

B.1.3.2 Timing of work packages and their components

WP n°	WP title	Project month																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
WP 1	Algal and aquatic biomass state of the art																		
	T 1.1 Questionnaire preparation and circulation	■																	
	T 1.2 Major stakeholders and main R&D activities	■																	
	T 1.3 Status quo of major algae-to-biofuel R&D pathways	■																	
	T 1.4 Taxonomy	■																	
	T 1.5 Biology of Algae and other aquatic biomass	■																	
	T 1.6 Biotechnology	■																	
	T 1.7 Criteria for strain selection						■												
	T 1.8 Biofuels production processes from micro, macro-algae and aquatic biomass	■																	
	T 1.9 Mapping available natural resources in artificial, marine and freshwater bodies						■												
WP 2	Roundtable organisation																		
	T 2.1 Call for papers	■																	
	T 2.2 Roundtable logistic and management				■														
	T 2.3 Proceedings production									■									
WP 3	Overall economic, environmental and social sustainability of algae and other aquatic biomass based on biofuels																		
	T 3.1 Research needs									■									
	T 3.2 Technological assessment - major bottlenecks									■									
	T 3.3 Value added outlets for algae biofuels by products									■									
	T 3.4 Life cycle assessment									■									
	T 3.5 Impacts on developing Countries - food security - social labor implication									■									
	T 3.6 Environmental assessment									■									
	T 3.7 Economic assessment									■									
	T 3.8 Overall sustainability assessment									■									
	T 3.9 Recommendations for decision makers									■									
WP 4	Coordinating research																		
	T 4.1 EU Platform on related projects																		
	T 4.1 Barter agreements	■								■									
	T 4.2 Exchanging services	■				■				■				■				■	
	T 4.3 Synergic meetings	■				■				■				■				■	
WP 5	Dissemination and exploitation of project results																		
	T 5.1 Project awareness																		
	T 5.2 Academic dissemination											■							
	T 5.3 Industrial dissemination											■							
WP 6	consortium Management																		
	T 6.1 Daily activities																		
	T 6.2 Contractual and financial management																		
	T 6.3 Quality assessment																		

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WP 1 Algal and aquatic biomass state fo the art

Description of work (possibly broken down into tasks), and role of participants

Task 1.1. Questionnaire preparation and distribution the first task will be dedicated to the questionnaire preparation. The questionnaire will be differentiated per organisation category (academic, industrial, other). The preparation will be done during the first month, questionnaire will be circulated within the second month and feedbacks collected within the fourth month, in order to allow the integration and elaboration of feedbacks timely for deliverable preparation. The questionnaire will cover information on the issues of the following tasks T 1.2, T 1.3, T 1.5, T 1.6, T 1.7, T 1.8 T 1.9. An open questionnaire will be adopted, for the multiple choice questionnaire is considered inconsistent for the purpose of this analysis.

The methodology of analysis will be structured as follows:

- STEP1: drafting of a questionnaire structured by chapters according WP1 tasks.
- STEP2: selecting the organization to whom send the questionnaire in order to cover all aspects appropriately
- STEP3: sending questionnaires and collecting feedbacks
- STEP4: grouping questionnaires chapters according to the argument
- STEP5: sending grouped chapters to the reference partner
- STEP6: selected contribution will be collected and used for the preparation of surveys and assessments.

