Proposal full title:

Algae and aquatic biomass for a sustainable production of 2nd generation biofuels

Proposal acronym:

AquaFUELs

Type of funding scheme:

Cooperation
Theme 5 – Energy

Report on the questionnaire

Name of the coordinating person:

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REV	Date		Organisation	Beneficiaries involved	Dissemination level
Rev 0	20 June 2010	Raffaello Garofalo Pierre-Antoine Vernon	EBB	EBB	PU
Rev 1	04 August 2010	Laura Martinelli	LM	EBB	PU
Rev 2	15 October 2010	Pierre-Antoine Vernon	EBB	EBB	PU
Rev 3	19 October 2010	Pierre-Antoine Vernon	EBB	EBB	PU

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1 The questionnaire

The European Biodiesel Board (EBB), as coordinator of AquaFUELs as well as the European Algae Biomass Association (EABA), sent a questionnaire to the algae stakeholders all around the world, in order to establish the status quo of development of algae biomass and algae based biofuels at international level.

The aim of this questionnaire is to create a Who's Who Directory and Survey on algae stakeholders at European and international level. For the project AquaFUELs itself, the questionnaire (Task 1.1) will not only form the basis of the other deliverables of the State of the art of algae biofuels (WP1), because it will also be instrumental in the development of the European Algae Biomass Association (EABA) (Task 5.4/ Milestone 4.2). From a broader perspective, this survey aims to be a simple, clear and practical tool for algae stakeholders by putting together all members of the emerging algae community.

It was decided to adopt an open questionnaire instead of a multiple choice questionnaire, which is considered inconsistent for the purpose of this analysis.

The full structure of the questionnaire it is presented below, while its text is shown in Annex I.

FIRST PART

1) General description of the organisation
2) Algae biomass core business: production and/or research, the final use of the products, the algae strains, and the technology employed.
3) Research project involvement

SECOND PART

4) Basic information about the organisation, such as name and contacts.
5) How long has the organisation been active in the algae sector.
6) Perspectives of interest in the algae biomass sector, with a reference to: animal feeding end uses, and the aquaculture end uses.
7) Liquid biofuels production processes and end uses.
8) Sustainability and energy balance of algae biofuels production with a reference to the Energy balance of algae to biofuels production chains.
9) R&D pathways and research projects
10) Biology of algae and algae strains
11) Biotechnology
12) The kind of technology that employed/researched on or plan to employ in terms of:
    - Culture media

- Cultivation methods
- Production systems
- Harvesting methods
- Biomass processing

Inside this part, it also asked if the organisation plan or focus algae genetic modifications GMOs or natural selection and reproduction.

13) Criteria for strain selection
14) Mapping of available resources

The questionnaire is divided into two parts, the first one with basic questions, while the following one has more detailed questions:

- The first part was designed to fit on one page and request only a few minutes of ther respondents' time, while capturing the essential information about the organisation and its activities related to algae biomass sector; this degree of information corresponds to that of the intended Who's Who Directory, making its creation a straightforward operation provided that the first part of the questionnaire has been filled in.
- The second part goes into greater details regarding the activities of the organisations in the algae biomass sector, their technologies and futures projects. The detailed information from this section of the questionnaire will form the basis for the WP1 deliverables focused on algae biology, biotechnology, the strains used and/or researched upon, the potential final uses and the biofuels technologies considered. On the longer term, this information will also form the basic picture of the industry practices for the European Algae Biomass Association (EABA), taking stock of the evolution of the technological innovation from research to commercial production at large scale. A better picture of the industry practices also allows a better promotion of the algae sector.

- The final part of the questionnaire is dedicated to the EABA activities, and to the interest of the organisation in EABA membership and in taking part to AquaFUELs Expert Group (EG) created within the AquaFUELs, whose members have been and are being selected based on their expertise among internationally recognised organizations worldwide distributed (from EU, to US and Japan).

In conclusion of the questionnaire, there is a reference to the Roundtable among the major stakeholders organized by AquaFUELs, on October 21st–22nd, 2010.

The objective of the Roundtable will be to promote critical thinking and reasoning on actual state of the art of research, development, and industrial initiatives in EU and outside with particular reference to technological and non barriers, economical, environmental and social implications of algae biofuels. Respondents are invited to express their interest in participating in the Roundtable.

