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

- Mobilising industry for a clean and circular economy
- Building and renovating in an energy and resource efficient way
- Supplying clean, affordable and secure energy

A zero pollution ambition for a toxic-free environment

Preserving and restoring ecosystems and biodiversity

From ‘Farm to Fork’: a fair, healthy and environmentally friendly food system

Accelerating the shift to sustainable and smart mobility

The EU as a global leader

Designing a set of deeply transformative policies
Mainstreaming sustainability in all EU policies
Financing the transition
Leave no one behind (Just Transition)
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/1dn66PW

#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.
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, fallowing histosols shows high mitigations already at low carbon price.

<table>
<thead>
<tr>
<th>Increase net carbon removals by 20%</th>
<th>Reduce non-CO2 emissions by 20%</th>
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</thead>
<tbody>
<tr>
<td>• Rewetting of drained peatlands</td>
<td>• Precision farming</td>
</tr>
<tr>
<td>• Aforestation and reforestation</td>
<td>• Efficient fertiliser use</td>
</tr>
<tr>
<td>• Soil management</td>
<td>• Anaerobic digestion</td>
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<tr>
<td>• Agroforestry</td>
<td>• Feed additives and breeding</td>
</tr>
<tr>
<td>• Carbon Storage Products, Harvested Wood Products</td>
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</table>
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.

**Benefits of carbon farming:**

- Increased carbon removals
- Additional income for land managers
- More biodiversity and nature
- Increased climate resilience of farm and forest land

**Dual opportunity for the agricultural sector:**

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

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

Sol Ortiz García
General Director of Policies, Prospective and Climate Change
Secretary of Agriculture and Rural Development
Mexico
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

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
Genomes of Mexican crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Species</th>
<th>Size</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave</td>
<td>Agave tequilana</td>
<td>2.7 Gbp</td>
<td>Finished</td>
</tr>
<tr>
<td>Avocado</td>
<td>Persea americana</td>
<td>920 Mbp</td>
<td>Published</td>
</tr>
<tr>
<td>Chili*</td>
<td>Capsicum annum</td>
<td>3.5 Gbp</td>
<td>Published</td>
</tr>
<tr>
<td>Beans</td>
<td>Phaseolus vulgaris</td>
<td>590 Mbp</td>
<td>Published</td>
</tr>
<tr>
<td>Mexican lime</td>
<td>Citrus aurantifolia</td>
<td>350 Mbp</td>
<td>Finished</td>
</tr>
<tr>
<td>Maize</td>
<td>Zea maize</td>
<td>2.3 Gbp</td>
<td>Published</td>
</tr>
<tr>
<td>Papaya</td>
<td>Carica papaya</td>
<td>507 Mbp</td>
<td>Finished</td>
</tr>
<tr>
<td>Vainilla</td>
<td>Vanilla planifolia</td>
<td>3.2 Gbp</td>
<td>Finished</td>
</tr>
<tr>
<td>Blackberry</td>
<td>Rubus ulmifolius</td>
<td>246 Mbp</td>
<td>Finished</td>
</tr>
</tbody>
</table>

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

*Not generated by Mexicans
What else is needed for adaptation to climate change

- **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
How to deal with this Challenge?
CRISPRevolution

Leading project on Genome Edition at EMBRAPA

Four Crops and Two Strategies

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

Plantas de importância econômica com genoma editado pela tecnologia CRISPR visando melhoria da qualidade nutricional e industrial e tolerância a estresse hídrico.
Adaptation of agriculture/farming systems to climate change: exploring genetic options
Developing the appropriate strategies

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
- Developing new agronomic packages for crops to mitigate climate change effects
Developing the appropriate strategies 2

Manipulating production/agronomic systems

Source: Current Opinion in Plant Biology, 2020
Developing the appropriate strategies

- 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 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 CO2 and Non-CO2 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 engenering 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