Session 4: Cultivation Systems and Scale-up

BIOFAT: Business Plan for a 10 ha production plant

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BIOFAT is an FP7 demonstration project which main goal is to integrate proven production technology designs by Europe's most experienced microalgal biotechnologists, to produce strains with proven performances at outdoor cultivation, and develop this within the concept of biorefinery, in order to bring to the biofuel production from algae the economic viability that is currently required. The BIOFAT consortium has been exploring this concept in the past 4 years, and the project was structured in two stages: 1) process optimization in two pilot-scale facilities, each one-half hectare in size, in Italy (BCPP) and Portugal (BPPP); 2) economic and scale-up modeling to a 10-hectare demo facility.

The pilot units scale was selected as the minimum area sufficient to provide consistent information about: a) the LCA and b) the economic balance. The DEMO plant (> 10 ha) will be composed of 20 pilot unit modules, reducing largely the associated scale-up risks. BPPP, the Pilot Unit constructed at Portugal, was operated for more than 1 year. BCPP, the pilot unit installed in Italy is being operated since early summer of 2015. Both units will soon have enough data to allow a complete and final LCA and economic analysis.

Two Business Case scenarios were developed considering their installation in a high radiation profile zone, as 25 $MJ/m^2/d$ average annual radiation, and productivity close to 20 $g/m^2/d$ as result of a proxy developed based on the performance of the two Pilot Units, and an additional prototype unit installed operated in Israel. The two scenarios already evaluated included: a) production of Nannochloropsis biomass exclusively for biodiesel production and, b) production of Nannochloropsis biomass for biodiesel production and added-value products, enhancing the Business Case viability. The model for the Business Plan development is now developed and complete, and several scenarios will be evaluated based on the real data obtained in the project, after BCPP pilot data is available, in April/2016.

The scenarios that will be evaluated will include: Nannochloropsis and Tetraselmis production (the 2 strains of the project), two different technology approaches, exclusive biodiesel and bioethanol production, and the additional production of value added products as microalgae biomass powder or valuable extracts as EPA and PUFA's. The comparison of all this scenarios will bring a clear and realistic vision on the sustainability of biofuel production through photoautotrophic microalgae production, and the potential of the biorefinery approach to increase the sustainability that is currently required.