This Directory aims to provide accurate and up-to-date information about the status quo of public and private initiatives in the field of algae biomass and their actual level of development.

It will include EU and global industrial and academic initiatives (in separate sections), as well as individuals and companies with activities and/or simple interest in this field (i.e. commercial airlines, engineering companies, etc.).

2 The working group

The working group active in creating the questionnaire, and in the elaboration of the results is composed by Raffaello Garofalo and Pierre-Antoine Vernon, from EBB, Mario Tredici from the University of Florence, from Vitor Verdelho Vieira by Necton, and by Laura Martinelli from Studio Martinelli.

The methodology of analysis it was structured as follows:

- STEP1: a questionnaire structured was draft by chapters according WP1 tasks.
- STEP2: we selected the organizations to whom send the questionnaire in order to cover all aspects appropriately.
- STEP3: we sent the questionnaires and collected the 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.

Taking into account a well known trend in data collection for statistics, the division into two parts was decided as an incentive for organisation to respond to at least part of the survey if they cannot provide more in-depth information. Following this first part, EBB sent several reminders for contacts having not responded and kindly invited the respondents of the first part to extend their input. This strategy can be related to the relatively high response rate recorded.

3 Findings

In detail, 52 respondents have filled in only the first part, 1 respondent has filled in only the second part, while 56 respondents have filled in both the first and the second part of the questionnaire.

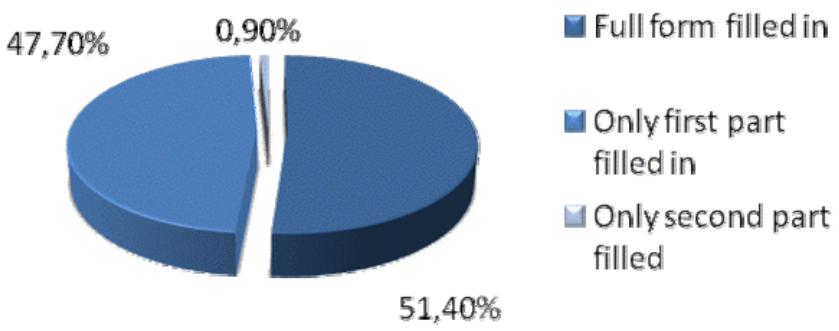

Figure 1 – Respondents

The questionnaire was received to all known algae stakeholders all around the world, although mainly the EU and the US are represented – a total number of **622 contacts**.

The list includes researchers and research institutes, algae producers and users, technology providers, biofuels producers, oil companies, airlines, car and aerospace industry, national public authorities, international organizations including the FAO, EU institutions, NGOs and industry associations.

The mailing list used includes the AquaFUELs consortium and Expert Group, the EABA members and a mailing list specifically covering algae stakeholders, developed and regularly updated by EBB since in mid-2008 on the basis of databases from different networks in the algae community.

In addition, the AquaFUELs partners forwarded the questionnaire to their own network, which implies that the questionnaire effectively reached many more algae stakeholders than the intended mailing list.

From the 622 contacts, 111 respondents returned a filled-in questionnaire, that means that the 17,52% of stakeholders contacted answered to the questionnaire. 109 questionnaires have been received from April 17th until June 14th, 2010. The additional submissions received since then will not be reflected in the AquaFUELs deliverables, but will be integrated during the update of the EABA Who's Who Directory.

According to the location of the respondents, 91 are based in Europe (Israel and Turkey not included), 8 respondents in the United States, while the remaining 10 respondents are located in the rest of the world.
As shown in the picture below, this corresponds respectively to the 83,5%, 7,3% and to the 9,2%.

