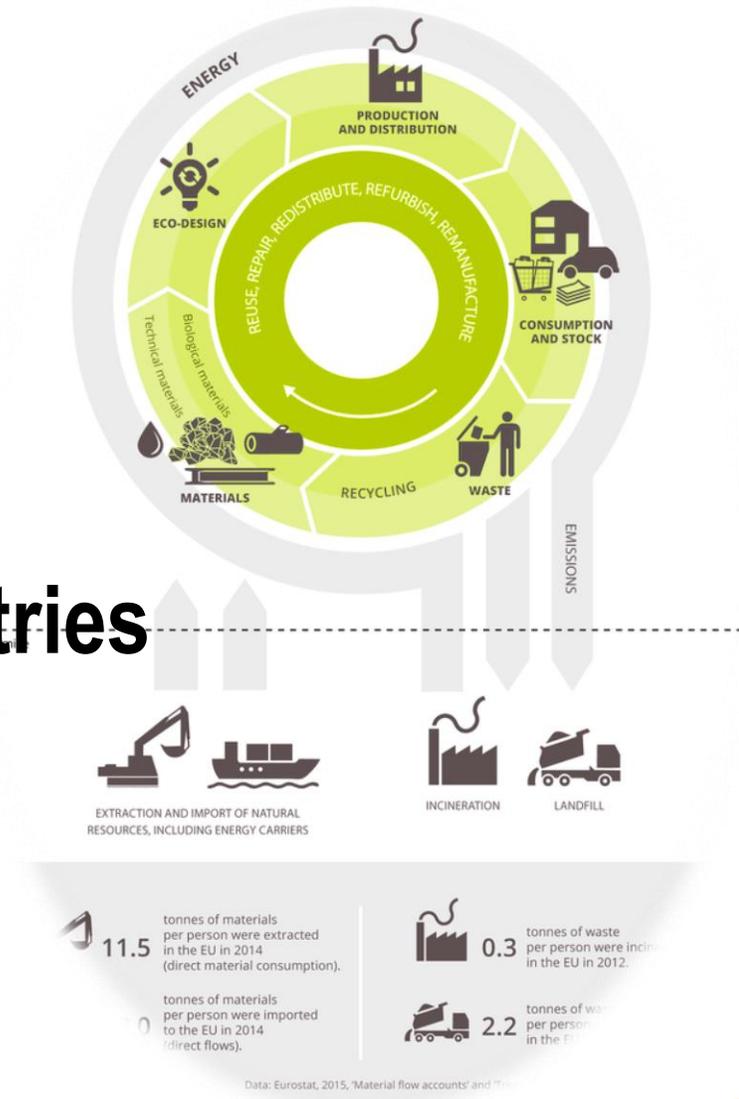


Circular economy in the Romanian food industries

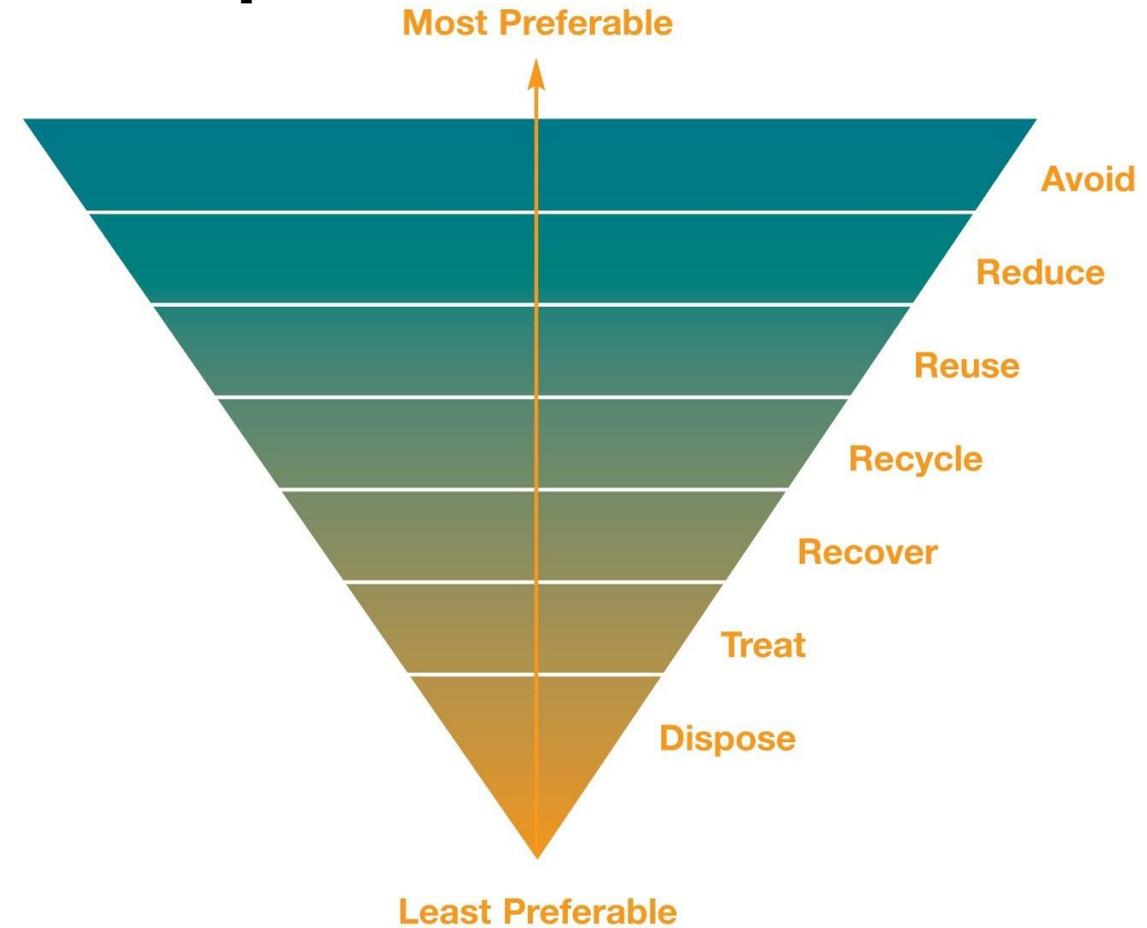
Nastasia Belc, Sorin Iorga and Claudia Moşoiu
IBA, Romania



Circular economy concept

A circular economy represents a fundamental alternative to the linear take-make-consume-dispose economic model that currently predominates.

This linear model is based on the assumption that natural resources are available, abundant, easy to source and cheap to dispose of, but it is not sustainable, as the world is moving towards, and is in some cases exceeding, planetary boundaries (Steffen et al., 2015).