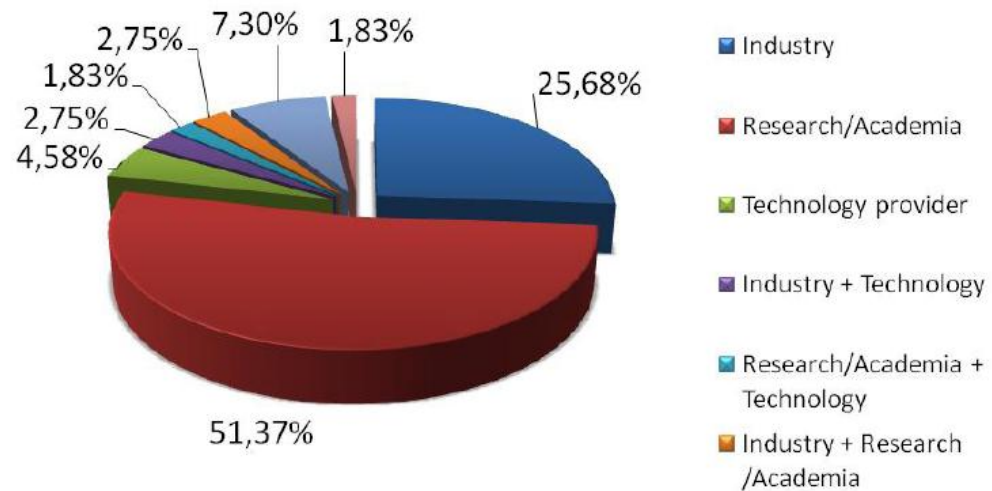
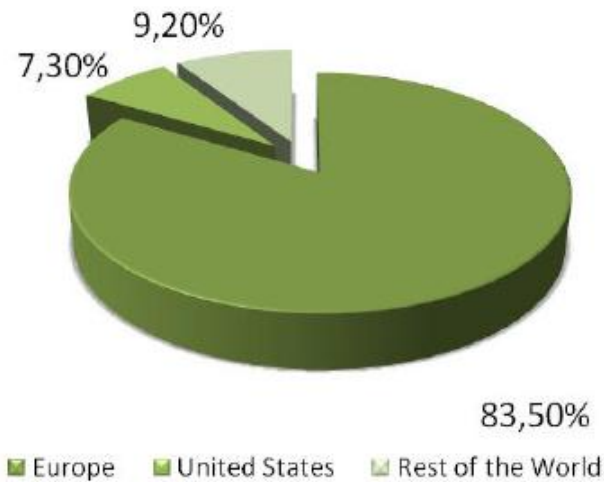
Task 1.2 Major stakeholders and main R&D activities Major stakeholders will be listed providing their profile (including research, commercial activities, etc). Academic, industrial and other interested groups (societal organizations, policy makers) will be included as well. It is worth mentioning that project partners can provide already more than 200 organizations profiles updated at 2007. This list will be revised, updated and widened. It is expected that at least up to 250 organizations will be finally listed.

ROLE OF THE PARTICIPANTS:

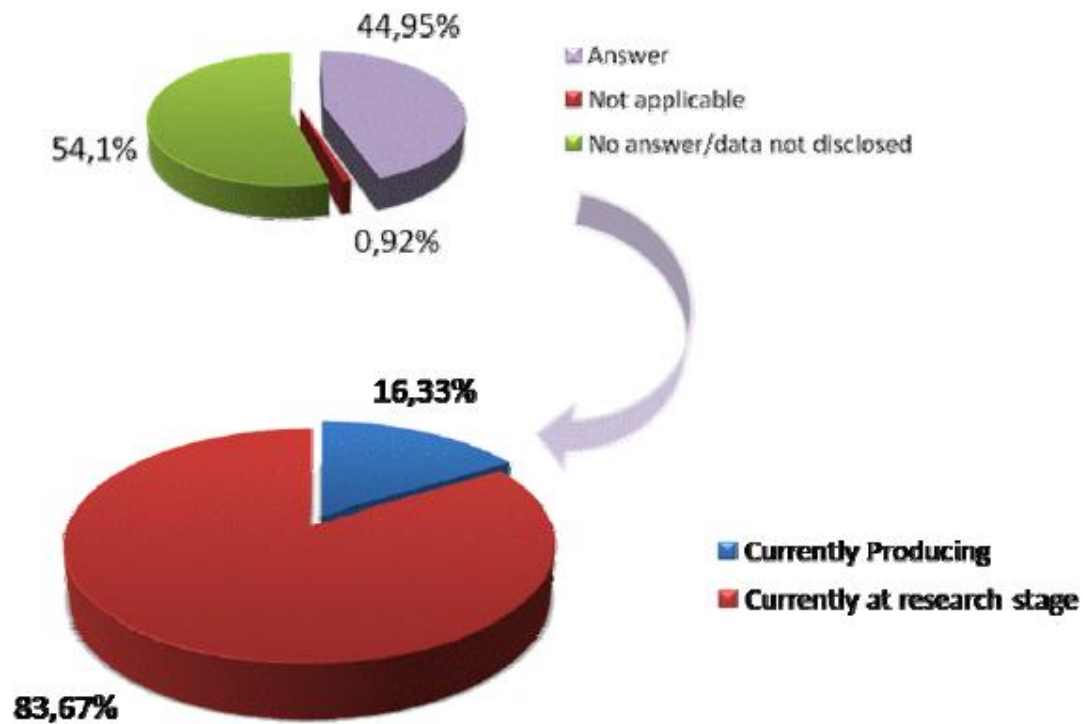
EBB and NE will coordinate together

Task 1.3 Status quo of major algae-to-biofuels R&D pathways This point is mainly intended to provide a first overview of major ongoing research and development pathways at the starting date of the project. No elaboration of the data collected is foreseen at this step. The elaboration will be instead done after the round table. In particular it is foreseen that the following pathways will be analyzed: (i) Algae-to-bioethanol (ii) Algae-to-biogas (iii) Algae-to-biodiesel (land and/or aviation transport) (iv) Biomass liquefaction by catalytic or thermal treatments.

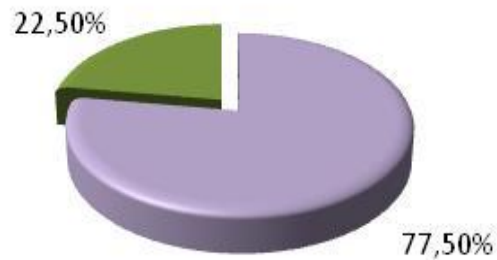
AquaFUELS questionnaire



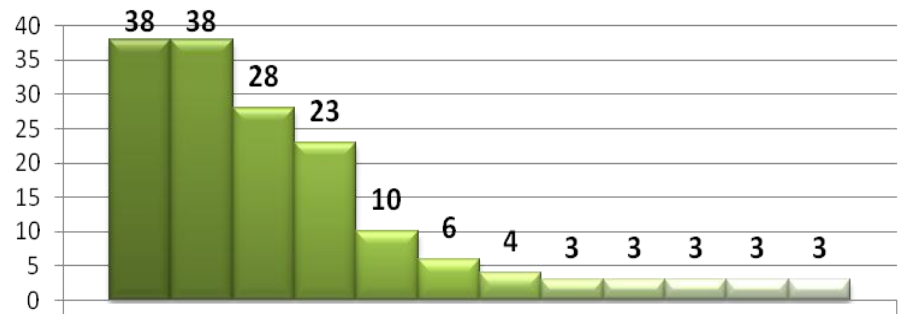
AquaFUELS Project – AquaFUELS questionnaire



