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The New Paradigm II

Agricultural Biotechnology

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we're working for **the future of food**

Kök Projekt is an agri-food startup accelerator and an innovation partner for **the food, agriculture and water sector companies**.

We work together with companies, NGO's and governmental organizations to establish interfaces for entrepreneurs to reach beyond their potential.

food agri water energy

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we work through **the food value chain**


producers of production inputs


farmers & growers


processors & traders


retailers


consumers

Agricultural Biotechnology

What is Agricultural Biotechnology?

Definition

- The Convention on Biological Diversity (CBD) defines biotechnology as; “any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products for specific use” (Secretariat of the Convention on Biological Diversity, 1992).

- Biotechnology can be applied to all classes of organism-from viruses and bacteria to plants and animals- and it is becoming a component of modern medicine, agriculture and industry.

- The FAO Glossary Of Biotechnology defines biotechnology “a range of different molecular technologies such as gene manipulation and gene transfer, DNA typing and cloning of plants and animals” (FAO, 2001). (UN, What is agricultural biotechnology)

What is Agricultural Biotechnology?

Biotechnology Use In Agriculture I

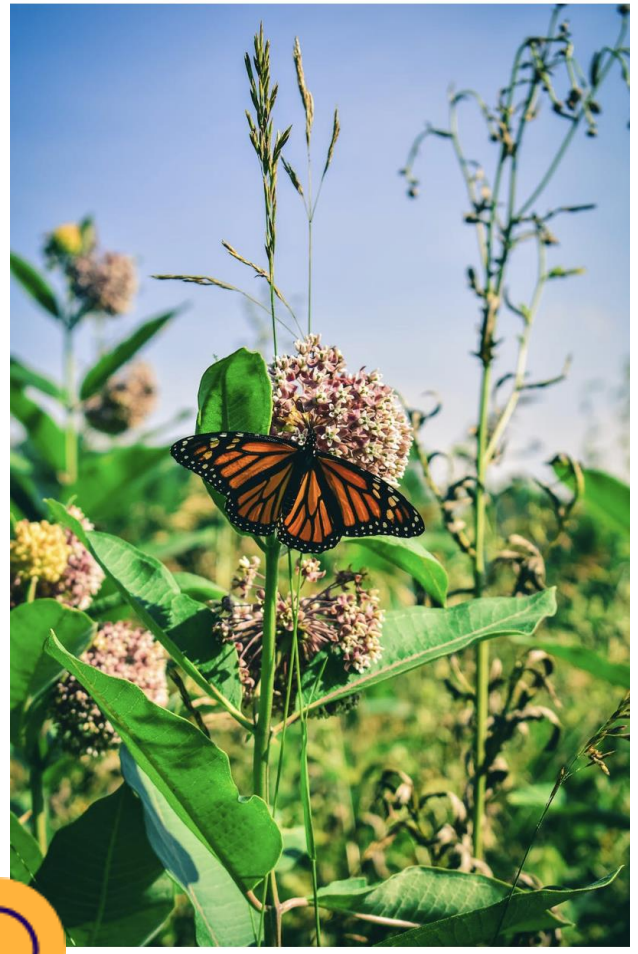
- Since agriculture was first developed more than ten thousand years ago, farmers have manipulated the genetic composition of plants and animals.

- Agricultural biotechnology is a collection of scientific techniques used to improve plants, animals, and microorganisms. Scientists have created methods to boost agricultural productivity based on their understanding of DNA. Improvements made feasible by biotechnology are not possible through the simple traditional crossing of related species. It is a broad category involving many different types of technology and science. (Cornell)

What is Agricultural Biotechnology?