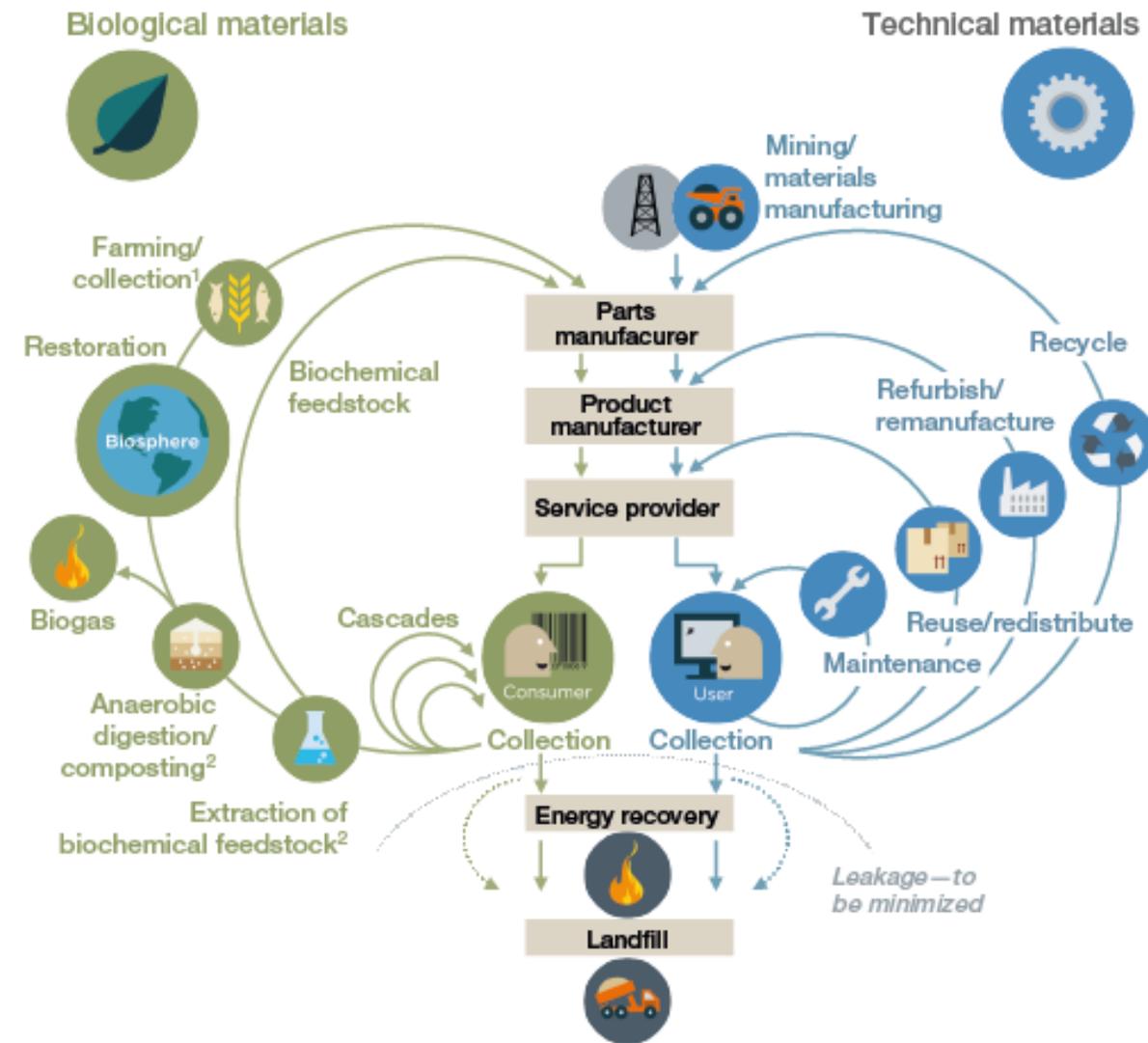
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Developing the knowledge base
EEA Report
No 2/2016

Circular economy concept

Circular economy is an industrial system that is restaurative or regenerativ by intention and design (producing no waste and pollution).

In Circular Economy material flows are of two types:

- 🌳 biological materials - designed to re-enter the biosphere safely;
- 🌳 technical materials - designed to circulate at high quality in the production system without entering the biosphere.



Key characteristics and enabling factors of a circular economy

Key characteristics

1. Less input and use of natural resources - minimised and optimised - exploitation of raw materials (more from less) and overall energy and water use; efficient use of all natural resources and reduced import dependence on natural resources;
2. Increased share of renewable and recyclable resources and energy
3. Reduced emissions
4. Fewer material losses/residuals
5. Keeping the value of products, components and materials in the economy – reuse, recycling

Enabling factors

1. Eco-design
2. Repair, refurbishment and remanufacture
3. Recycling
4. Economic incentives and finance
5. Business models
6. Eco-innovation
7. Governance, skills and knowledge

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What is the Circular Economy Package?

In December 2015, the European Commission published *Closing the loop — An EU action plan for the circular economy*, a new strategy that aims to support the transition to a circular economy in the EU.