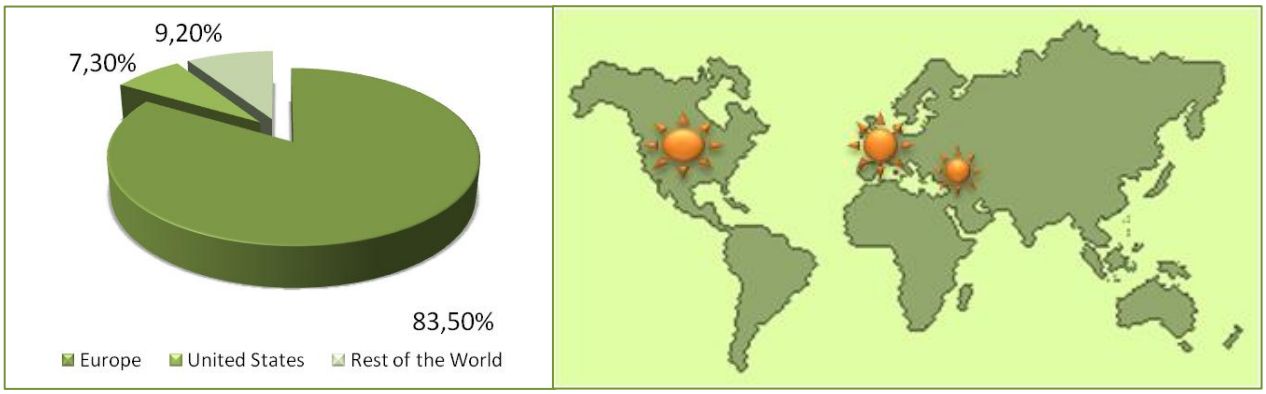

Figure 2 – Location of the respondents

The respondents belong to different sectors: 28 respondents belong to the industry sector, 56 to research and / or academia, which corresponds respectively to 25,68% and to 51,37%. 5 respondents are technology providers, 3 work in the sector of industry and technology, while 2 belong both to the industry and to the research. 8 respondents did not specificy the sector they belong to, while 2 works in other different sector not specificated. The chart below displays these results.

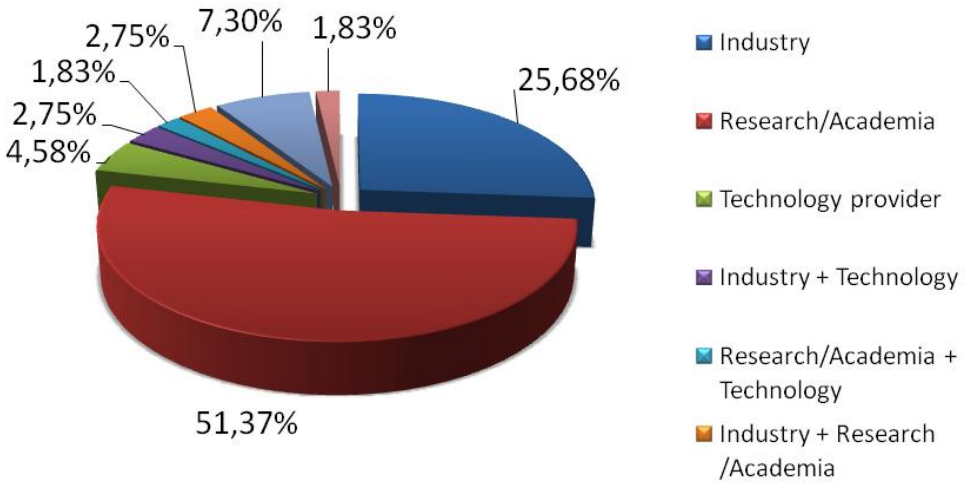

Figure 3 – Sectors of the respondents

To the question about the main interest in algae, 90 respondents answered while others did not. 81 respondents have "upstream" interests such as algae productivity, biology, technology, engineering, while the remaining part has interest "downstream" interests: final use of algae, advocacy of the algae industry, consultancy. These aspects are shown in the chart below.

