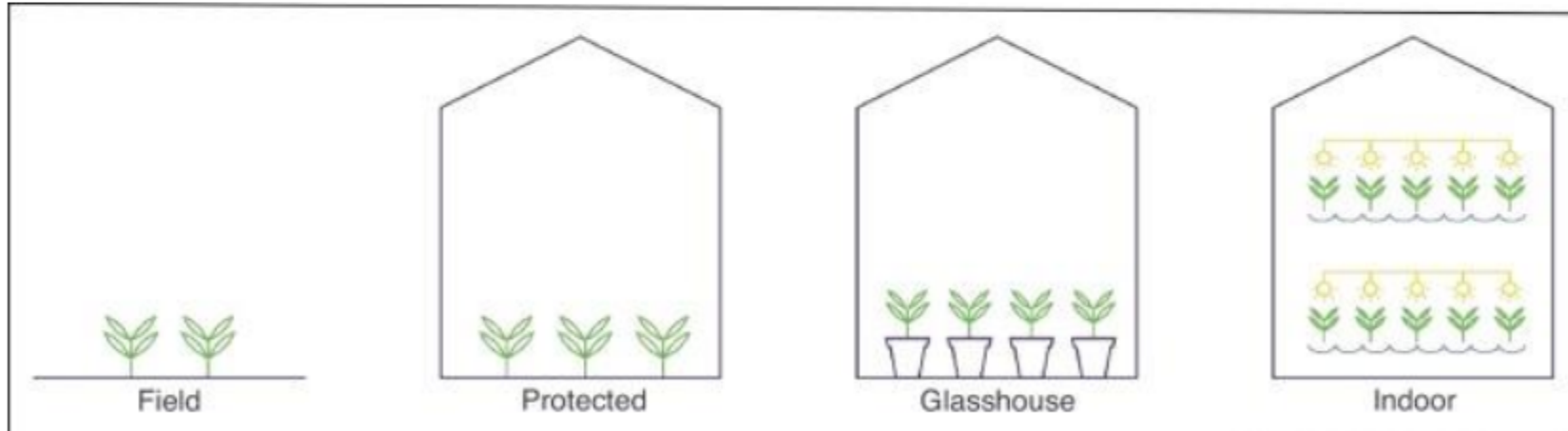
- ❑ moving agriculture to new locations to follow environmental change
- ❑ adopting protected agriculture by partially or completely controlling the environment.
- ❑ Utilizing environments hitherto classified as not useful for agriculture to mitigate climate change effects
- <sup>6</sup> ❑ Developing new agronomic packages for crops to mitigate climate change effects



## Developing the appropriate strategies 2



Manipulating production/agronomic systems



7

Source: Current Opinion in Plant Biology, 2020

## **Developing the appropriate strategies 3**

- Utilization of underutilized crop species to be able to contribute to climate adaptation and mitigation
- Domestication of new species and the improvement of existing ones to adapt to climate change effects
- Extensive use of wild relatives of crops capturing much more of the available climate smart plant biodiversity into elite genotypes.
- Strengthening gene banks to preserve important genotypes for future utilization
- Accessing UPOV PLUTO database to support breeding

**Genetic  
option**

# Genetic improvement technology



**Traditional Crop Modification**

*selective breeding and hybridization*



**Genetic Engineering**

*High yielding, pests and diseases control, manipulation of genome for improved varieties, including farmer preferred traits (PVS, PVB)*



**Genome Editing**

*Removal of genes responsible for deleterious traits affecting storage  
Nutrient uptake*

# Brief summary

- Strategies to mitigate the climate change in agriculture:

- reducing CO<sub>2</sub> and Non-CO<sub>2</sub> emission by enhancing climate resilience of agroecosystems towards green development, such as reduce use of pesticide, fertilizer improve soil quality etc.

- rewarding managers for improved farmland management practices, resulting in carbon sequestration in ecosystems.

- Strategies to adapt to climate change in agriculture:

- improving crop variety traits adapting to climate change by conservation of plant species, by using breeding technology such as traditional breeding and hybridization, genetic engineering and genome editing, etc.

- enhancing food production system adapted to climate change, such as investment in farmland construction, smart agriculture, technology innovation, etc.



# **THANK YOU FOR YOUR ATTENTION!**

## **CLIMATE CHANGE ADAPTATION FOR FOOD SECURITY**

**IMPROVE SOIL  
HEALTH & MANAGE  
EROSION**

**OPTIMISE  
IRRIGATION**

**SWITCH TO PLANT  
VARIETIES TOLERANT  
TO HEAT, DROUGHT &  
FLOODING**

**PRESERVE  
BIODIVERSITY**

**MIXED CROP AND  
LIVESTOCK  
FARMING**