The new Circular Economy Package consists of:

- ✦ an EU Action Plan for the Circular Economy;
- ✦ a timetable setting out when the actions will be completed (set out in an Annex to the Action Plan);
and
- ✦ adoption of a number of legislative proposals, including:
 - Proposed Directive on Waste;
 - Proposed Directive on Packaging Waste;
 - Proposed Directive on Landfill;
 - Proposed Directive on Electrical and Electronic Waste.

The proposed EU actions aim to contribute to "closing the loop" of product lifecycles through greater **recycling and re-use**, and bring benefits for both the environment and the economy.

The Commission states that the measures could bring **net savings of €600 billion** or **8% of annual turnover** for businesses in the EU and will **reduce total annual greenhouse gas emissions by 2-4%**.



Revised legislative proposals on waste

- **simplified definitions** and **harmonised calculation methods** for recycling rates in EU;
- increasing **economic incentives for better product design** through provisions on extended producer responsibility schemes;
- increasing the preparing for reuse and recycling target for **municipal waste to 60% by weight , by 2025 and, 65% by weight, by 2030**;
- a gradual limitation of the **landfilling of municipal waste to 10% by 2030** and a **ban on landfilling separately collected waste**;
- increasing the preparing for reuse and recycling targets for all **packaging waste to 65% by 2025 and 75% by 2030** (with specific targets for specific packaging materials such as plastic, wood, glass, paper and cardboard);
- ensuring the **separate collection of bio-waste** (including biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises) where it is technically, environmentally and economically practicable and appropriate.

Estonia, Greece, Croatia, Latvia, Malta, Romania and Slovakia are given the option of applying for extensions to meet the recycling and landfill targets.

Major problems associated with the present food system

Wastefulness

- 1/3 of food is lost or wasted before consumption/ 20% is lost along the supply chain
- fertilisers not completely used

Decrease of healthy components

- less K, Fe, and vitamins in fruits and vegetables now than during the 50s
- presence of toxicants

Increase of environmental externalities

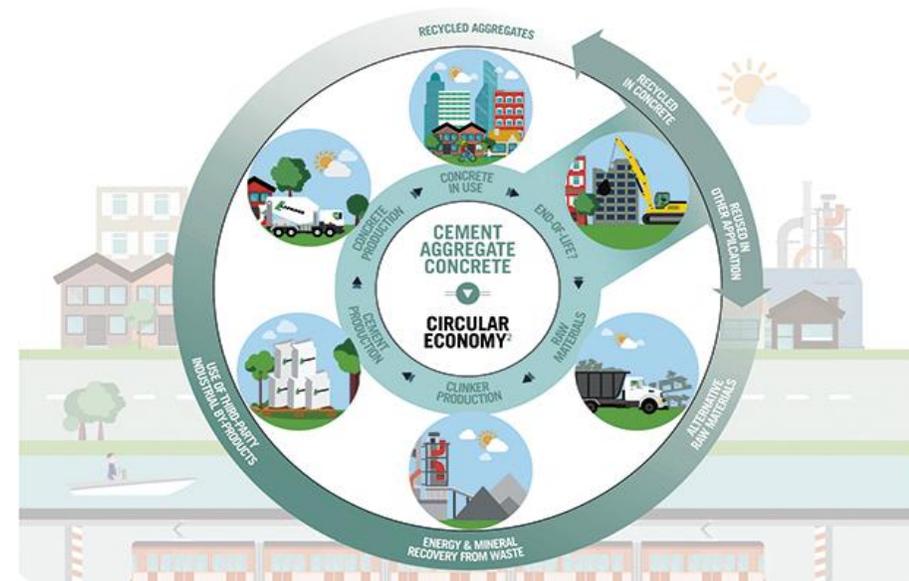
- eutrophication
- biodiversification affected



In Europe, food waste is a major problem: it is estimated that around **100 million tonnes of food** is scattered annually in the EU.

They are **lost or are wasted throughout the distribution chain**, in agricultural exploitation, in processing and manufacturing, in shops, restaurants and at home.

