*ERASMUS+ project*

*- Biotechnology in our life -*

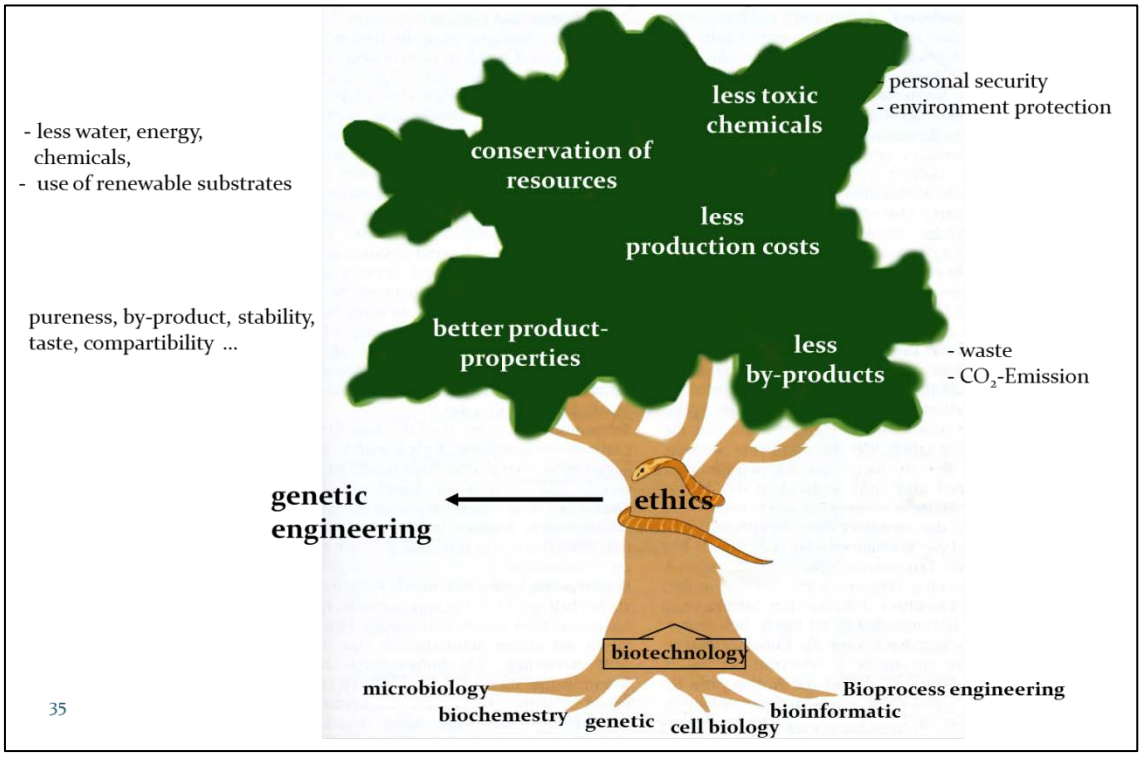
# BIOTECHNOLOGY

## What is biotechnology?

Biotechnological processes are defined as technical applications using living organisms (or parts thereof). Biotechnology combines sciences from microbiology, biochemistry, genetics, cell biology, bioinformatics and bioprocess engineering.

***Official definition of the Organisation for Economic Cooperation and Development (OECD, 2004):***
*Biotechnology is the application of science and technology to living organisms, parts of them, their products or models of them for the purpose of altering living or non-living matter to enhance knowledge, produce goods and provide services.*

