# Some key biofortified crop research projects

# SPAIN

A GM maize high in provitamin A, vitamin C and folate was developed by the University of Lleida. It is called "Carolight" and involves 36 patents. Already approved for commercial use in Spain, it is meant to be handed over to India and South Africa for dissemination and use.

# **MEXICO**

A GM maize high in lysine, an amino acid meant for use as animal feed has been released by Monsanto (now Bayer) in Mexico, Japan, Canada and the United States.

### BRAZIL

Brazilian Agricultural Research Corporation (Embrapa) and Pepsico launched a strategic partnership in 2011 to develop biofortified maize, sweet potato and cassava.

### NIGER

Africa's first biofortified iron pearl millet was released in the birthplace of millet in 2018.

## INDIA

- ICRISAT developed a pearl millet high in iron and zinc, called "Dhanshakti", based on a peasant variety found in Northern Togo. It was the first biofortified crop to be officially released in India in 2013. ICRISAT released an iron and zinc sorghum in July 2018.

- A GM mustard developed by the University of Delhi is close to being tested, but facing widespread resistance. There is talk of developing it further into a biofortified version, high in provitamin A.

- The National Agri-Food Biotechnology Institute is developing a GM banana high in provitamin A.

# BANGLADESH

- Bangladesh Rice Research Institute has developed and released zinc rice with help from HarvestPlus, IRRI and others.

- GM rice high in provitamin A ("golden rice") developed by IRRI has been submitted for biosafety tests and is expected to be released in 2019 or 2020.

#### NIGERIA

- A sweet potato high in provitamin A has been released and widely adopted.

- African Harvest, DuPont, the Gates Foundation and others have partnered to develop a GM sorghum high in provitamin A aimed at Burkina Faso, Kenya and Nigeria. Confined field tests are ongoing in Nigeria.

- The VIRCA Plus programme is developing a GM cassava high in iron and zinc. It is targeted for release in Nigeria, Uganda and Kenya.

# ZAMBIA

- Biofortified zinc maize is being developed for Zambia by HarvestPlus in collaboration with the International Maize and Wheat Improvement Centre and some US universities.

- Biofortified maize high in provitamin A has already been released while cassava high in provitamin A is under development.

# UGANDA

A GM banana high in provitamin A is under development with support from the Bill and Melinda Gates Foundation. Feeding trials were held in 2016 in the United States and Uganda, while field trials are ongoing in Australia and Uganda. Release is planned for 2021.

# INDONESIA

- HarvestPlus and Development Finance International Inc jointly released a rice high in zinc and iron in December 2018 with aim of preventing cognitive deficiencies and stunting in children.

- GM rice high in provitamin A ("golden rice"), developed by IRRI, is slated for release in 2021 or 2022.



# PHILIPPINES

- The hugely contested GM rice high in provitamin A ("golden rice"), developed by IRRI, is planned for release in 2020 or 2021.

- A GM rice high in iron and zinc developed by IRRI based on the popular "IR64" rice in collaboration with the International Centre for Tropical Agriculture. It was tested in Colombia and the Philippines in 2016.



- Confined field tests of GM sorghum high in provitamin A have already been carried out in the United States, Kenya and Nigeria. Release is slated for 2019 in Kenya.

- GM cassava rich in iron and zinc is being developed through Bayer- and Gates Foundation-affiliated organisations. Confined field tests have been carried out in Puerto Rico and release in Kenya is slated for 2020 or 2021.