In addition to economic and environmental impact, food waste also has an **important social dimension**: it should be facilitated to donate the surplus of safe and edible food so that it can reach those who most need it.



Food Waste.....

In September 2015, as part of the 2030 Sustainable Development Goals, the UN adopted a target of having per capita food waste at the retail and consumer level and reducing food losses along the production and supply chains.

In order to support actions to meet this target, the Commission commits to the following actions on food waste:

- to **establish a common methodology, including minimum quality requirements** in 2016 (to quantify the food waste);
- to **facilitate food donation and utilisation of foodstuffs for animal feed** in 2016;
- examining ways to **improve the use of date marking** and its understanding by consumers, in particular the "best before" label in 2017.
- **to ensure separate collections of bio-waste** (including food waste) where technically, environmentally and economically practicable and appropriate.

Food Waste.....

The circular economy is based on the sustainable development principles, contrary to the linear business model used so far, characterized by:

“resources’ use → products making → waste obtaining”.

The new model is universally valued for its:

- **increased efficiency** in the utilization of the ecological resources;
- **reducing the environmental pollution** and tackling the long-standing contradiction among the resources’ shortage, the environmental pollution and the economic growth

i.e. Food waste a useful resource through biotechnology

Microbial feed protein production on organic residues, tackles two of our major societal challenges; usage of resources and sustainable food production, in one production system.

With the help of microbes, we can transform residues into a protein raw material for feed, thereby creating a food resource for people in an environmentally-friendly and sustainable manner.

There is needed **to be clarified EU legislation on waste, food and feed** so as to **facilitate the redistribution of safe and edible food** to people in difficulty and, when this can be done safe use of former food products to produce animal feed.

For example, the legislative proposal on waste explicitly excluded feed materials from its scope.

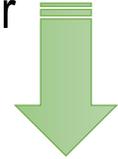
This will ensure that former foodstuffs (i.e. broken crackers or stale bread) that are safe but can not enter the food chain for commercial reasons are not considered "waste" anywhere in the Union and that they can therefore used as a resource for the production of animal feed.

Development of EU-level guidelines for donors and food banks and related food safety, traceability, liability, VAT, and so on issues are also needed.

A Circular Economy for the food industries means **preserving the value of resources** (raw materials, water and energy) that go into producing food and drink products for as long as possible, while also paying attention to:

- 🌱 prevention
- 🌱 resources efficiency
- 🌱 environmental performance
- 🌱 consumer awareness
- 🌱 sustainable sourcing

