THE POTENTIAL OF THE CIRCULAR ECONOMY IMPROVING THE FOOD CHAIN

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Abstract: The article analyzes the current global agricultural system, which is responsible for about a quarter of the greenhouse gases released by human activity, and proposes solutions to reduce pollution and losses in the process of obtaining food.
It also considers current problems in agriculture related to the harmful effects of agricultural inputs such as fossil fuels, pesticides, mineral fertilizers, improved plant and animal genetics. Because the current global agricultural system is responsible for about a quarter of the greenhouse gases released by human activity, the article proposes solutions to reduce pollution and losses in the process of obtaining food.
Prevention of food loss and food waste can be lessened if human edible by-products are reused as food whenever possible. Only after these options have been exhausted should they be recycled into the food system - along with inedible by-products for humans - to enrich the soil and fertilize crops or feed animals.
This is possible through the transition to a circular food system, which involves the search for practices and technologies that minimize the input of finite resources, encourage regenerative use, prevent the drain of natural resources from the food system, and stimulate the reuse and recycling of inevitable resource losses in a way that add the greatest possible value to the food system.

Keywords: circular economy, environmental impact, redesign, developing initiatives, food production

JEL Classification: Q13, Q18, Q53.

INTRODUCTION

The concept of circularity comes from industrial ecology, which aims to reduce resource consumption and environmental emissions by closing the loop of materials and substances. According to this paradigm, losses of materials and substances should be prevented and otherwise recovered for reuse, reconditioning and recycling. According to these principles, moving towards a circular food system involves the search for practices and technologies that minimize the input of finite resources, encourage the use of regenerative ones, prevent the drain of natural resources (e.g. carbon (C), nitrogen (N) , phosphorus (P), water) from the food system and stimulate the reuse and recycling of inevitable resource losses in a way that adds the greatest possible value to the food system (Jurgilevich et al., 2016).

Therefore, the goal of circularity implies that arable land is primarily used to produce plant biomass for human consumption.

While the Covid-19 pandemic has impacted many value chains with containment measures, the food industry has experienced widespread disruptions affecting harvest, transport logistics and processing. However, because of these disruptions, new opportunities have opened up for economic agents interested in making their operations more resilient (eg through shorter value chains).

METHODS OF IMPLEMENTATION OF CIRCULAR ECONOMY ACTIONS IN THE FOOD CHAIN

A circular economy, can change more than circular food systems, offers an even broader perspective and can open new opportunities for efficiency gains or regenerative capacity.

Circularity in plant and animal production assumes that plant biomass is the basis of our food system and should be used primarily to produce human food.

The production and consumption of food from plant sources results in a number of by-products, such as crop residues, industrial food processing co-products, food losses and waste.

A priority in this regard is the need to prevent by-products, i.e. food losses and food waste. They should be recycled into the food system, to enrich the soil and fertilize crops or feed animals.

The main goal in recycling by-products should be to ensure the quality of soils, as they are the basis of agriculture.

Also, animals can consume these by-products from the food system. Their role in the food system should focus on turning by-products that humans cannot or do not want to eat into valuable products, such as nutrient-dense food, manure and various ecosystem services.

By converting these biomass streams, farm animals recycle nutrients from the food system that would otherwise have been lost in the food production process (Garnett et al., 2015).

At the same time, agriculture must reduce its environmental footprint. The impact of agriculture is large and growing, already undermining food production through soil degradation, water scarcity and negative climate impacts.

Thus, creating a sustainable global food system defines and quantifies three major issues it faces:

- Food production must increase, given that food consumption is expected to increase by over 50% by 2050.
- To protect critical natural ecosystems and mitigate the consequences of climate change, additional food land use must be achieved without net expansion in agricultural area (estimated to increase by almost 600 million hectares by 2050 if no action is taken)).
- Agriculture is a significant source of emissions, which is continuously increasing, given that it has to respond to a 50% higher demand and a two-thirds reduction in polluting gases.

These emissions can be reduced by reforesting at least 585 million hectares of cleared agricultural land and reductions in productivity on demand. Other solutions address both supply and demand-side measures: more food needs to be produced, but at the same time the pace of demand growth, especially resource-intensive food demand, needs to be slowed.

