Breeding vitamin D-fortified Tomato using NGTs

The **EU Green Deal aims** to increase the sustainability of EU agri-food systems and public health.
Food and **nutritional security** are of paramount importance to ensure **social sustainability** in line with **environmental and economic**.

Plant breeding is at the basis of our agri-food systems and is solely responsible for **~66%** of production gains over the past two decades[1].

Scientific and technological advances enabling **faster, more precise, and more efficient plant breeding** must be leveraged to both maintain food and nutritional security and improve public health.

For more information on plant breeding, see our factsheet "Plant Breeding is the Basis of our Food Systems".

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Tomato (Solanum lycopersicon)

Tomato is among the **world's largest and fastest growing vegetable crops**, with global tomato production currently around **180 million** tons over 5 million ha[4].
Leading producers are **China, India, Turkey** and the **US**. In Europe **Italy** and **Spain** are the main producers and in the top 10 producers globally[4].

Vitamin D deficiency: a global health problem

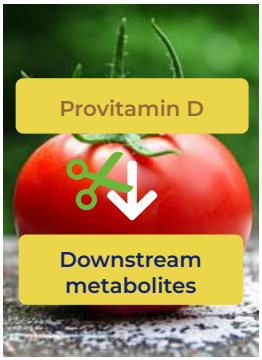
Vitamin D deficiency is associated with multiple health risks, including cancer, cardiovascular diseases and depression[5].
Uptake of vitamin D occurs through exposure of the skin to sunlight or from dietary sources.

About **40%** of Europeans are vitamin D deficient and up to **13% are severely deficient**[6].

Vitamin D - fortified tomatoes

Like most fruit and vegetables, tomatoes contain low concentrations of vitamin D.
Using targeted mutagenesis, researchers have developed a tomato that accumulates provitamin D (the precursor of vitamin D) in the fruit and leaves[6].

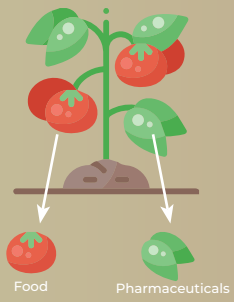
Vitamin D – fortified tomatoes can provide a new dietary source of vitamin D, while the leaves can be used to create vitamin D supplements.



Breeding for vitamin D - fortified tomato

New genomic techniques

Targeted mutagenesis using genome editing can be performed directly in most commercial varieties, reducing the breeding time to 2-3 years



Conventional breeding

Obtaining the donor tomato plant using classical mutagenesis would take 3-4 years and be very resource intensive

The donor plant would be used to introduce the mutations to commercial varieties, which would take an additional 4-5 years.

Obtaining a similar tomato using conventional mutagenesis and classical breeding would require many years and extensive resources.

NGTs offer a much **faster** and **predictable** outcome, that is l**ess resource intensive** and can **meet societal needs**.

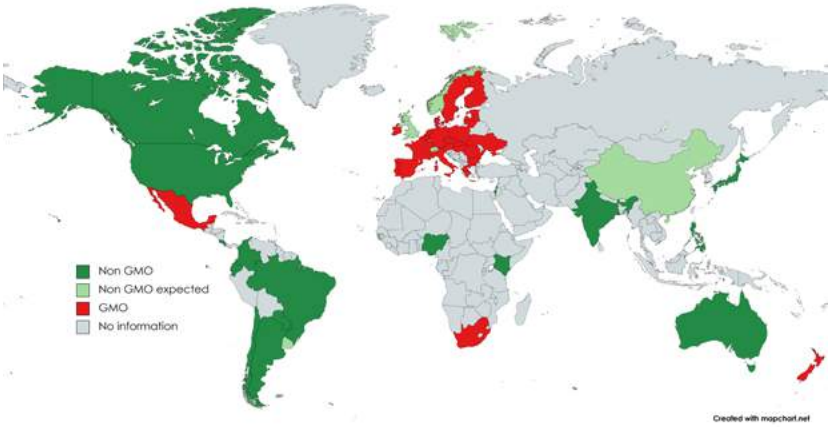
Expected impacts

Consumption of one **vitamin D - fortified tomato** is expected to provide about **30% of the recommended daily intake**[5], thereby contributing to consumer and societal health.
The leaves of **vitamin D - fortified tomato**, can be used to extract vitamin D for vitamin D supplements, thereby providing an **additional source of income for farmers** and contributing to **better circularity**.

Vitamin D - fortified tomato can contribute to the socio-economic sustainability goals of the **EU Green Deal and the UN SDGs**:

How are NGTs being regulated worldwide?

By regulating NGTs as GMO, the EU is hindering their contribution to the EU Green Deal and UN SDGs. As non-EU countries are embracing these technologies, the EU is getting left behind, at the expense of the agri-food stakeholders, particularly farmers, SMEs and consumers.



Plants for the Future calls on EU policymakers to exclude plants developed using NGTs (targeted mutagenesis or cisgenesis) from the scope of the GMO directive, so that they may contribute to the transition towards more sustainable food systems.

About us
Plants for the Future (Plant ETP) is a multistakeholder platform representing the plant sector, with members for academia, industry and the farming community. Plant ETP considers the challenges and opportunities of agricultural value chains and develops a vision for future food systems.
For more information see our website: www.plantetp.eu.
Contact secretariat@plantetp.eu

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References
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4. FAO (2022)
5. Li et al., (2022)
6. Amrein et al., (2020)

Check out our other factsheets here!