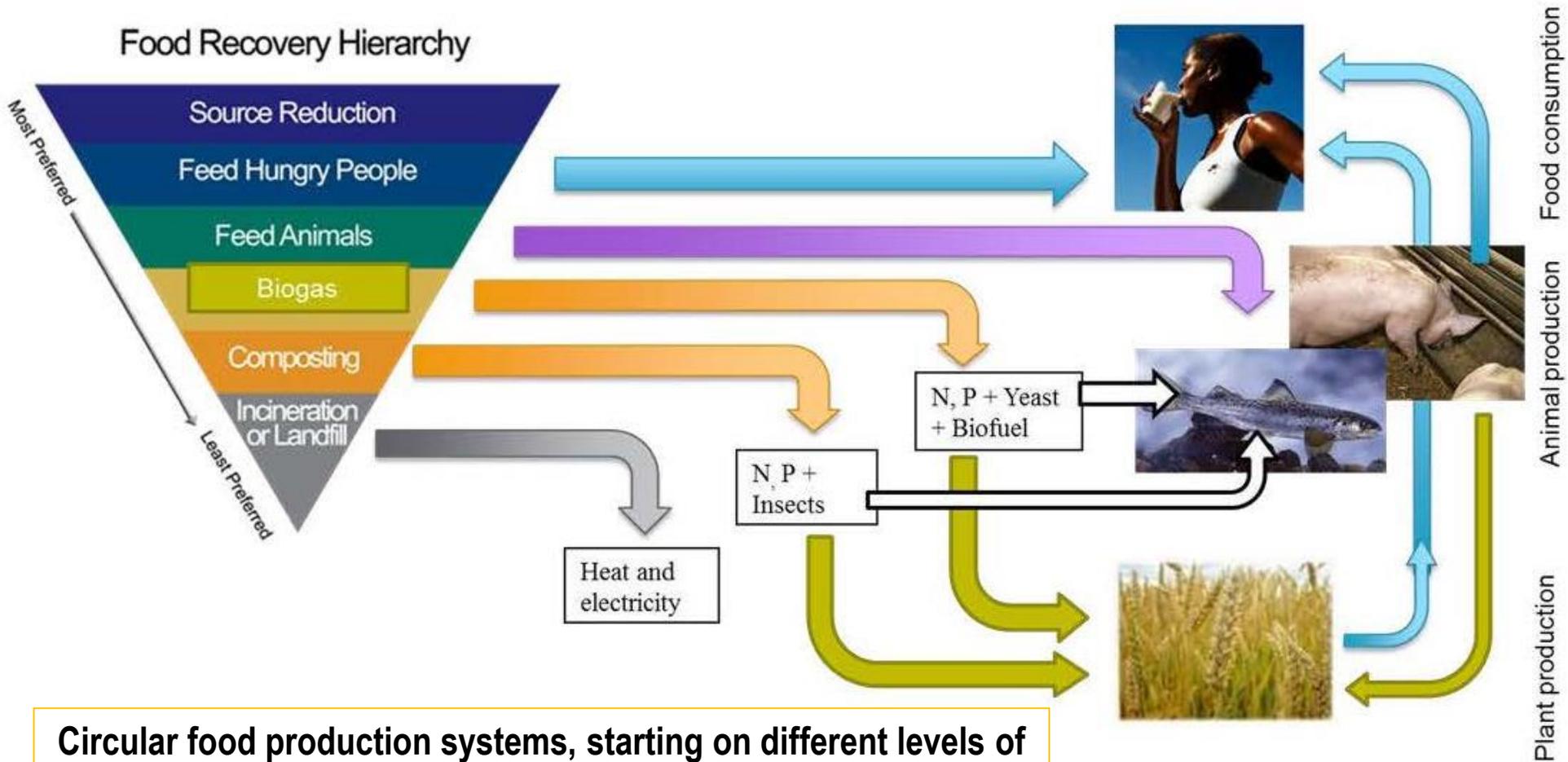
Food processors should work together with suppliers to improve farming practices, inclusive storage and logistics, so that ingredients can stay fresher for longer



better quality ingredients, so less goes to waste.

When food is wasted, all of the resources that went into its production are lost – including precious natural resources such as water and fuel.

Not only does it represent a missed opportunity to feed a growing world population, but it also has negative environmental and economic consequences.



Circular food production systems, starting on different levels of the food recovery hierarchy.
 The proposed novel systems (white arrows) can valorize food and other organic waste into feed via insect larvae and yeast, growing on compost and biogas substrate, respectively, thereby creating shorter, but biosecure, pathways in the food supply chain.

Source: Jakob Ottoson*, Ingrid Strid, Anders Kiessling, Ivar Vågsholm, David Huyben, Jakob Babul, Sofia Boqvist, Biosecurity risks and environmental opportunities when recapturing nutrients for sustainable agri-food production, Food Waste in the European Food Supply Chain: Challenges and Opportunities, Cost Action, 12 & 13 May 2014

Romania: the second largest market in Central Europe and the gross domestic product (GDP) per capita in Romania is situated at 54% of the EU-28 average.

Considered, in the past, Europe's bread basket, agriculture plays an important role in Romania.

In a Romania has also the highest percentage of rural population in the EU (45%).

In accordance with the Europe's 2020 Strategy, by 2020, Romania must recycle 50% of its waste. At present, it recycles only 3% of its municipal waste.

