

Energy Efficiency in Tomato Greenhouse Production. A Preliminary Study

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Keywords: greenhouse, tomatoes, energy efficiency

Abstract

Improved energy efficiency is the combination of efforts to reduce the amount of energy required to provide products and services. It includes all measures that are suitable to reduce specific components of the energy input, improving energy utilisation and contributing directly to the reduction of greenhouse gas (GHG) emissions. The AGREE project funded by the European Union aims to quantify the energy requirement (direct and indirect) of the various processes involved in agricultural production, in order to find where the largest gain in energy efficiency may be achieved. The approach is based on the life cycle analysis (LCA) of the primary production process and its direct inputs, up to the farm gate. This preliminary study on tomato (the most common greenhouse crop in EU) is based on data provided by Germany, Greece, Portugal and The Netherlands. In Central Europe the direct energy input (heating and, to a much lesser extent, electricity) is predominant, accounting for over 99% of the estimated total energy input of some 63 GJ t⁻¹ in Germany and 24 GJ t⁻¹ in the Netherlands, while in the Southern countries it accounts for 30-70% of a much smaller estimated total energy of 2.0 GJ t⁻¹. In Portugal, the indirect energy input is mainly associated with application of fertilizers and plastic cover materials, while in Greece it is associated with auxiliary equipment and materials (thermal screens and polyethylene based solarisation and covering films) and fertilizers. In conclusion, the scope for increasing energy efficiency in heated greenhouses is, obviously, to reduce heating requirement (or apply renewable sources). In the Mediterranean region there is a lot to be gained through a better management of fertigation, design improvements and the application of integrated control systems.

INTRODUCTION

One of the EU headline target indicators for Europe is “20% increase in energy efficiency” by 2020. It is anticipated that in the following decades energy demand and use will increase significantly and will have a widespread impact on the economy, including the agricultural sector. Energy efficiency is the goal of efforts to reduce the amount of energy required to provide products and services. It includes all measures that are suitable to reduce specific components of the energy input, improving energy utilisation and contributing directly to the reduction of greenhouse gas (GHG) emissions.

Agricultural production relies not only on the efficient use of solar energy by photosynthesis but to a great extent on the use of energy from fossil resources, either directly with the use of fuel or electricity or indirect with the use of agricultural

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