

Requirement, balance and energy efficiency under two models of cropping systems in the center-south of Buenos Aires, Argentina.

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In a natural ecosystem, the solar energy is the main source. However, in the agro ecosystem we should use others in order to sustain specific processes or to avoid some interactions. This energy is introduced in the agro-system not only as fossil fuel but also as inputs like fertilizers and pesticides or for agricultural machines. Since February 2011, two adjacent fields were set at Barrow Experimental Station (Lat:-38.322844, Lon:-60.25572): one of them adopting agro-ecology principles (AGROE), as biodiversity increase, polyculture with legumes, less use of agro-chemicals; while the other one is based on industrial model of agriculture (ACTUAL). This model is defined by its capital intensity and dependence on massive inputs like seeds, fertilizer, and pesticides. In both fields, beef cattle and agriculture production have been implemented with different intensity. The aim of this study was to compare the demand, production, balance and energy efficiency between these two agro-systems. To do this, we use tables of energy associated with different processes and inputs. For both systems, we estimate the energetic demand used in seeds, pesticides, fertilizers and labor during the crop sequence from February 2011 to December 2015; the energy production according to grains and meat yield achieved; the energetic balance calculated as the difference between inputs and outputs of energy in the system and finally, the energy efficiency which is the ratio between the energy produced and consumed. Inputs-outputs ratios of energy were transformed into equivalent units = GJ (Gigajoules). After a sequence of seven crops, ACTUAL consumed 60 GJ, which represents 158% more energy than AGROE. Particularly, ACTUAL consumed a 72% more energy in cultivation labor, 372% more in herbicides and 10 times more energy used in fertilizers than AGROE. Even though ACTUAL produced 37% more energy than AGROE (187 GJ vs 127 GJ) in grain and meat, the energetic balance was only 12% higher. However, AGROE double the energy efficiency (5.9 vs. 3.13). AGROE was more efficient in the use of energy resources and less energy-dependent to produce goods and food. In addition, this model produces less environmental deterioration, preserve natural resources and produce food on a sustainable basis.