Thus, waste recycling is one of Romania's key priorities, striving to reach the average level of the European Union's countries with regard to the value of this indicator of sustainable development.

A poll conducted by the European Commission concluded that 82% of the Romanian citizens consider that they may play a role in protecting the environment and that most of them act and behave from an ecological perspective.

With regard to recycling habits:

- 32% of Romanian consumers show concern related to recycling,
- 34% show interest in reducing energy consumption and
- 29% in reducing water consumption.

In conclusion, the average Romanian consumer shows interest in protecting the environment through savings of energy and water and through selective waste behaviors

Turning waste into a resource” indicator. Romania vs. European Union Comparison

Indicators	Romania / EU	Measurement units	Reference Period								Source
			2000	2005	2010	2011	2012	2013	2014	2015	
Generation of Romania Waste excluding major mineral wastes	Romania	Kg/ capita	(:)	(:)	2050	(:)	2041	(:)	(:)	(:)	Eurostat
	EU	Kg/ capita	(:)	(:)		(:)		(:)	(:)	(:)	Eurostat
Landfill rate of waste excluding major mineral wastes	Romania	%	(:)	(:)	53	(:)	49	(:)	(:)	(:)	Eurostat
	EU	%	(:)	(:)	9	(:)	8	(:)	(:)	(:)	Eurostat
Recycling rate of Municipal waste	Romania	%	0.00	01.80	12.80	11.7	14.80	13.20	(:)	(:)	Eurostat
	EU	%	48.4	53.80	57.70	57.4	55.70	54.90	55.10	(:)	Eurostat
Recycling rate of e-waste	Romania	%	(:)	(:)	12.0	10.3	14.5	(:)	(:)	(:)	Eurostat
	EU	%	(:)	(:)	30.4	31.9	32.0	31.7	(:)	(:)	Eurostat

Last update: 10/05/2016 11:07:01

Source: Eurostat [5] (<http://ec.europa.eu/eurostat/web/europe-2020-indicators/resource-efficient>)

Is Romania prepared for recycle?

- Romania generates 389 kg of municipal waste per person, while 313 kg of municipal waste is treated per person.
- Figures from Eurostat show that 99 percent of waste treated is put into landfills, with only 3 percent recycled and composted.
- Romania is the UE country that currently has the lowest recycling rate.
- Romania's target for collecting is 62%.
- A tax of 2 LEI (EUR 0.44) for each kilogram of recyclable packaging placed on the market and unrecovered has created a big debate in Romania, pinning the local food producers against the Environment Ministry and local environment organizations.



Around 350 million aluminum doses are marketed annually in Romania. Given that much of this goes to landfills,.....

Opportunities to meet Circular Economy

- turning agricultural waste into fertilizer, methanisation (FR)
- Integrated Quality Management Standard for the arable crops and horticulture sectors (some criteria in the Standard are designed to avoid food waste - e.g. storage conditions that keep crops fresher for longer) (BE).
- breeding potatoes that have the right shape for crisps or chips helps avoid unnecessary losses during peeling and cutting in order to reduce post-harvest losses (NL).
- using rejected fruits and vegetables for juice production and the remaining pulp to a sauce producer (IT)
- reworking bread into sourdough bread (NL)
- redistributing edible non-sellable food to feed people (i.e. food or its packaging may occasionally be damaged during the production process, making it perfectly edible but unsuitable for sale.) (NL, Nordic Countries)
- using food by-products as animal feed and as inputs for other industries, while waste can be turned into fertiliser and energy (Scandinavian Countries)