Biotechnology Use In Agriculture II

- Similar to early farmers, current breeders try to create superior crops or animals.
- Agricultural biotechnologies may have low-tech approaches such as artificial insemination, fermentation techniques, and biofertilizers, or high-tech approaches and advanced DNA-based methods, such as genetically modified organisms. (FAO)
- Biotechnology-derived vaccines are also used in livestock. For example, the vaccine against hemorrhagic septicemia, a major source of death for both cattle and water buffalo, has been created using biotechnology. (Cornell)



Agricultural Technology Timeline

Technology	Era	Genetic Interventions
Traditional	About 10 000 Years BC	Civilizations harvested from natural biological diversity, domesticated crops and animals, began to select plant materials for propagation and animals for breeding
	About 3 000 Years BC	Beer brewing, cheese making and wine fermentation
	Late nineteenth century	Identification of principles of inheritance by Gregor Mendel in 1865, laying the foundation for classical breeding methods
Conventional	1930s	Development of commercial hybrid crops
	1940s to 1960s	Use of mutagenesis, tissue culture, plant regeneration. Discovery of transformation and transduction. Discovery by Watson and Crick of the structure of DNA in 1953. Identification of genes that detach and move.
	1970s	Advent of gene transfer through recombinant DNA techniques. Use of embryo rescue and protoplast fusion in plant breeding and artificial insemination in animal reproduction
	1980s	Insulin as first commercial product from gene transfer. Tissue culture for mass propagation in plants and embryo transfer in animal production
Modern	1990s	Extensive genetic fingerprinting of a wide range organisms. First field trials of genetically engineered plant varities in 1990 followed by the first commercial release in 1992. Genetically engineered vaccines and hormones and cloning of animals.
	2000s	Bioinformatics, genomics, proteomics, metabolomics

Source: Adapted from, UN, The State of Food & Agriculture 2003-2004, p.10 https://www.un-ilibrary.org/content/books/9789210473767s006-c002/read

Why Agricultural Biotechnology ?

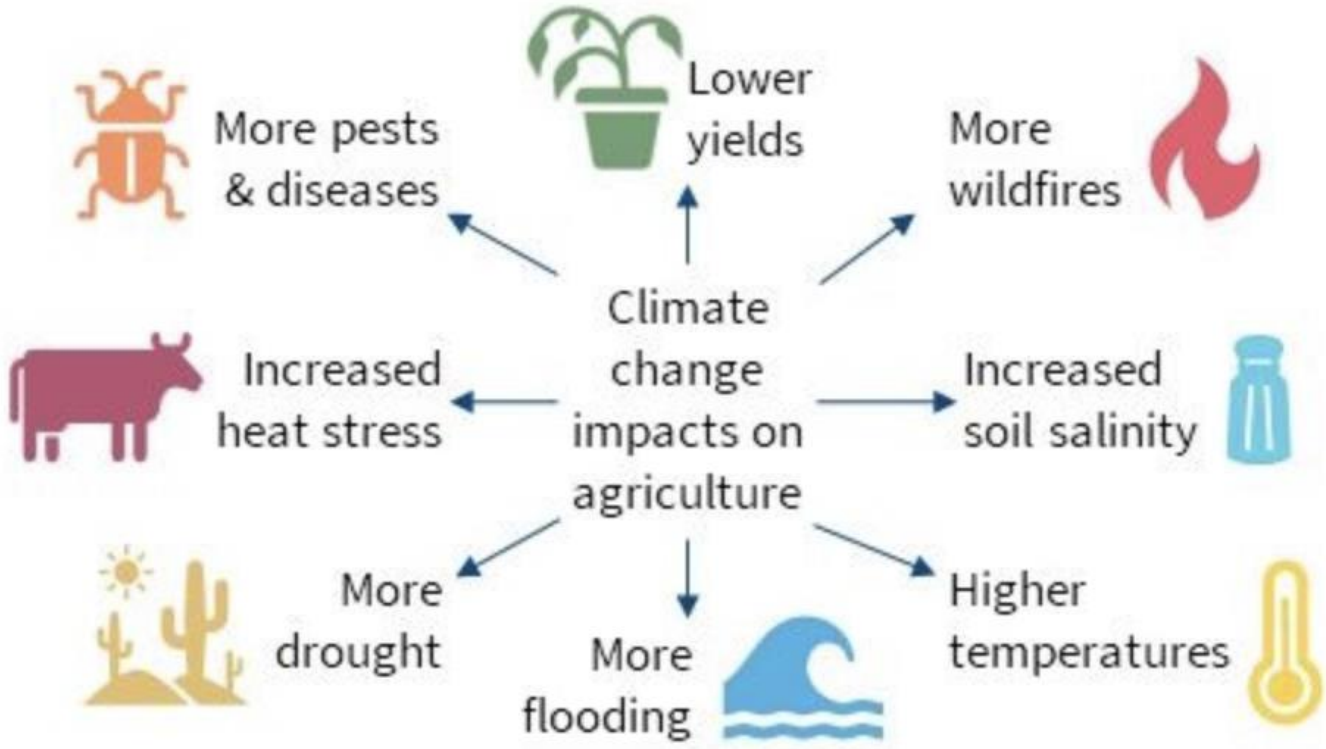
Why Agricultural Biotechnology?