AquaFUELS Project – AquaFUELS questionnaire



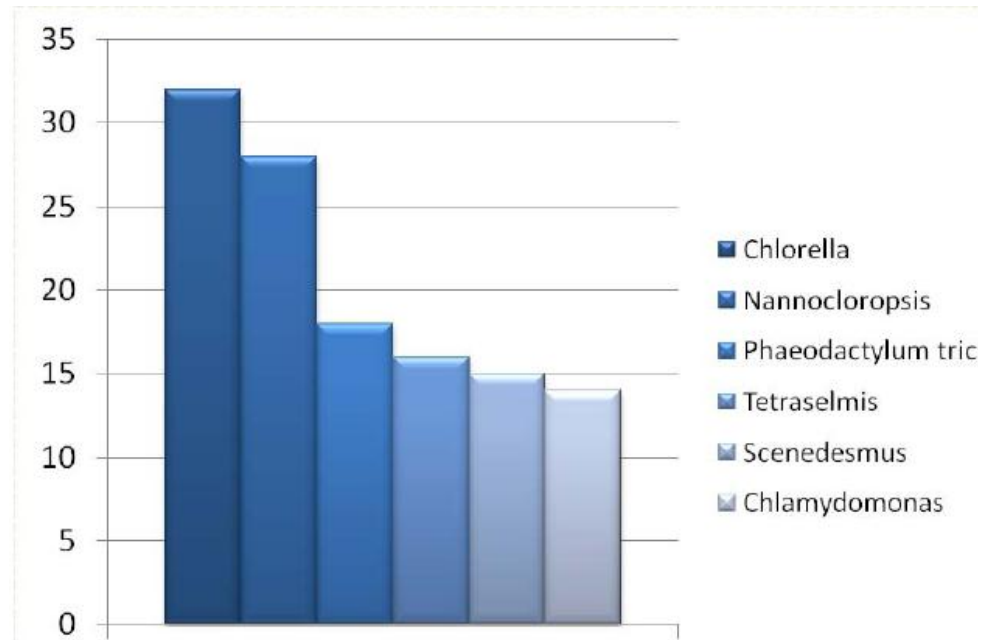
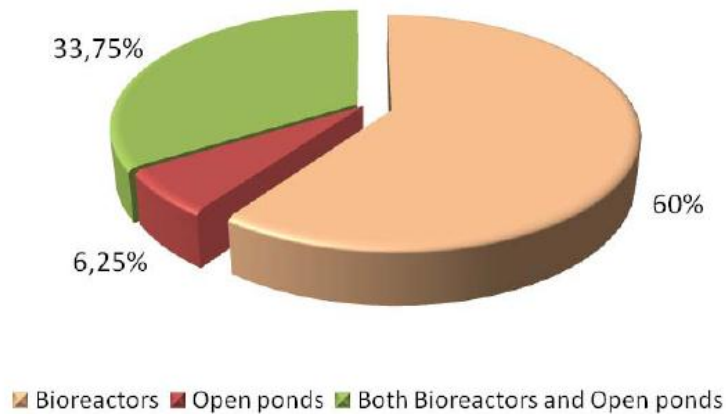
■ Energy
 ■ Other Final uses



Others final uses

- Feed and Food
- Aquaculture
- Fine chemicals
- Waste water treatment
- Enviroment remediation application
- Fertilizer
- Nutraceuticals
- Cosmetics
- Pharmaceuticals
- Pigments and colorants
- CO2Mitigation/storage
- Materials

AquaFUELS Project – State of the Art of algae biofuels



Task 1.5 Biology of algae and other aquatic biomass. This task will gather available basic scientific background information on biochemistry, biology, and physiology of algae and aquatic biomass:

- **General description of major divisions and classes** Algae and other aquatic biomass main divisions and classes; (in some cases also families) will be described. It is expected that a hundred of groups could be listed with their major characteristics. In some cases, relevant genera will be also dealt with. When useful, life cycles multiplication and reproduction strategies, will be described.
- **Main physiological characteristics of the families** will be provided bioenergetics (phototrophy, chemotrophy) and nutritional mo

Task 1.7 Criteria for strain selection This task will collect the present criteria for the most appropriate strains. This step is of particular importance, there is indeed a wide range of strains and the feasibility of biofuels production are greatly affected by this choice. It is foreseen that major criteria collected will be: (i) Robustness (ii) Productivity under natural conditions (iii) Chemical composition (iv) Harvestability (v) Growth on wastewaters and flue gases (vi) Biofuels yields. (vii) High growth rate, high temperature and CO₂ concentration tolerance, (viii) Content of starch and lipids in the cell.

Task 1.4 Taxonomy: due to the fact that a universal taxonomy for algae and aquatic biomass is not in use and often confusion is created because of lack or bad use of wording, a taxonomy functional to biofuel production will be produced. Existing taxonomies on micro and macro-algae and aquatic biomass will be revised under the light of biofuel production (external experts will validate the final taxonomy). The aim is to provide a common vocabulary to the project as well as to the audience at large. The taxonomy will be organized in 3 chapters: (i) Algae, (ii) Other Aquatic biomass.

