

International Virtual Experts Meeting on Promoting Sustainable Agriculture Development in Drylands

Riyadh, Kingdom of Saudi Arabia 10th August 2020



# Genome editing for drought tolerance and crop production sustainability

Dr. Sergio Feingold INTA - Argentina

feingold.sergio@inta.gob.ar





Ministerio de Agricultura, Ganadería y Pesca **Presidencia de la Nación** 



(DTN photo by Pamela Smith)

#### Long-term cereal yields in the United Kingdom, 1270 to 2014

Average agricultural yields in key crops in the United Kingdom from 1270-2014, measured in tonnes per hectare.

Our World in Data



#### Average corn yields in the United States, 1866-2014, 1866 to 2014

Our World in Data

Average corn (maize) yields in the United States, measured in tonnes per hectare.



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



# 80

### 8000- 10000 BCE







# **Genome Editing**



# Genome Editing happens within a cell.



### Which is the target gene?

Drought tolerance: adaptation to water shortage during crop cycle

**Avoid stress** 

Reduced crop cycle

**Cope with stress** 

Transpiration control wax cuticules, stomata

#### Ignore stress

Altering drought signals (hormones)

Root architecture Access to more water Water use efficiency

Delayed senescence Stay-green



Photo: /www.pbs.org/newshour/science/



Santosh Kumar et al., 2020 Physiol. Molecular Biology of Plants 26:1099–1110



Crop genome sequencing and its application Bolger et al. 2014 Current Opinion in Biotechnology, 26:31–37



Martignago et al., 2020 Front. Plant Sci., 10 . DOI=10.3389/fpls.2019.01676



# Genome Editing is not regulated as a GMO in certain countries

most of South and North America, Australia, Japan, Vietnam and S. Africa, among others

Genome Editing is considered under the GMO regulation in others

European countries, most of Africa, most of Asia.

## One prototype of a COVID-19 vaccine



# TRANSGENIC VIRUS

#### Cumulative confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.





#### Number of people who are severely food insecure, 2015 to 2017



Food insecurity is defined by the Food Insecurity Experience Scale (FIES). Severe food insecurity is more strongly related to insufficient quantity of food (energy) and therefore strongly related to undernourishment or hunger.

		World
600 million	•	
500 million		
400 million		
300 million	•	Asia Asia Sub-Saharan Africa
200 million	•	
100 million		
2015	2016	South America Northern Africa Europe and Northern America 2017

Source: UN Food and Agriculture Organization (FAO)

OurWorldInData.org/hunger-and-undernourishment • CC BY



International Virtual Experts Meeting on Promoting Sustainable Agriculture Development in Drylands

Riyadh, Kingdom of Saudi Arabia 10th August 2020



# Thank you for your attention

feingold.sergio@inta.gob.ar





Ministerio de Agricultura, Ganadería y Pesca **Presidencia de la Nación**