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Assessing food security in water scarce regions by Life Cycle Analysis: a case study in the Gaza strip

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Food security is a major issue in Palestine for both political and physical reasons, with direct effects on the local population living conditions: the nutritional level of people in Gaza is classified by FAO as “insecure”. As most of the protein supply comes from irrigated agricultural production and aquaculture, freshwater availability is a limiting factor to food security, and the primary reason for frequent conflicts among food production processes (e.g. aquaculture, land livestock or different types of crops).
In this study we use Life Cycle Analysis to assess the environmental impacts associated to all the stages of water-based protein production (from agriculture and aquaculture) in the Gaza strip under different agricultural scenarios and hydroclimatic variability. As reported in several recent studies, LCA seems to be an appropriate methodology to analyze agricultural systems and assess associated food security in different socio-economic contexts. However, we argue that the inherently linear and static nature of LCA might prove inadequate to tackle with the complex interaction between water cycle variability and the food production system in water-scarce regions of underdeveloped countries. Lack of sufficient and reliable data to characterize the water cycle is a further source of uncertainty affecting the robustness of the analysis.
We investigate pros and cons of LCA and LCA-based option planning in an average size farm in Gaza strip, where farming and aquaculture are family-based and integrated by reuse of fish breeding water for irrigation. Different technological solutions (drip irrigation system, greenhouses etc.) are evaluated to improve protein supply and reduce the pressure on freshwater, particularly during droughts. But this use of technology represent also a contribution in increasing sustainability in agricultural processes, and therefore in economy, of Gaza Strip (reduction in chemical fertilizers and pesticides etc.).