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Chapter 6

Challenges for Cost-Effective Microalgae Anaerobic Digestion

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Additional information is available at the end of the chapter

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1. Introduction

Microalgae, the common denomination for a broad group of photosynthetic prokaryotes and eukaryotes, are characterized by an efficient conversion of the solar energy into biomass. They are a promising feedstock for the production of third generation biofuels for several reasons:

1. Microalgae photosynthesis allows biological CO_2 fixation, which is expected to mitigate atmospheric CO_2 increase (Amin 2009; Brennan & Owende 2010; Mutanda *et al.* 2011).
2. Microalgae are 10 – 50 times more efficient than plants in terms of CO_2 fixation (Wang *et al.* 2008). Thus, microalgae can fix 1.83 tonnes of CO_2 per 1 tonne of produced microalgae (Chisti 2007).
3. Microalgae can be produced on non-arable areas such as lakes, oceans or deserts, thus reducing competition with food production (Mussgnug *et al.* 2010; Stephens *et al.* 2010). This advantage is a key factor when energy supply is considered in desert zones near oceans.
4. Some microalgae can grow under saline conditions, which strengthen the use of microalgae as feedstock for biofuel production in desert zones near the ocean when freshwater supply is not feasible.

Most of current efforts to take advantage of microalgae as a source of bioenergy are directed to biodiesel production, considering the ability of certain types of microalgae to accumulate lipids under controlled culture conditions. Microalgae biodiesel produced from microalgae lipids also presents technical advantages compared to lignocellulosic biomass based biodiesel.

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