Challenges of Our Food System

- A business-as-usual strategy will not be sufficient to provide food sustainably for an additional 2 billion people by 2050.
- This is especially true given the threat posed by climate change and other factors, such as forestry and fisheries, to natural resources like biodiversity, land, and water that are necessary for food production and agriculture.
- Science, the use of biotechnologies, and traditional technologies will all be crucial in overcoming these obstacles. (FAO, Biotechnology)

Why Agricultural Biotechnology?

Climate Change Impacts on Ariculture



Source: USDA, https://www.usda.gov/topics/biotechnology/climate-change

Agricultural Biotechnology

Advantages

- Agricultural biotechnology has the potential to be a crucial instrument for tackling the causes and effects of climate change as well as for attaining significant societal objectives including lowering poverty, enhancing global food security, and minimizing the negative environmental effects of agriculture. (USDA)

- Biotechnology can help to increase crop yields, reduce the need for pesticides, make crops more resistant to droughts, and pests, and help to conserve water. (Agrihunt)

Statement on Biotechnology

> FAO recognizes that when appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding and increasingly urbanized population.

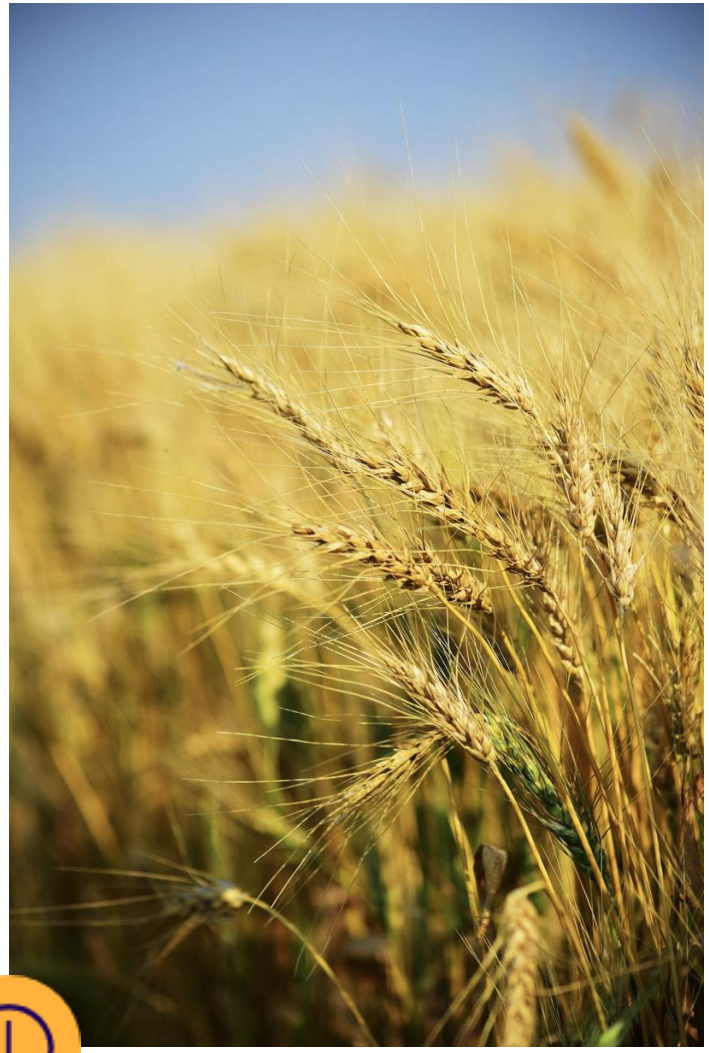
Source: FAO, Statement on Biotechnology, 2000 https://www.fao.org/biotech/fao-statement-on-biotechnology/en/

