



## **The future of food production. Is there a place for more integrative systems?**

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Feeding an increasing population of 9 billion souls is one of the main challenges mankind will face in the forthcoming decades. The problem is aggravated by a decreasing availability of several production factors related with the consumption of fossil fuels, namely, pesticides, fertilizers and the work provided by the machinery. In addition, the increasing pressure over the natural resources, such as water and soils leads to a reduction of productive capacity, with predicted negative impacts on yields and food availability.

It is urgent a change in the paradigm of food production. Nevertheless, the transition to a post-oil agriculture may be difficult and deceiving, and alternatives have to be evaluated to find the best, more sustainable and yielding solutions.

Under the ECODEEP project, a set of energy and mass balances are being assessed for various agro-industrial sectors, in order to characterize the productive processes in Portugal. In addition we are monitoring the various agriculture and livestock production activities within the Escola Superior Agrária de Coimbra (ESAC) farm, where we are introducing solutions to increase the integration between the different agro-industrial activities that take place at the farm level. This work compares the yields and the use of energy and productive factors at intensive cash crop and intensive animal husbandry, comparing them with the integrative solutions at the farm level, where the wastes from a given process can be used as a raw material in another.

This work shows that some of the energy and mass sources currently used in the so called “oil agriculture” are difficult to replace, with significant impacts on crop yield and on livestock production. Nevertheless, synergies between different activities can be found, bearing the promise of a higher level of sustainability.

In fact, the new solutions to close the loops between activities at farm level decrease the external inputs of energy and mass, allow for a more judicious use of internal resources, with fewer environmental impacts, although at the current stage, it is difficult to attain the same level of crop yields.