Source: Ingredients for a Circular Economy, FoodDrinkEurope, e-News

Opportunities to recover food waste



- transforming whey, dairy producer's wastewater, into animal feed (HR);
- using parts of the animals that are not sold, as food, for pharmaceuticals, food ingredients, animal feed, pet food and biodiesel for renewable energy (FI);
- turning wastewater sludge and cow stomach content into biogas, resulting in renewable energy for car fuel, electricity and heating and nutrients for soil improvement and organic fertilisers (FI);
- turning by-products from bakery and confectionary factories into raw material for bio-ethanol, animal feed and also donations to food aid if possible (FI);
- using of oat husks from milling operations for power generation;
- using meat by-products as pet food and other animal products recycled to produce bio-diesel (HR);
- using wastes from canteens for producing compost to grow more vegetables for the kitchen on site;
- turning waste from the confectionery site's manufacturing processes into renewable energy and clean water through anaerobic digestion;
- using recyclable PET plastic bottle reducing the raw material used in the manufacture of primary and secondary packaging by 10%;
- implementing measures to improve PET packaging recyclability and increasing recycled material in primary and secondary packaging to reach 5% (ES);
- reuses transport packaging for food products.

A circular economy is about preserving the value of resources, **including water and energy**, for as long as possible.

Water - washing, boiling and steaming.

These actions allow water and energy to be recovered and reused, either within the factory, where allowed by food hygiene laws, or by other users.



1. **Innovative water treatment technologies**, such as **reverse osmosis**, allow sites to recycle waste water for reuse across dairy operations from cleaning the filling lines to pasteurising the milk. Several sites in the EU have introduced this technology. Significant steps are also being taken to improve the quality of waste water and to reduce the impact on water basins.
2. **Steam generated** from a nearby incineration facility burning household waste **is transferred for melting** chocolate to heat the buildings in a chocolate company (FR)
3. **Innovative applications for the capture and use of heat as an energy source**, which has helped reduce gas consumption - to recover previously wasted heat from the exhaust systems on the cookers, and to use it to preheat the water going into the boiler (UK)
4. **Overheated steam is needed in the process of oil refining and margarine production**. Sudden chilling transforms steam to water condensate. Previously the condensate was wasted, thus wasting water and heat. With improvement of the process this condensate is pumped back into heating facility, slightly heated and returned back to process. In this way water as well as heat is re-used (HR).

While implementing the circular economy both, the European dimension and, in particular, the Romanian one – needs an integrated approach based on the triad: consumer-company-natural environment.

Circular economy is both a new approach of the societal life, based on changing the mentalities of the individuals having the role of decision makers at the company level and public administration and the decision makers – consumers, as well as a policy meant to be made operational across all entities: governmental, entrepreneurial, individually – human.



**Important: optimising manufacturing processes,
training employees and innovating new products
from leftover by-products and ingredients
developing**

Increasing global competition for natural resources has contributed to **increased prices and volatility**.

Circular economy strategies applied could have as **effect of reducing costs** and increased competitiveness of Romanian industry by net benefits which consist of job opportunities.

Creating a circular economy in Romania **requires fundamental changes in the value chain**, from product design and production processes to new models of circularity business and consumption patterns.

In this manner, recycling will turn waste into a resource, and product life extension facility will contribute to reducing natural resources consumption.

Some Romanian companies are already are experimenting new circularity business models such as those based on functions and services of collaborative consumption model specific for circular economy.

For the future Romanian managers could take some measures for waste reduction:

- the changing status of the waste by selling it as product;
- the mechanisms for paying for treatment and/or disposal which discourage waste generation;
- the use of financial resources obtained from secondary raw materials for the efficiency of waste management.



Some general conclusions



1. Implementing the UN Sustainable Development Goal on food waste at EU level;
2. Developing a common EU food waste measurement methodology aligned with global standards;
3. Setting up a food waste stakeholder's platform with the involvement of all food chain actors both at national level and Member States;
4. Maximising the value of raw materials by allowing more materials to remain products or to be classified as by-products;
5. Explore options to improve understanding of date marking without compromising food safety and quality;
6. Promoting continuous improvement of the environmental performance of food and drink products along their life-cycle;
7. Focusing on consumer education and changing public attitudes towards waste minimization;
8. Promoting investment in research and development;
9. Maintain waste to energy as a waste management option where justified by life cycle thinking.

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