Examples I

Protecting and Enriching Crops

- Saving Papayas: Agricultural biotechnology has been used to protect crops from devastating diseases. The Hawaiian papaya industry was in danger of failing because of the papaya ringspot virus until genetic engineering enabled the development of disease-resistant papayas.(USDA)

- Enriching crops: Biotech crops may provide enhanced quality features such as increased levels of beta carotene in rice to assist in vitamin A deficiencies and improved oil compositions in canola, soybean, and corn. (USDA)



Examples II

Drought Tolerant Corn

- Drought Tolerant Corn: Between 2011 and 2013, Drought Tolerant corn varieties were made accessible to American farmers. Private seed companies have used either conventional (non-GE) or genetic engineering (GE) techniques to develop seeds, which are two very distinct approaches. The insertion of a gene from the soil bacterium Bacillus subtilis into the plant is the basis for GE drought resistance. A protein that helps lessen the negative impacts of drought is activated by this gene. Contrarily, molecular breeding study has primarily contributed to non-GE drought tolerance. Although the corn plants themselves are conventionally bred, this form of study employs genetic analysis and extensive computer modeling to predict corn varieties optimized for drought.

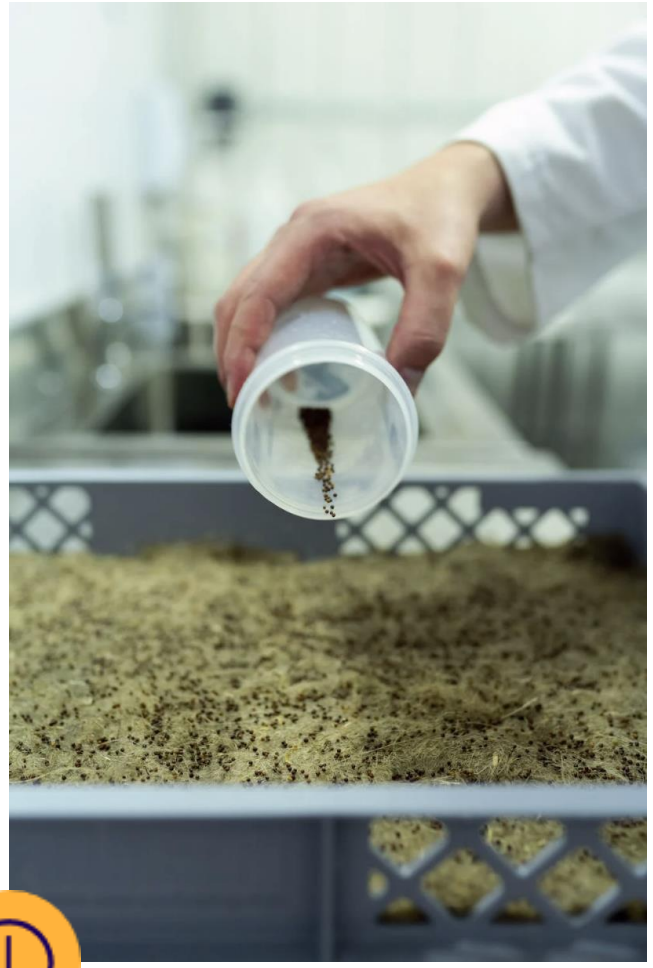
- Regardless of development technique, drought tolerant varieties are designed to help check the plant's natural tendency to divert energy from reproduction to survival in droughts. (USDA)

Agricultural Biotechnology

Disadvantages

- In order to increase food productivity, the commercialization of biotechnology has intensified the quest for new biological resources. Despite the fact that biotechnology has benefited humanity, some people argue that negative effects have also been brought about by its use.