Globally, food loss and waste is about $1 trillion a year. It also wastes natural resources: a quarter of all water used in agriculture each year, agricultural land the size of China, and about 8% of all greenhouse gases emitted in a year.

RESULTS

Food losses can occur at any stage of the food chain, during harvesting, handling and storage, processing and packaging, marketing (Figure 1).

Food losses and waste along the supply chain in Europe account for approximately 22% of global losses (EUROSTAT, 2018).

These losses can be mitigated through savings estimates, technical and management opportunities.

The Food Waste and Resources Action Program (WRAP) looked at efforts to reduce food loss and waste at nearly 1,200 shopping centers in 17 countries and over 700 companies. It found that the average cost-benefit ratio was 14 to 1 across all types of companies, while hotels, food manufacturers, retailers tended to have ratios between 5 to 1 and 10 to 1.18.

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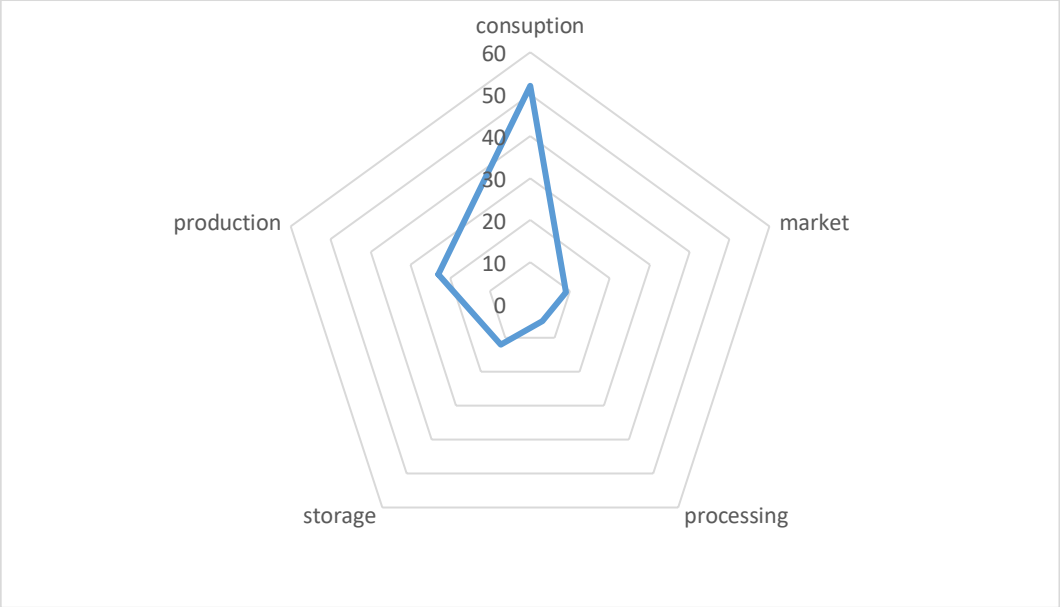
Fig 1: Food losses and waste occurring along the supply chain in Europe



Source: author's conception

Some countries and companies have begun to quantify food loss and waste. Although many companies measure and report levels of material waste, very few specifically track and report food loss and waste separately.

However, some progress has been seen, for example, some retailers now sell products that are not perfectly shaped, smaller but perfectly nutritious, which in previous years would have been thrown away because they did not meet aesthetic standards.

Also, a very large number of restaurants and many retailers donate food to charity, thus avoiding food waste.

In many developing regions, most food loss occurs between the point of harvest and when it reaches the market. Therefore tracking actions during the production, storage, and processing stages of the food supply chain is important. In developed regions as well as rapidly growing urban areas a significant share of food waste occurs closer to the end of the food chain.

Thus, we will propose some solutions for each stage of the food chain.