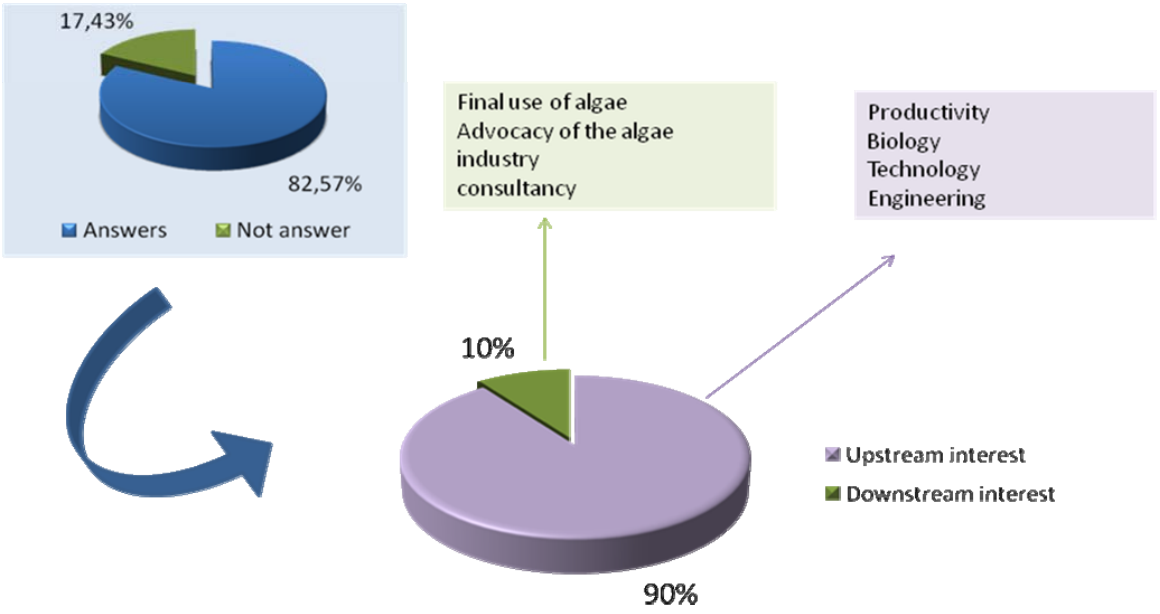

Figure 4 – Main interest

The question about the algae biomass production and/or research received 49 answer, 1 was not applicable, and the remaining 59 did not answer or did not disclose data.

Amongst the 49 respondents to this section, 8 are currently producing but none of them is producing above 5 tonnes/year. In addition, 12 respondents have projects for the next years. Finally, 32 respondents are currently working in laboratories.

These results are displayed in the picture below.

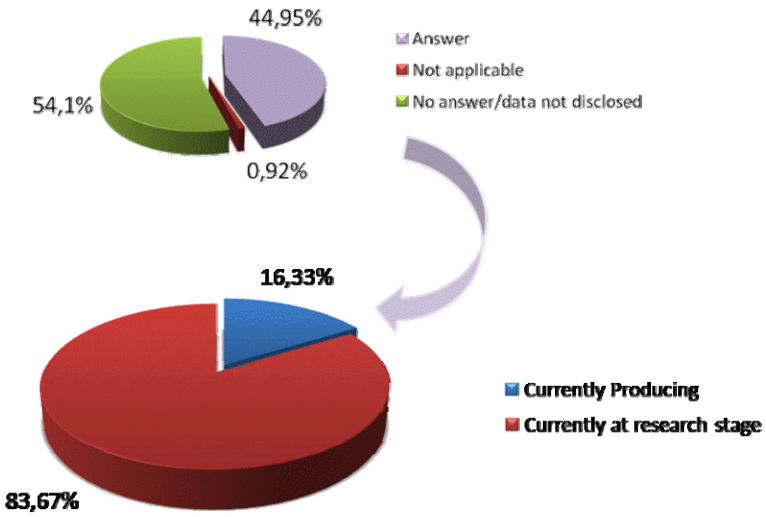

Figure 5 – Algae biomass production and/or research

Regarding the final use of the product, 80 answered this question (73,4%), while 29 did not answer (26,6%), as shown in the chart opposite.

The greatest share of the respondents (77%) declared energy as their final uses.

In details, 10 of them mentioned biodiesel as final use of their product, 7 mentioned bioethanol, 5 biogas (e.g. methane, hydrogen), 1 SVO, 1 methanol.

