GEORGOFILI WORLD
Newsletter of the Georgofili Accademy

A NEW APPROACH TO EVALUATE THE ENVIRONMENTAL FOOTPRINT OF CROP AND ANIMAL FOOD PRODUCTION

by Paolo Tessari, Anna Lante, Giuliano Mosca

October 17 2016

***

The Food and Agriculture Organization has recently estimated that ˜ 15% of the world's population is chronically hungry nowadays, and that even more suffer from nutritional

inadequacy. About 1-billion face an inadequate protein intake, causing a variety of nutritional deficiencies, impaired growth, poor health etc. Prospectively, ˜ 70–100% more food than that produced today will be required by 2050. Therefore, a dramatic increase in the demand of land, the need for increased efficiency in the food production system, and/or a reconsideration of dietary habits in the perspective of human requirements, are to be expected in the near future.

In this regard, the environmental footprint of animal food production is considered several-fold greater than that of crops cultivation. Therefore, the choice between animal and vegetarian diets may have a relevant environmental impact. In such comparisons however, an often neglected issue is the nutritional value of foods. Previous estimates of nutrients' environmental footprint had predominantly been based on either food raw weight or caloric content, not in respect to human requirements. In addition, the total protein content of the various foods was actually considered, not

their nutritional values in terms of Essential Amino Acids (EAAs). Since these components are key parameters in food quality assessment, the environmental footprint expressed both as land use for production and as Green House Gas Emission (GHGE) of some animal and vegetal foods may be revaluated on the basis of their EAAs amounts in respect to human requirements.

Sources of proteins can be either animal or vegetal foods. Broadly speaking, the nutritive value of vegetal proteins is lower than that of animal ones, because the former have a deficient and/or an unbalanced EAAs content. It could be somewhat more difficult to guarantee the RDA of all the EAAs using only vegetal, rather than animal or mixed vegetal/animal protein feeding. In other words, an individual would need to eat more vegetal proteins to get the same level of nutrition as that offered by the animal ones. Therefore, since the production of proteins of either source has a relevant and differential environmental footprint, the consumption and/or the design of diets adequate in dietary proteins and EAAs, but from different sources, do retain a major ecologic footprint. Production of high-quality animal proteins, in amounts sufficient to match the Recommended Daily Allowances of all the EAAs, would require a land use and a GHGE approximately equal, greater o smaller (by only ±1-fold), than that necessary to produce vegetal proteins, except for soybeans, that exhibited the smallest footprint.

In conclusion, this new approach downsizes the common concept of a large advantage, in respect to environmental footprint, of crops vs. animal foods production, when human requirements of EAAs are used for reference.

The paper here summarized is available on Scientific Reports | 6:26074 | DOI: 10.1038/srep26074 www.nature.com/scien www.nature.com/scientificreports/ tificreports/