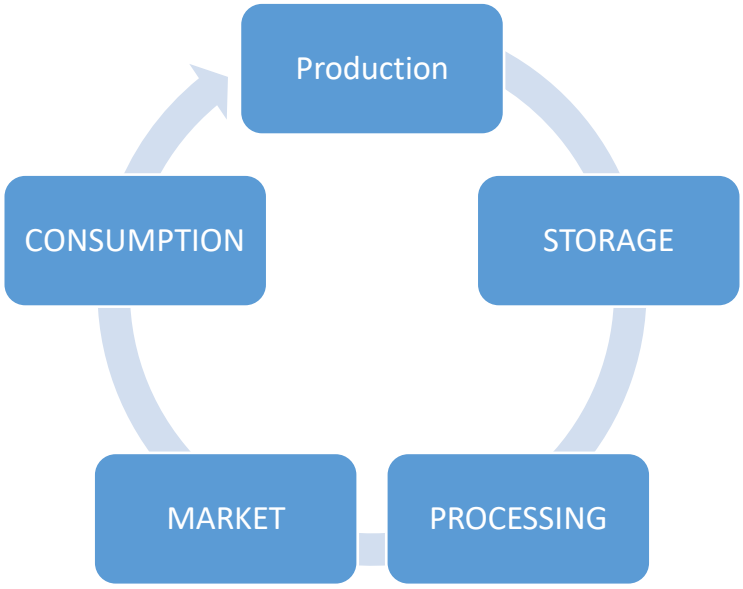
In production, the measures specific to the circular model that can be taken are: transforming crops that cannot be traded into value-added products, improving harvesting techniques, improving access to infrastructure and markets, improving agricultural extension services.

The following measures can be taken for food storage: the introduction of energy-efficient, low-carbon refrigeration chains, the improvement of food handling to reduce losses, and the improvement of infrastructure.

In the manufacturing process, measures that can be taken are: improving supply chain management, improving packaging to keep food fresher for longer, reprocessing or repackaging food that does not meet certain specifications.

In order to market the products, it is proposed to change the standards related to the appearance of the food (e.g. smaller size and the appearance of an apple) to be more favorable to the sale, as well as the promotion of promotions.

Figure 2.: Stages of the food chain



Source: author's conception

Food consumption can be influenced by changing consumer behavior, through education campaigns and by encouraging the consumption of less pleasant looking but healthy foods.

Some proposed solutions involve large-scale infrastructure development, the introduction of refrigeration in low-income countries would help reduce food spoilage and thus losses. Other solutions involve technologies, policies and consumer behavior interventions.

With all these drawbacks (necessary changes), these solutions offer the chance to generate social, environmental and economic benefits that are the foundation of sustainable development.

There is a biunivocal relationship between increased food production and climate change. Increasing food production negatively affects the climate, and climate change in turn negatively affects food production. It is believed that by the year 2050, the temperature will increase by about 0.5-2 ° C.

Climate change negatively affects agricultural yields through: changes in temperature, changes in precipitation and rising sea levels.

Higher temperatures during critical periods have direct and devastating effects on the growth of some crops, drying out the atmosphere and soils due to water loss through evaporation, which in turn increases the rate at which plants transpire. Although warmer temperatures mean more precipitation worldwide, these conditions lead to greater water scarcity in other areas.

Agricultural pesticides contribute to soil, water and air pollution. Excess nutrients in the environment are a major source of air, soil, water pollution and biodiversity and a negative impact on the climate.

To avoid these situations, it is proposed to reduce the use of chemical pesticides by 50%, the loss of nutrients by at least 50%, and the consumption of fertilizers by at least 20%.

CONCLUSIONS

New operations that those involved in agriculture can do through shorter value chains can help build resilience.

Given that resilience is not limited to size or budget, adopting a sustainable approach such as circular models is necessary in times of change.

Looking for alternatives with higher availability can be solutions for agriculture. New alternatives could be through more energy-efficient manufacturing and processing, and increased digitization in sales and marketing would greatly help this area.

The need for rapid adaptation is essential, with those involved in agriculture reacting with flexibility rather than control.

The transition to a circular economy, to sustainable agriculture, leads to the protection of people's health and well-being and, at the same time, increases the competitiveness and resilience of the E.U.

Thus, in the future, the global agricultural system must find ways to meet urgent but sometimes competing needs. Agriculture must continue to be an engine of inclusion in economic and social development that contributes to poverty reduction.

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