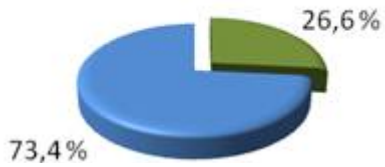

Figure 6 – Final use – reponse rate

On the contrary, 48 respondents did not further specify their final use within the energy sector. Other final uses include:

- Feed and food 47,5%
- Nutraceuticals 47,5%
- Aquaculture 35% (28) of the respondents to this section (80)
- Cosmetics 28,75% (23)
- Fine chemicals 12,5% (10)
- Pharmaceuticals 7,5% (6)
- Waste after treatment 5% (4)
- Pigments and colorants 3,75% (3)
- Environment remediation applications 3,75% (3)
- CO_2 mitigation/storage 3,75% (3)
- Fertilizer 3,75% (3)
- Materials (e.g. building materials) 3,75% (3)

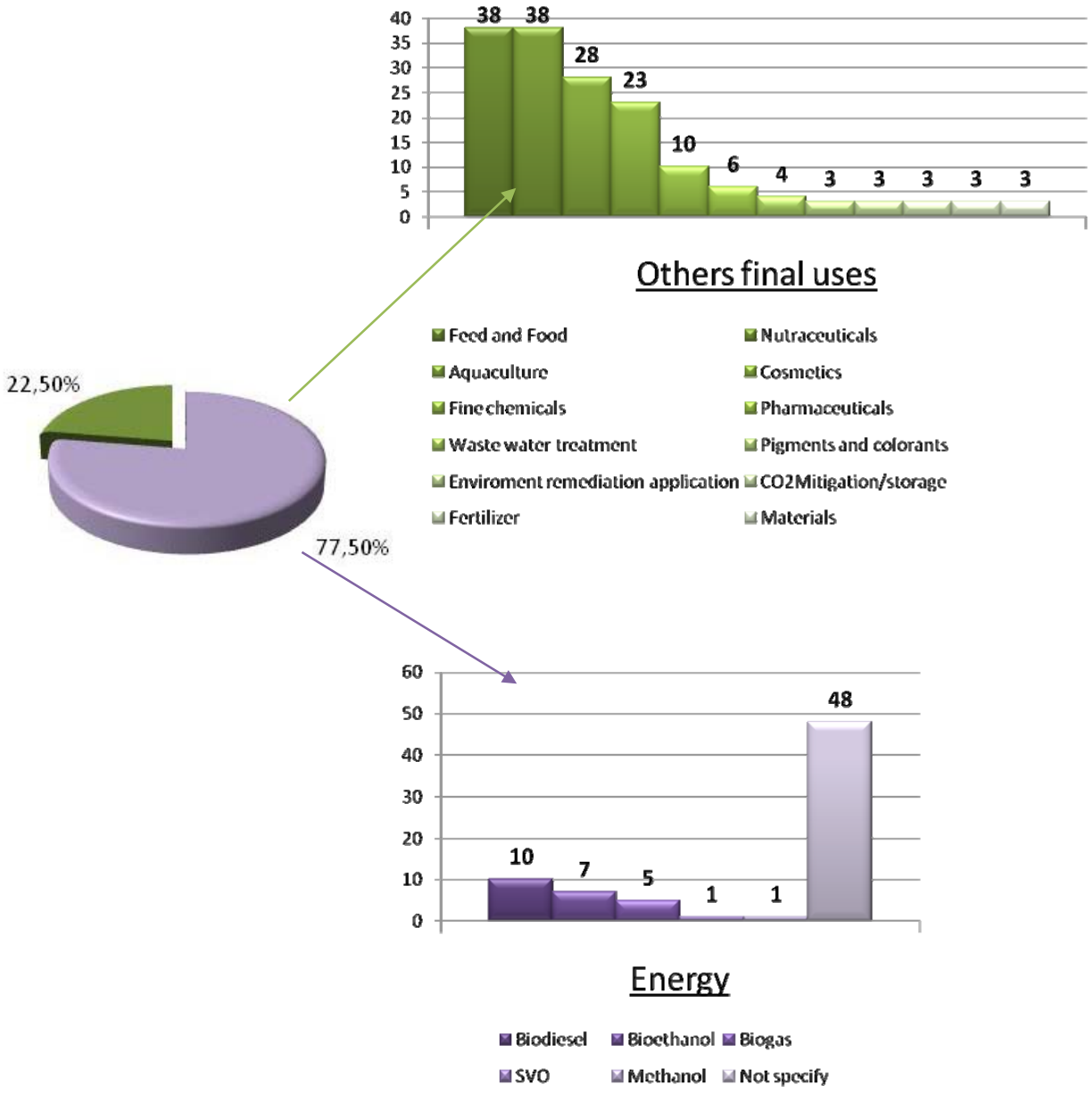

Figure 7 – Final use of the product

With particular reference to the energy implication of algae, the results obtained from the questionnaire indicate that the 11,25% of respondents (9 out of 80) admitted to considering only energy as the final use of their product.

The 73,75% of respondents (59 out of 80) considered energy to be complementary to other final uses for their product. 15% of respondents (12 out of 80) declared considering final uses other than energy.