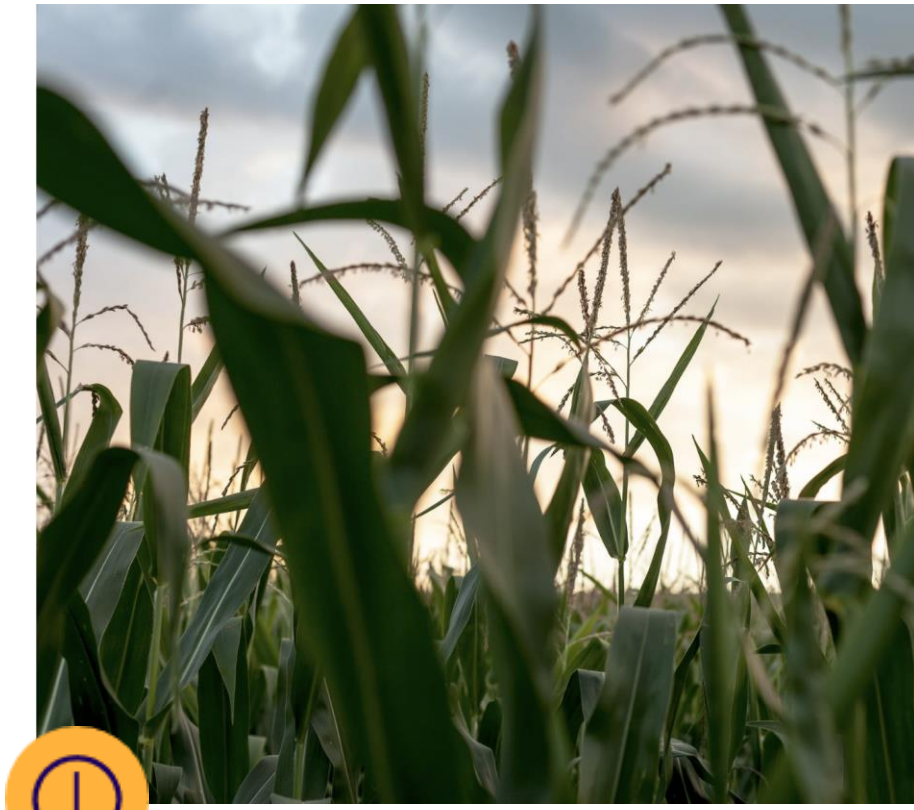
- Opponents argue that first of all, it may have negative impacts on environment, biotechnology can threaten survival of some species and cause monoculture. Second, it may impact human health in a negative way. Finally, it may create new strains of diseases.



Impact of Technology

Biotechnology, companies & startups

- For many years, agricultural biotechnology was the focus of big agribusiness corporations with effective innovation or the focus of academia and researchers with promising but non scalable solutions.
- Large agribusinesses have been developing and dominating biotech innovations to boost and safeguard agricultural yields through the use of synthetic fertilizers, crop protection products like pesticides, and genetically modified seeds.
- However, startups are also developing cutting edge technologies to disrupt the status quo.



