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Population Growth and Environmental and Food Sustainability: time to Reconsider Our Paths.

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According to estimates of the United Nations Food and Agriculture Organization (FAO), world population will increase from the current seven billion to nine billion by the year 2050, equivalent to a 30% increase. According to experts, in order to meet the increased demand for food, without a significant increase in prices and scarcity, world production must increase to around 70% (RAMOS, 2017, ONU, 2017; FAO, 2019a)

Estimates of food production show that food waste is in the range of 1.3 billion tons per year, approximately 33% of all that is produced annually in the world. Of this percentage, 54% of the losses take place in the cultivation, handling, post-harvest and storage stages. The remaining 46% are lost in the processing, distribution and consumption stages (FAO, 2019b; RAMOS, 2017).

In this scenario, if the world population continues to grow and consumption habits remain the same, there will be a need to occupy areas of natural vegetation for agricultural production. This situation may jeopardize regions rich in biodiversity such as the Brazilian, African and Australian savannas. Only in the Cerrado biome (Brazilian savanna) there are more than 160 thousand different species of plants, animals and fungi, and about 6 thousand types of fruit trees, constituting an important reservoir of genes and environmental services that would be compromised with the expansion of the agricultural frontier (COSTA, et al. 2018).

Terrestrial and aquatic biodiversity are fundamental for the planet's sustainability, being responsible for the recycling of nutrients, carbon fixation and the release of oxygen into the atmosphere. Therefore, if we compromise our planet's biodiversity, we will condemn our existence as a species. Several efforts have been made by various countries around the world to minimize the impact of population growth. For example, in Brazil, the Brazilian Agricultural Research Corporation (Embrapa) and partners have been generating technologies aimed at promoting paradigm shifts in agricultural production in order to increase productivity and reduce the environmental impact of production systems. Among actions undertaken, the most important ones are those that pursue production efficiency and technologies for sustainable agricultural production, such as the technology that transforms rock powder obtained from mining tailings, biological nitrogen fixation, and those that promote the enrichment of agricultural micro-organisms to

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improve soil quality, reducing the need for chemical fertilizers and agrochemicals, and increasing water availability, among others (SILVEIRA, 2016; SOUZA, *et al.* 2017; PRADO, *et al.* 2016; MENDES, *et al.* 2015, FERREIRA, *et al.* 2013, DIANESE, *et al.* 2012). As a result, it is already possible to note the substitution of traditional monocultures for more sustainable production systems, which include crop, livestock and forest integration and agroecological/organic production, with production efficiencies equal to or greater than conventional crops (EMBRAPA, 2016).

In order to contribute to the reduction of waste, research has also focused on the integral use of food by stimulating the circular economy. In this type of economy, residues obtained from the processing of one product serve as raw material for the generation of other products. Some industrial chains are already organized in this manner, such as, for example, the citrus production chain, where pulp extraction residue is used as a thickening agent (pectin) in the food industry (RAMOS, 2017, COSTA *et al.*, 2018). However, such examples remain exceptions. The involvement of the private sector and consumers for an effective change of attitude regarding reduction of waste is still below desirable, thus indicating the need to strengthen public policies at getting greater commitments of such segments.

It is important considering that, while fundamental, policies aimed at increasing food availability and protecting the environment are only mitigating factors and do not resolve the problems themselves: population growth and uncontrolled consumption habits. Therefore, it is necessary and urgent that we rethink the fundamentals that move the economy along with the demographic issue so that we can guarantee quality of life for next generations.

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