The chart below displays these results.

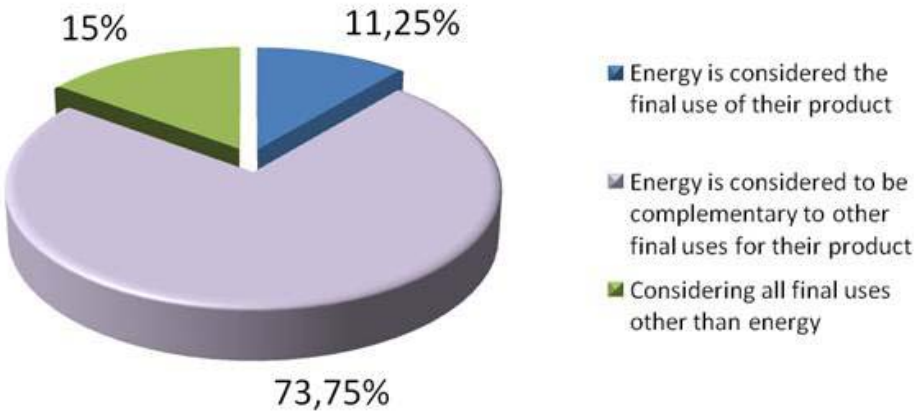

Figure 8 – Final uses

According to the algae strains, the number of questionnaire answered are 67, 32 respondents did not answer, while the remaining indicated that this information was not disclosed/not applicable/confidential data. The respectively percentages are shown in the picture above.

Figure 9 – Percent of answer to the question about algae strains

According to the survey, the algae strains most commonly farmed are the following:

- Chlorella: 32 out of 67 respondents (47,8%)

- Nannochloropsis: 28 out of 67 respondents (41,8%)
- Phaeodactylum tricornutum: 18 out of 67 respondents (26,9%)
- Tetraselmis: 16 out of 67 respondents (23,9%)
- Scenedesmus: 15 out of 67 respondents (22,4%)
- Chlamydomonas: 14 out of 67 respondents (20,9%)

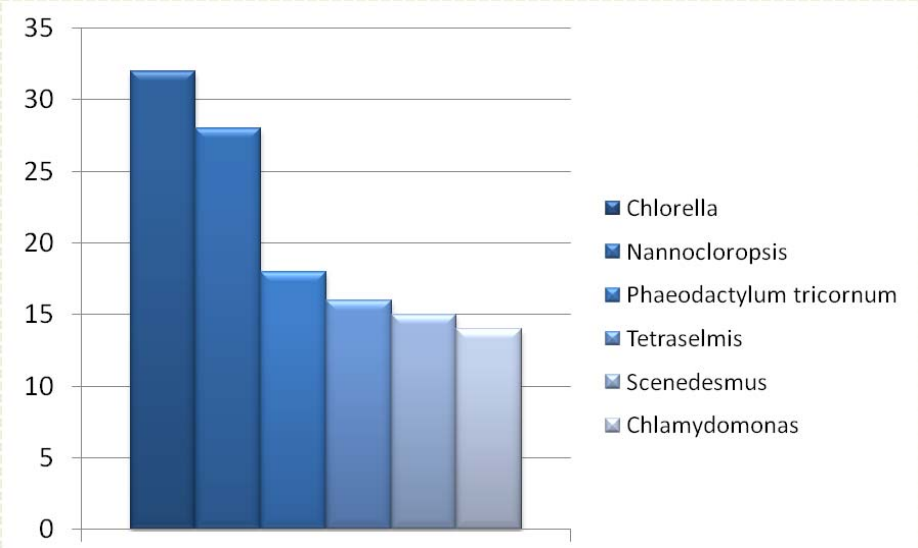

Figure 10 – Algae strains

Finally, we received 80 answers regarding the technology used, while 24 respondents did not answer this question and 5 were not applicable. The results are shown in the chart (opposite).