Task 1.6 Biotechnology This task will gather information on biotechnology of Algae and other aquatic biomass, as it is reported in the following points:

- **Culture media:** main artificial (synthetic media for marine, saline or freshwater species); natural (media based on (freshwater, seawater or wastewaters); complex (media of non fully known composition for specific algae species) and defined (of completely known composition) media will be described.
- **Cultivation methods:** batch, semicontinuous and continuous cultivation methods
- **Production systems:** a) laboratory, b) pilot c) demonstration, and industrial systems; a) photobioreactors, b) ponds, c) tanks, d) lagoons
- **Harvesting methods** (i) Centrifugation, Filtration, Flocculation, Sedimentation (microalgae) (ii) manual or mechanical
- **Biomass processing** (i) dewatering (ii) extraction (oil, carbohydrates, proteins)

Task 1.8 Biofuels production processes from micro, macro-algae and aquatic biomass. This task will detail present technologies to transform algae and other aquatic biomass in biofuels. The aim will be to cover all known technologies, ranging from those that are already been demonstrated, methods and production systems functional

Task 1.9 Mapping of available natural resources in artificial, marine and freshwater bodies. The task will collect the necessary information to understand the sustainability of algae technologies to produce biofuels. The results obtained will be used to elaborate the successive assessment studies with particular reference to environmental and social sustainability (non food competition, use of arable lands). Mapping will cover both natural resources for algae and other aquatic biomass, as well as land resources necessary to open ponds or photobioreactors for massive production of microalgae. Natural blooms and wastewater streams and polluted rivers and lakes will not be forgotten. The partners have already started such work and are collaborating with some projects, such as PROMICROBE (3 Meuros, 7 participants, ongoing).

WP 3 Overall economic, environmental and social sustainability of algae and other aquatic biomass based on biofuels

Task 3.1 Research needs This task will provide a view of major research needs, areas where it is necessary to further improve our understand of basic phenomena at four level.

- **At molecular level:** (i) Improving plant material, potential GMOs able to enhance photosynthetic efficiency and productivity outdoors (long term) (ii) Obtaining GMOs able to increase production of desired cell constituents (e.g. lipid or carbohydrates)
- **At biochemical level:** (i) Understanding the pathways leading to the synthesis of main constituents and/or specific molecules of interest as bioenergy sources (e.g. TAGs) (ii) Use of stresses to increase synthesis and/or accumulation desired polymers-molecules
- **At cellular level:** (iii) Understanding cell cycles to improve growth (iv) Optimizing nutrition and efficiency of utilization of nutrients
- **At ecosystem level:** (i) Study interactions of algae and OAB with their associated (mainly bacterial) organisms to enhance the homeostasis of the system (ii) Understand synergistic and inhibitory relationships to improve stability of outdoor cultures (iii) Impact on the environment of large scale systems for production of aquatic biomass (local, regional, global) (iv) Ecological and carbon foot print of algae and OAB systems.

It is opinion of the Consortium that before launching reliable roadmaps, a thorough assessment is needed; up to now, there are too many not reliable figures in the industrial field. There is hence a VERY HIGH RISK to favor the diffusion of unproven technology could end up in the delusion of the stakeholders and society at large. It is a promising and strategically important field such as that of Algae; for this reason, the task would be to identify future research improvements/Breakthrough technologies that will serve as a base for a further development aimed at the benefit from all stakeholders (from scientists, to industry, policy makers, NGOs).

Task 3.2 Technological assessment - Major bottlenecks This task will concentrate on those technological aspects that could potentially represent major limitations to the future development of the technology: (i) Main limitation of large scale cultivation; (ii) Harvesting and dewatering (iii) Biomass extraction (iv) Quality of the final biofuel product, correspondence with fuels' standards, engine adaptability. Partners will be supported by UNCTAD

ROLE OF THE PARTICIPANTS:

EBB (standardization); DI and BIOP (biodiesel large scale production); IMIC (bioethanol and integration in power plants; CO₂ sequestration); WU, BGU, UAL and NE (all biofuels)

Task 3.3 Downstream by products - Value added algae biofuel byproducts: This task will concentrate on the downstream of the technology, assessing which chemicals/nutraceuticals from micro macro-algae and aquatic biomass can be produced from algae and for which applications (Pharmaceuticals, Agrochemicals food and Feed applications).

