

BREEDING – NEW TECHNIQUES AND APPLICATIONS

THE NEW APPROACH TO PRIMARY FOOD PRODUCTION AND DISTRIBUTION

FOOD 2030: NUTRITION, CLIMATE



Since the domestication of animals and plants in the Neolithic era, the human race has made efforts to breed new varieties. This can be achieved by traditional selective breeding or by new genome techniques like genetic modification, or by modern new breeding techniques, which allow a faster breeding process.

SPECIFIC RESEARCH AND INNOVATION (R&I) BREAKTHROUGH TOPICS

New varieties of animals and plants: Traditional selective breeding is the process by which humans select specific parent animal or plant individuals to improve particular beneficial characteristics (phenotypes). By improving generations of those specific traits, humanity has achieved the existing species of today. This is a never-ending process, which provides new specifications.

New genetic methodologies and applications: The artificial engineering of the genome of organisms, traditionally known as Genetically Modified Organisms (GMOs), allows the creation of new species by introducing external genome sequences into known species, replacing, or cutting out sequences, thus leading to positive specific characteristics. Modern new breeding techniques (some known as CRISPR-Cas Technology) are not producing what is considered GMOs, instead it allows the introduction of genetic material already existing in the same plant species, allowing for faster selective breeding than would be possible traditionally.

EXPECTED IMPACT

Breeding techniques for animals and plants create species with new characteristics that are beneficial for humans. In the case of plants, varieties with increased drought resistance, higher resilience, pest-resistance, and

less fertiliser dependency can be produced faster and more efficiently. Some further examples are varieties with increased photosynthesis or seeds and leaves with a modified coating to provide higher resistance to dryer climates. In the case of animals, faster production rates can be obtained in certain species. Overall, it helps tackle great challenges such as climate change and food and nutrition security, or less use of pesticides in plants and antibiotics in animals.

MARKET OPPORTUNITIES / CHALLENGES

- Investments and technology are ready for multiple applications.
- Traditional selective breeding is very time consuming, new genetic methodologies allow for a faster and more reliable process.
- The efficiency and resilience of new plant and animal breeds have to compensate for the possible costs of development and market insertion.
- There is controversy within the scientific community related to the environmental impact of new breeding techniques, mainly in the area of biodiversity and insect displacement.
- Legislation and consumer acceptance might be a barrier for many of the GMO and NPBT applications, affecting labelling issues and detection methods.

EXAMPLE REFERENCES

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Borlaug N.E. (2000) Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry. Plant physiology 124(2), 487-490.

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ASSOCIATED TRENDS IN FIT4FOOD2030 (URL)

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|---------------------------------|------------------------------------|
| ○ Climate change | ○ Novel foods |
| ○ Malnutrition | ○ Biodiversity loss |
| ○ Scarcity of natural resources | ○ Transboundary pests and diseases |
| ○ Agricultural pollution | ○ Genome engineering |
| ○ Engaged consumers | ○ Bio-fortification |
| ○ Back to nature | |

ASSOCIATED CASES IN FIT4FOOD2030 (URL)

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| ○ Goodberry | ○ EggXYt |
| ○ HealthyMinorCereals | ○ Calxyt |
| ○ Fishboost | |