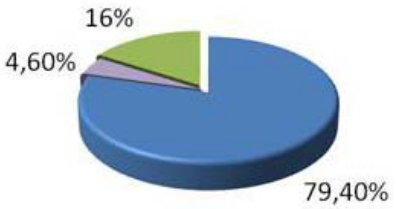

Figure 11 – Percentage of answer

The main technologies used are:

- Photobioreactors, indicated by 48 respondents (60%)
- Open ponds, 5 respondents (6,25%)
- Photobioreactors and open ponds, by 27 respondents (33,75%).

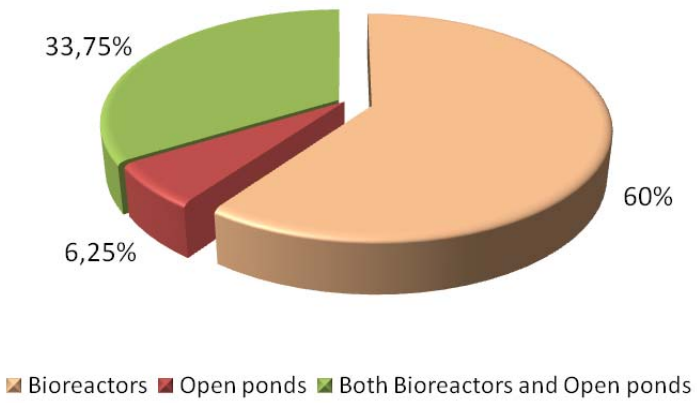

Figure 12 – Technology

14 respondents use other technologies, such as:

- Batch scale in Erlenmeyer
- Lyophilisation
- Diaforce techonology
- High and low pressure extraction vessels
- Classical and molecular genetics methods
- Own design
- Harvesting and monitoring control system
- Laboratory cultures
- Biosensor for algae cultivation
- Flat panel airlift reactors
- Green wall
- Cultivation platforms

Despite the lower response rate than for other questions, respondents reported that they use, research upon or have an interest in 64 different geni of algae (strains were seldom specifically mentioned).

Alaria 1
Alexandrium 2
Amphidinium 2
Anabaena 5
Ascophillus 2
Asparagopsis 1
Asterionella 1
Bangia 1
Botryococcus 5
Calothrix 1

Chaetoceros 1
Chlamydomonas 14
Chondrus 1
Cladophora 1
Chlorococcum 1
Cyclotella 2
Chlorella 32
Cylindrotheca 1
Dunaliella 10 (salina 7, tertiolecta 3)
Ectocarpus 1
Emiliania 2
Fragilariopsis 1
Gracilaria 2
Grateloupia 1
Haematococcus 7
Halymenia 1
Heterosigma 1
Isochrysis 12
Karlodinium 1
Laminaria 3
Leptolyngbya 1
Lynbya 1
Microcystis 1
Monoraphidium 1
Muriellopsis 2
Nannochloropsis 28
Neochloris 2
Nostoc 3
Oocystis 2
Odontella 1
Palmaria 1
Pavlova 4
Phaeodactylum tricornutum 19
Physcomitrella 1
Phormidium 8
Porphyra 1
Prorecentrium 1
Protoceratium 2
Pseudokirchneriella 2
Rhodobacter 1
Rhodomonas 3
Saccharina 1
Sacchoriza 1
Scenedesmus 15
Schyzothrix 1
Seminavis 1

Skeletonema 2
Scripsiella 1
Synechococcus 4
Synechocystis 3
Spirulina 10
Tetraselmis 16
Thallassiosira 6
Ulva 4