ROLE OF THE PARTICIPANTS:

EBB (Reach and standardization); RF (technology, potential markets, applications); UAL and UGENT supporting RF

Task 3.4 Life cycle assessment and net energy balance (NER) of the different algae and aquatic biomass-to-biofuels production pathways (eventual CO₂ sequestration and use of waste water) will be performed using information from existing literature resources and the industrial contacts of the co-ordination action. The inputs and outputs from the work will be validated through the stakeholders and the roundtable discussions prior to finalisation.

The Life Cycle Assessment will be assessed following the methodology standardized by norms ISO 14040, and consist of two steps: goal and scope definition of the analysis Life Cycle Inventory, Life cycle Impact assessment and interpretation.

WP 4 Coordinating research

Task 4.2 – Barter Agreements preparation and signing. Long and medium term cooperation agreement, i.e barter agreements, will be concluded with relevant actors in order to ensure maximum information exchange and always stay updated on the newest policy development and priorities in exchange for dissemination opportunities. The Agreements will be signed within the first 4 months. It is expected that up to 20 agreements will be signed.

ROLE OF THE PARTICIPANTS:

EBB barter agreements preparation supported by LM

UNIFI selection of most interesting funded projects with whom exchange the agreements

Task 4.3 – Exchanging services. Services that could be required are:

- Participation to project meetings as external observer
- Participation to the round table
- Contribution in the assessments produced by the project
- Collaboration for the organization of a dissemination workshop
- Participation to the final conference

Task 4.1 – Creation of a network and joint communication platform of European flagship projects.

This task will be dedicated to the identification and categorisation of past and ongoing EU flagship projects with particular reference to the following EU Programmes: V, VI and VII Framework Programs, Intelligent Energy Europe, Cost, Eureka, Eurostars.

The projects will be catalogued in separated database, recording, per each project, the following information: Coordinator, participants, abstract, eligible costs, overall funding, start/end date. Further, the project will be motivated to actively participate to the exchanging of information concerning present events, ideas, etc on Algae world (discussion forum)

The Joint communication platform will be included on a dedicate page of the WEB portal. The project will benefit from ongoing and past initiatives such as:

- **BIOMAP** project (mapping project on biofuels), partnered by EBB
- **BIOMANET** project (mapping projects on biomaterials and biomass), contacted
- **CORDIS** databases on V, VI and VII FP, public
- **IEE** project collection publications

Thank to these links the efforts needed to carry on this task effectively will be greatly reduced, and overlapping/carbon copy with other initiatives avoided.

The ongoing most interesting projects will be contacted and included in the dissemination mailing list of AquaFUELS, they will be provided with project brochures and flyers. Whenever appropriate, they will selected for the signing of a barter agreement aimed at exchanging specific services/information (see Task 4.2).

WP 5 Dissemination and exploitation of project results

Task 5.2 – External dissemination. Objective of this task is to promote the dissemination of project results in the European industrial and scientific communities.

The following means and channels will be used in the dissemination of results:

- Project LOGO (**ALREADY PREPARED**), project brochure and flyer, project posters
- Project presentation events:
- Project presentation via Cordis and other web based platforms (permission also to FAO and UNCTAD and other organisations participating to the Expert Group)
- Project presentation via National Contact Points network in EU and world (contacted and alerted)
- Project presentation to the network created (more than 300 organisations will be contacted)
- Project presentation to Technology Platforms related
- Project presentation to the industrial network with whom the partners are collaborating
- Scientific publications such as Journal of Applied Phycology, European Journal of Phycology, Hydrobiologia, Marine Biology, Marine Biotechnology, Biomass Energy from Biomass, Biotechnology & Bioengineering, J Appl Microb, Aquatic Microbiol, J Bioethnol, Appl Microbiol Biotechnol, (50 papers are worth mentioning that the Consortium hold hundreds of publications over the years in the field);
- participation to national and international scientific conferences, such as the 10th Int. Society for Applied Phycology to be held in Canada in 2011; Congress Latino Americano de Biotecnología Algal to be held in Chile in 2009; Workshop on Microalgae and Seaweed Products in Agriculture to be held in Hungary in 2009; Europ Workshop "Biotechnology of Microalgae"; The 2009 Algae Biomass Summit in California (USA); The 9th Int Marine Biotechnology Conference; The 7th Int Algae Biomass Summit in California (USA);

Task 5.1 - Public awareness of the project and internal dissemination. This task will be dedicated to increase public awareness of the project beyond the research community, this goal will be achieved through the creation of project web platform (portal) which will foresee a public area addressed to non specialist, in which the project results will be included with clear and comprehensible language. The web portal will be included in searching engines of the web (google, etc) and linked to other project web sites. Non specialist publications are foreseen at regional, national and European level.

Task 5.4 – Establishment of the European Association on Algae. EU Scientific and Industrial Association on algae and other aquatic biomass will be created, opened to all stakeholders interested to join and contribute, starting from a core group represented by project partners. The

general objective of this EU Association will be to promote mutual interchange and cooperation in the field of algal biomass production and use. It will aim at creating, developing and maintaining solidarity and links between its Members and at defending their interests at European and international level. Its main target will be to act as a catalyst for fostering synergies among scientists, industrialists and decision makers in order to promote the development of research, technology and industrial capacities in the field of algae.

THE ASSOCIATION STATUTE HAS ALREADY BEEN APPROVED AND SHARED AMONG PARTNERS and is included in ANNEX 1.

The Association has been presented and launched during the first session of the World Biofuel Market Annual Conference from 16 - 18 in Brussels, March 2009 (850 participants, including all major European and International stakeholders on biofuels sector). A web platform has already been prepared: www.eaba-association.eu.

It is expected that up to 50 organisations will join the Association within the end of the project.

Further the Association will link itself with national initiatives such as the Flemish Association (chaired by UGENT, AquaFUEL partner). It is expected to link with ONE organisation per member state, for a total of 25 organisations.

The Association activities will be:

- Establishing a permanent liaison with EU and EU Member States' Institutions
- Defining and expressing a common position on EU issues (legislation, product specifications, trade and sustainability standards, etc.), acting as a technology neutral platform
- Representing the European algae biomass industry and scientific community at international level
- Spreading scientific information and knowledge about algae biomass and biofuels production
- Making algae research and industry alive in public debate
- Promoting investment and financial support in the field of algae

ing and planning of research and industrial development on algae
freedom as well as responsibility
nic and technical problems which may impact the algae sector in the
related countries
boundaries on algae
ing of scientific information and the publication of sound articles



1st EABA Conference and General Assembly was held

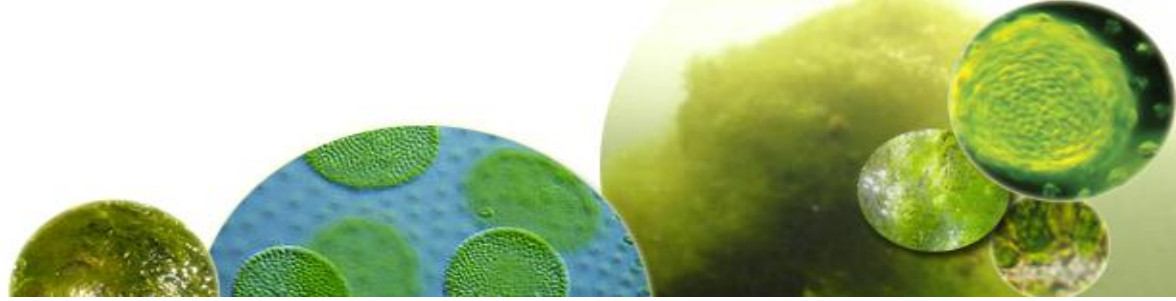
*June 3-4, 2009 at the Home of the New York University
in Florence, Italy*