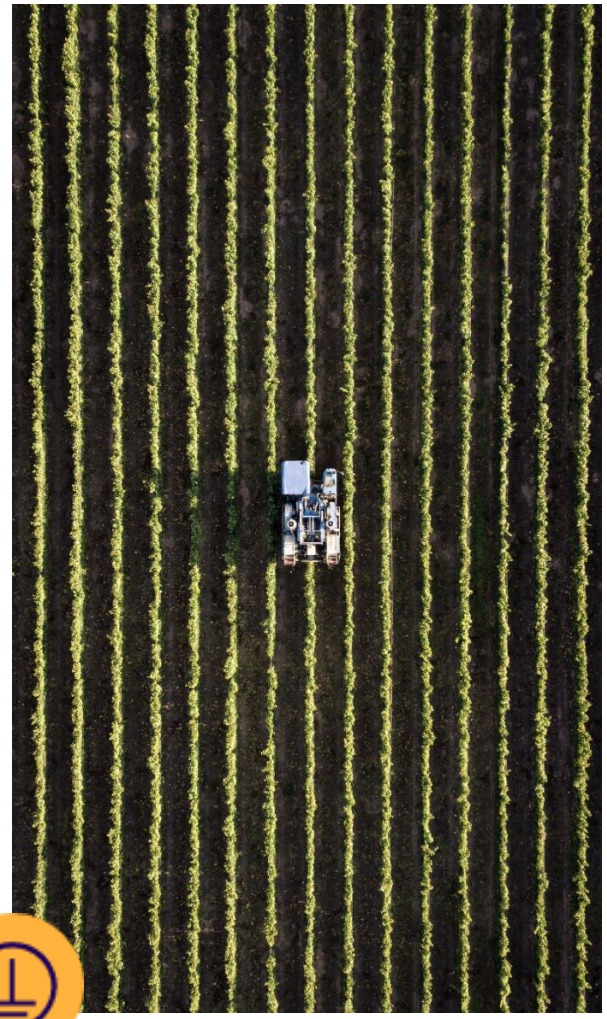
Biotechnology in the service of paradigm shift

- Although technology can not be a silver bullet for the current food system problems, it may help to create more sustainable, efficient, fair, and healthy food supply chains.
- In our second report for the new paradigm report series, we look for startups and the biotechnology that they use to create a more resilient agriculture system.
- To begin with ,we choose three startups from Italy, France and Canada and look for their value proposition.

Reazent

Supercharging Sustainable Agriculture

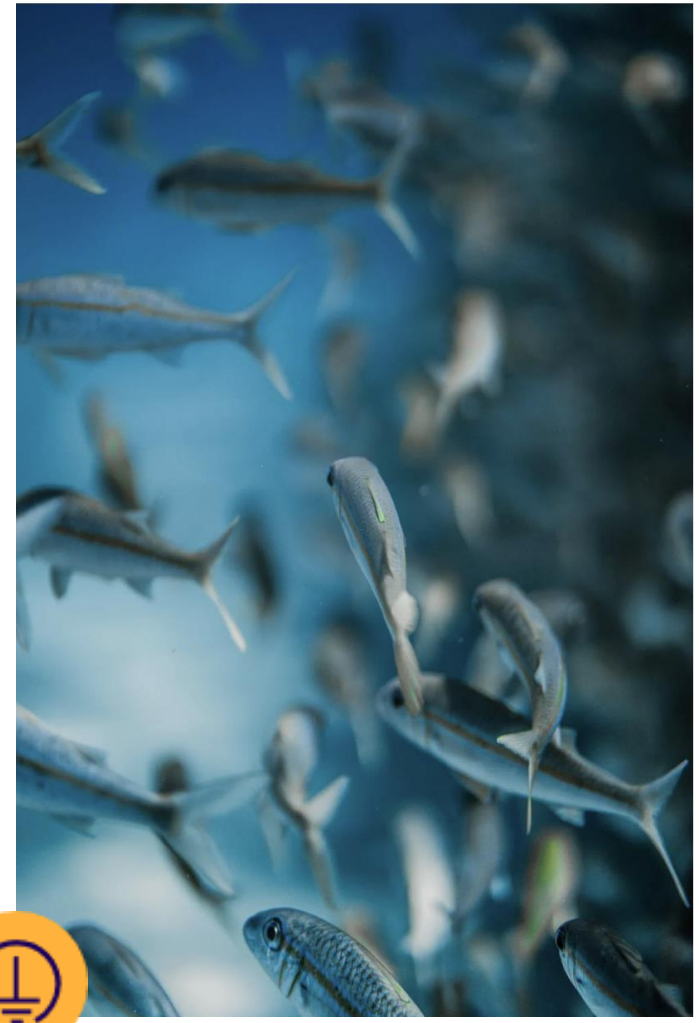
- Located in Nova Scotia, Canada, Reagent creates natural and secure agrochemicals for farming.
- Reazent offers high efficacy organic alternatives to agrochemicals by using biotechnology. The company is on a mission to replace synthetic agrochemicals with more economically viable, sustainable, and safer solutions
- Their science is based on symbiotic relationship, between microorganisms such as bacteria and fungi,to develop biological based organic alternatives to agrochemicals by enabling them multiply their effects manifold.
- They help growers achieve higher return on their investment by helping them grow healthier crops, increase crop yield and protect them from plant diseases.