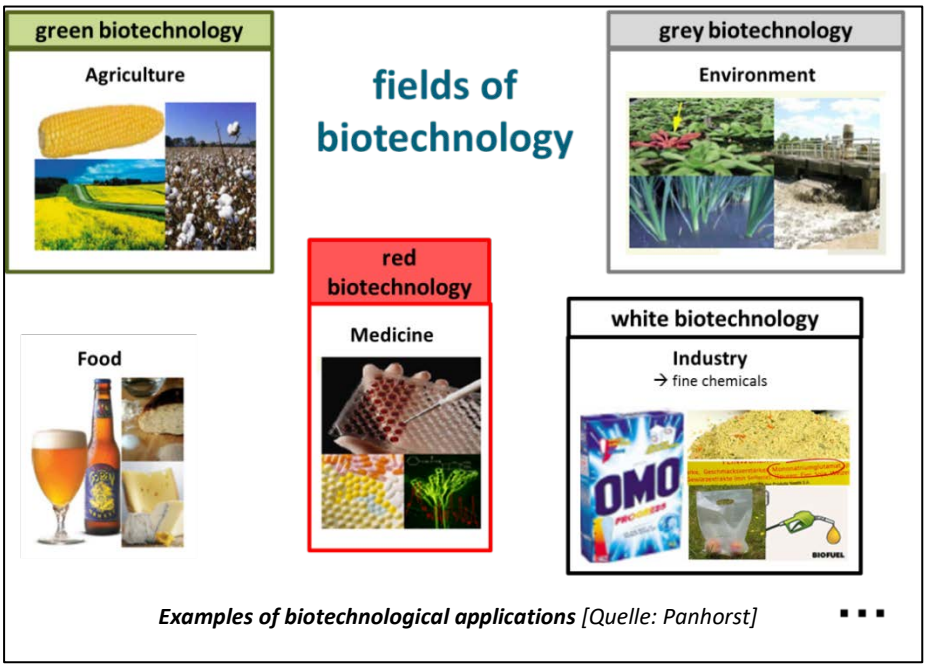
Biotechnological applications have a long tradition (production of beer, wine, cheese...), a high everyday relevance (wastewater treatment, production of medical products (e.g. antibiotics, insulin), production of chemicals, production of new plant varieties, production of detergents, medical diagnostics...) and a high potential for future challenges to our society (bioplastics, biofuels, biomedicine...). Some of the biotechnological applications are produced using organisms whose genetic information has been altered. In contrast to chemical production, biotechnological processes have various advantages (see figure). At the same time, the use of genetic engineering is differently accepted in different countries and in different application areas (in Germany: high acceptance for use in medicine; low acceptance for use in food).




***Chemical versus biotechnological production***

*[Quelle: modified in accordance with Taschenatlas der Biotechnologie und Gentechnik,Schmidt, 2002]*

Biotechnical processes can be used in many different areas. In some cases, attempts are made to sort these processes by application areas, such as medicine (red biotechnology), plants or agriculture (green biotechnology), environment (grey biotechnology) and industry (white biotechnology). A distinction is also made in part according to the organisms to which the methods are applied, such as blue biotechnology (marine organisms) or yellow biotechnology (insects). Occasionally, the use of biotechnology in the field of food is also referred to as yellow biotechnology.




***Examples of biotechnological applications*** *[Quelle: Panhorst]*

According to biotechnologie.de (as of 2017), most biotech companies in Germany are classified as red biotechnology (48.2%), followed by companies that are classified as non-specific applications (33%). This is followed by companies for applications in white biotechnology (10.2%), green biotechnology (4.5%) and biofinformatics.

(4,9 %).

http://biotechnologie.de/knowledge_base_articles/1-was-ist-biotechnologie

In the EU-funded project "Biotechnology in our lives", the following topics and sub-topics were addressed in the project years 2015/2016 and 2016/2017:

| **green biotechnology** | |
|---|---|
| **aims** | Improvement of crops |
| | Extraction of plant contents |
| | Usage of plants for detoxification of soils (Phytoremediation) |
| **topics 2015/2016** | Genetically Modified Mays |
| | Golden Rice |
| | Uses of Meristematic Material |
| **topics 2016/2017** | Amflora |
| | Pharming in Plants |
| | Cotton |
| **topics 2017/2018** | Golden Rice |
| | Bt-corn - biology |
| | Bt-corn - controversity |

| **red biotechnology** | |
|---|---|
| **aims** | Development and production of agents |
| | Development of diagnostic agents |
| | Gene therapy |
| **topics 2015/2016** | Biosensors |
| | Blood Glucose Biosensors |
| | Stem Cell Biotechnology |
| **topics 2016/2017** | Biotechnology and cancer |
| | Insulin produced by bacteria |
| | Vaccines |
| **topics 2017/2018** | Personalised medicine |
| | antibiotics |
| | prenatal diagnosis |

| white biotechnology | |
|---|---|
| **aims** | Industrial biotechnological production procedures |
| **topics 2015/2016** | Biogas Plants in Germany<br>Food From Waste<br>Removing Oestrogen from drinking Water |
| **topics 2016/2017** | Biofuels – an overview<br>Bioplastic<br>Who cleans my laundry? |
| **topics 2017/2018** | Enzymes in food processing industry<br>Amino acids<br>Company profile - Janssen |

| grey biotechnology | |
|---|---|
| **aims** | Sewage purification, waste management,<br>remediation of contaminated soils / waste air |
| **topics 2016/2017** | Microbes as cleaning compunds<br>Microbial plastic degradation<br>Wastewater treatment plant |
| **topics 2017/2018** | Microbial soil remediation<br>Biological pest control<br>Oil biodegradation |

| bioethics | |
|---|---|
| **aims** | study of ethical issues (for example genetic engineering) |
| **topics 2015/2016** | Ethics and Law<br>Quantitative questionnaire<br>Qualitative questionnaire and movie |

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*This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.*