EABA membership





EABA members

- EABA membership across Europe: **77** members as of today
 - **36** industrial members,
 - **28** scientific and
 - individual or associates (from outside EU)
- Private companies or research organisations are directly members of the EABA
 - Directly federates legal entities at EU level (no national filters)
 - Large part of reference EU academia and research
 - Multinational companies of the Agricultural processing and biofuels sectors
 - Industries from the fossil fuels and renewable energy sector
 - Engineering companies
 - Algae start-ups or algae research spin-offs



The EABA what for?

Algae-based biofuels need to be defined in the EU legislative framework:

- EU Directive on Renewable Energies
- **UNCLEAR if algae are in the group of biofuels made from wastes residues, non-food cellulosic material, ligno-cellulosic material (and algae?) counting double**
- **No CO₂ emission default values for algae-based biofuel exist**
- **European fuel norms (CEN): EABA works on normalisation with EC Commission – mandate in preparation**
- **Definition itself of algae as biomass is at stake and needs to be defended**

Algae must be in the review of the next EU animal feed legislation

If no initiative at these levels is taken algae risk to remain a theoretical promise and not to become a real opportunity



New EU Catalogue of Feed materials

EABA has obtained 6 new entries for feed materials produced from algae

Name	Description	Compulsory declarations
Dried algae	Product obtained by drying algae. This product may have been washed to reduce the iodine content.	Crude protein Crude fat Crude ash
Algae meal	Product of algae oil manufacture, obtained by extraction of algae.	Crude protein Crude fat Crude ash
Algae	Whole or enriched algae live or processed, regardless of their presentation, including fresh, chilled or frozen algae.	Crude protein Crude fat Crude ash
Algae extract	Watery or alcoholic extract of algae that principally contains carbohydrates	none
Seaweed meal	Product obtained by drying and crushing macro-algae, in particular brown seaweed. This product may have been washed to reduce the iodine content.	Crude ash
Algal oil	Oil obtained by extraction of algae.	Moisture if > 1%



Who's Who of algae stakeholders

AquaFUELS project report on algae stakeholders
(report available on www.aquafuels.eu)

Creation of an EABA Who's Who of algae stakeholders over
1. 000 stakeholders listed with full detail

will be presented at the EABA Conference in November

SAMPLE PAGE →



Who's Who Sample page:

Academia and Research

NEWCASTLE UNIVERSITY – SCHOOL OF MARINE SCIENCE AND TECHNOLOGY
United Kingdom

Professor Dr. Gary Caldwell

NE1 7RU, United Kingdom
+44 191 222 6660
gary.caldwell@ncl.ac.uk
www.ncl.ac.uk



Professor Gary Caldwell has a keen and active interest in the continued development of algae (both micro- and macroalgae) as potential sources of marine biofuels. Professor Gary Caldwell leads an active and growing research group addressing a diverse range of marine bioenergy topics, and currently has programmes funded by research councils, industry and local and national government. He is leading programmes in seaweed anaerobic digestion; microalgae culture management for biodiesel production; microalgae bioflocculation and harvesting; and energy production from marine biomass wastes.

Main interest

Microalgal chemical ecology; manipulation of algal physiology and culture performance;
Anaerobic digestion using algae as feedstock

Production or Research

Pilot 1 Carbon Trust Algal Biofuels Challenge project
ITI Energy Seaweed Anaerobic Digestion
Several algal biofuel related PhD programmes

**Questionnaire is
available at
AQUAFUEL/EABA
websites.**

**Fill it and send to
EABA!**



2011 EABA European Algae Conference and Expo:

November 29th-30th, 2011, Brussels

with Evening debate in the EUROPEAN PARLIAMENT (November 29th, 2011)

www.eaba-association.eu



For more information visit the EABA Web-portal: www.eaba-association.eu

Or send your questions to:

eaba@eaba-association.eu