Ittinsect

Feed For The Ocean

- Founded 2020 in Rome, Italy, Ittinsect produces sustainable, high performance aquaculture feeds. The team employs experts in biotechnology, marine biology, fish nutrition, engineering and sales.
- The aquaculture feed is produced through biotech treatment of novel raw ingredients including insects, micro algae and agricultural by-products.
- Thanks to the production of a specialized feed from agri-food by-products, the need for nutrients from the ocean is fully replaced by ingredients such as yeasts, microbes, and insect powders.
- Their mission is making aquaculture ocean-impact neural.



Plantik

Engineering Plants For Tomorrow

- Founded in 2019 in Paris, France, Plantik develops synthetic biotechnology tools to engineer future plants ten times faster.
- Plantik started with one plant: Hemp. Using biotechnology, they precisely control single or multiple cannabinoids, adapt plants to different growing conditions and create disease resilient stronger plants.
- The company is also working with Wageningen Plant research on a project aiming to accelerate the development of quinoa.

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Source

- UN Library, The state of food and agriculture 2003 & 2004, what is agricultural biotechnology, 2004, Retrieved from; https://www.un-ilibrary.org/content/books/9789210473767s006-c002, (Accessed: 16/03/2023).
- FAO, The future of food and agriculture: Trends and challenges, 2017 Retrieved from; https://www.fao.org/3/i6583e/i6583e.pdf, (Accessed: 16/03/2023).
- Cornell, What is agricultural biotechnology, 2004, Retrieved from; http://absp2.cornell.edu/resources/briefs/documents/warp_briefs_eng_scr.pdf, (Accessed: 16/03/2023)
- FAO, Biotechnology, Retrieved from; https://www.fao.org/biotechnology/en/, (Accessed: 17/03/2023).
- USDA, Biotechnology and climate change, Retrieved from; https://www.usda.gov/topics/biotechnology/climate-change, (Accessed: 17/03/2023).
- USDA, Biotechnology Frequently asked questions, Retrieved from; https://www.usda.gov/topics/biotechnology/biotechnology-frequently-asked-questions-faqs, (Accessed: 17/03/2023).
- USDA, Drought-Tolerant Corn in the United States: Research, Commercialization, and Related Crop Production Practices 2019, Retrieved from; https://www.ers.usda.gov/amber-waves/2019/march/drought-tolerant-corn-in-the-united-states-research-commercialization-and-related-crop-production-practices/
- Agrihunt, Agricultural biotechnology and its pros and cons, Retrieved from; https://agrihunt.com/articles/agricultural-biotechnology-and-its-pros-and-cons/, (Accessed: 21/03/2023)
- FAO, Statement on biotechnology, 2000, Retrieved from; https://www.fao.org/biotech/fao-statement-on-biotechnology/en/, (Accessed: 22/03/2023)
- Our World In Data, How much of global greenhouse gas emissions come from food?, Retrieved from; https://ourworldindata.org/greenhouse-gas-emissions-food, (Accessed: 16/01/2023)

Startups

- Reazent, Startup Example, https://reazent.com (Accessed:17/03/2023).
- Ittinsect, Startup Example, https://ittinsect.com/en/home/, (Accessed: 17/03/2023).
- Plantik, Startup Example,https://www.plantik.bio(Accessed:18/03/2023).
- Plantik News, https://www.plantik.bio/latest-news/tki-consortium-quinoa-lupin-breeding, (Accessed:18/03/2023).

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