NATURE TO SUPPORT CIRCULAR ECONOMY- INDUSTRIAL SYMBIOSIS IN FOOD MANUFACTURING

„Look deep into nature, and then you will understand everything better."
-Albert Einstein

Introduction

Nature	versus	Economy
nature creates no waste	→	**production** (manufacturing) **creates:** 1.products (waste) and 2.waste (residues, by-products)

Learning from nature

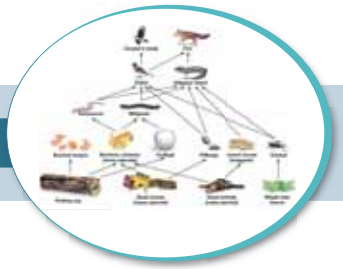
Natural ecosystems - energy and materials are extracted, metabolized and transferred by organisms and across their communities, in a circular manner. → **Industrial ecosystems -** consumption of energy and materials is optimized, waste generation is minimized and the effluents of one process are inputs for another process.

Symbiosis - any type of a close and long-term biological interaction between two different biological organisms. → **Industrial symbiosis -** cooperation among companies in managing resources, particularly by-products, such that the waste of one firm become the input for another.

Food webs - interconnection of uses of both organisms and their waste is established. → **Industrial food web?**

Research question

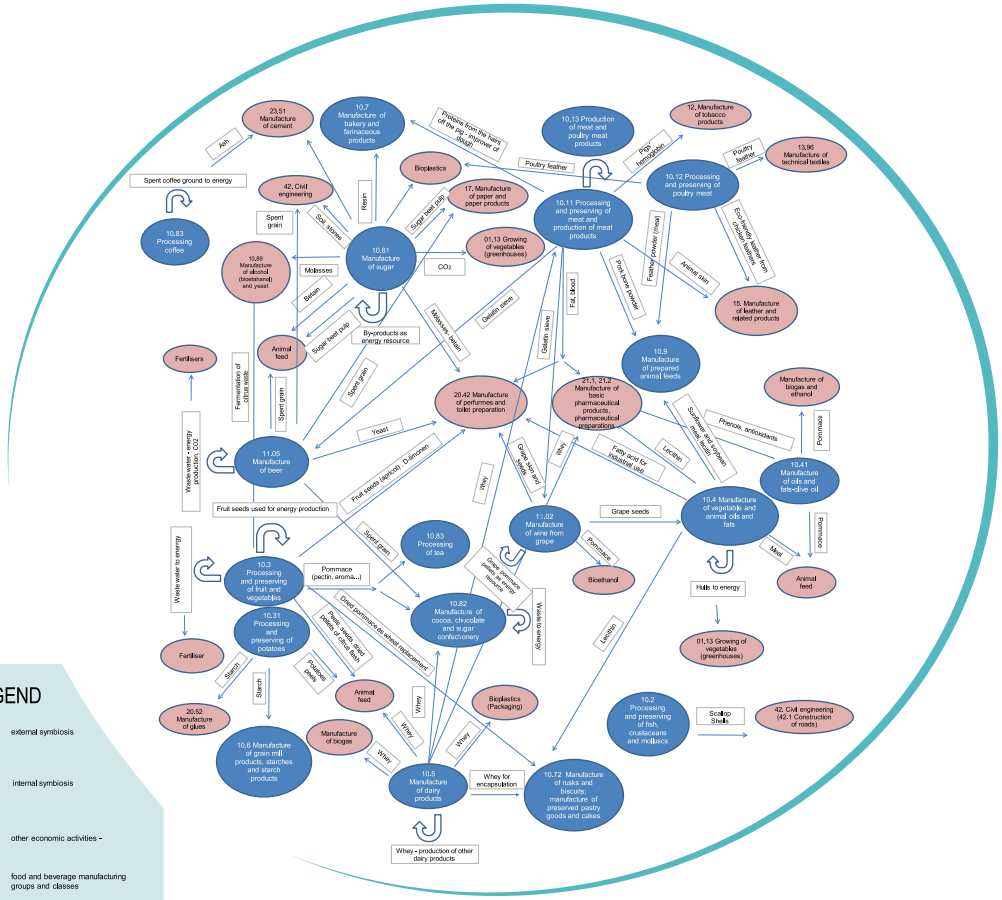
Natural food web



Food web in food manufacturing

Methods: Model of industrial food web development was based on the literature review in the field of valorization of food manufacturing residues, companies' web sites and field research.

Results: Model presents the flows of food production residues generated in the food manufacturing stage of the food supply chain and their industrial uses.



Food web in food manufacturing

Conclusions

- There is a **significant resource potential in the food manufacturing residues.**
- Through **internal or external use** of selected **waste and by-products streams** as **a raw material and/or energy sources**, industrial symbiosis helps to easier close certain material loops and to establish **circularity of resources.**
- **Cooperation** between companies **within and outside food manufacturing industry** through symbiotic relationships and the maximization of by-products and waste utilization means **growing internal efficiency and competitiveness.**
- **Valorization** of by-products and waste from food industry **improve company's economic and environmental performances** at the same time: reduces costs, increases revenue, reduces amount of waste sent to landfill, reduces non-renewable energy sources use, etc.
- **Industrial symbiosis** can be of a crucial importance for sustainable transition to sustainability and **circular economy**, above all economically sustainable sustainability.

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