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Importance of energy balance in agriculture.

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Since the beginning, man has tried to control nature and the environment, and the use of energy, mainly from non-renewable sources providing the necessary power for that. The consequences of this long fight against nature has reached a critical state of unprecedented worldwide environmental degradation, as evidenced by the increasing erosion of fertile lands, the deforestation processes, the pollution of water, air and land by agrochemicals, the loss of plant and animal species, the progressive deterioration of the ozone layer and signs of global warming. This is exacerbated by the increasing population growth, implying a steady increase in consumption, and consequently, in the use of energy.

Unfortunately, all these claims are resulting in serious economic and environmental problems worldwide. Because the economic and environmental future of the countries is interrelated, it becomes necessary to adopt sustainable development models based on the use of renewable and clean energies, the search for alternative resources and the use of productive systems more efficient from an energy standpoint, always with a reduction of greenhouse gas emissions.

In relation to the agricultural sector, the question we ask is: how long can we keep the current energy-intensive agricultural techniques in developed countries? To analyze this aspect, energy balance is a very helpful tool because can lead to more efficient, sustainable and environment-friendly production systems for each agro-climatic region. This requires the identification of all the inputs and the outputs involved and their conversion to energy values by means of corresponding energy coefficients or equivalents (International Federation of Institutes for Advanced Studies).

Energy inputs (EI) can be divided in direct (energy directly used in farms as fuel, machines, fertilizers, seeds, herbicides, human labor, etc.) and indirect (energy not consumed in the farm but in the elaboration, manufacturing or manipulation of inputs) ones. Energy outputs (EO) are considered as the calorific value of the harvested biomass (main products and sub-products), calculated from the total production (kg/ha) and its corresponding energy coefficient (strongly correlated to the biochemical composition of the products).
Based on energy inputs and outputs, energy efficiency can be expressed as (i) net energy produced (NE) (also known as energy gain or energy balance, calculated as EI-EO and expressed as MJ/ha), (ii) the energy output/input ratio (also known as energy efficiency and calculated as EO/EI), and (iii) energy productivity (EP) (Crop yield/EI, expressed as kg/MJ).

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