Finally, the following classes were mentioned by respondents without any further specification:

Bacillariophycae (Diatoms) 7
Blue Greens 2
Chlorophyceae (Green Algae) 2
Cyanophyceae (Blue-green Algae) 6
Extremophilic 1
Filamentous 1
Rhodophyceans (Red Algae) 1

Regarding the main technology challenges for algae development, 28 respondents only provided feedback. Technological cost efficiency, a challenge potentially covering many aspects, was mentioned 9 times, as compared to oil extraction (7 times), strain selection, sustainability of the production process and the final use (all 6 times), closely followed by harvesting and recycling water and nutrients (5 times). These close results, though potentially not representative of the whole sector, tend to indicate that there are still many variables in the equation to solve in order to make algae biofuels economically viable and sustainable.

From the 33 respondents on biotechnology, 10 are based on seawater, 7 on wastewaters, 7 on synthetic or other artifical media, leaving freshwater behind. Batch processes, continuous or semi-continuous processes are to be found in equivalent proportions, indicating a wide array in production methods. 21 respondents were producing in laboratory conditions, 12 in pilot/semi-pilot facilities, 3 at demonstration plant level and only 1 at commercial scale (one stakeholder can use several methods). Photobioreactors are used twice more often than open ponds.

Reported harvesting methods included mainly filtration (14 respondents), Centrifugation (12), Sedimentation (6) and Flocculation (5), but four other technologies were also reported. This accounts for a great diversity in harvesting technologies, indicating an early stage of maturity of the processes to produce algae biofuels. The further processing of the biomass was extraction in 50% cases, dewatering (25%) and drying (14%), while the remaining 10% included 15 different applications. This reveals that algae are cultivated for the purpose of extracting one valuable compound, leaving options for the use of the co-products.

50% of the 30 respondents are neither focussing, nor planning algae genetic modifications or natural selection and reproduction. However, 26% of respondents answered that they are planning or focussing on algae genetic modifications, natural selection and reproduction. 10% of

respondents are only focussing on natural selection, while 6.6% of them are planning to focus on GMOs in the future. Finally, 6.6% of respondents are still undecided on this issue.

To the open question on scaling-up limitations, most respondents replied that the lack of market or investments was constraining production, closely followed by environmental concerns. However, there was a great variety of answers. The most elaborated comment may summarise all others: *Problems will be diverse, since [Scaling-up] combines engineering with biology and ecology. Harvesting, managing the crop purity, multi-state (growth and then lipid formation) delivery of media and CO2 and more. A decade of basic R&D including engineering biology, ecology, process control etc. will be required to optimize it is essential for the public sector to understand need for public funding to encourage private investments*.

When asked for their criteria for strains selection, the 28 respondents clearly identified 3 main factors: chemical composition, productivity under natural conditions and robustness.

4 Summary of the key findings

From the 622 contacts, 111 respondents returned a filled-in questionnaire, but the information provided varies according to the question asked.

Most respondents provided information on the intended final use of their activities, but a limited number of respondents provided information on the algae strains that they regards as of interest for algae biomass.

The key findings are that:

- the Who's Who reflects the situation in Europe: 84% of the respondents are based in Europe
- 50% of the respondents are researchers and 25% are industrial
- 90% are involved in cultivation and/or production of biofuels, only 10% are potential users
- algae production remains marginal in Europe: only 8 respondents produce algae and their production never exceeds 5 tons/year (less then 50% respondents provided information for this section)
- 80% produce algae for bioenergy, 50% produce for food/feed/nutraceuticals, 35% for aquaculture and the vast majority of respondents (75%) regards bioenergy is complementary with other final uses
- 50% of algae produced is chlorella (food, animal, feed), 40% is *nannochloropsis* (aquaculture), 27% *phaedodactylum* (lab cultivation, potential hydrogen source) – however, these figures cannot reflect the actual situation since only half of the respondents indicated the algae strains of interest.

ANNEX I: Structure of the questionnaire

Ref: 92/MIS/10
17/4/2010

WHO'S WHO SURVEY QUESTIONNAIRE – Part 1

Please fill in the blanks (preferably using "insert" Word fo
where and if appropriate (your answer can exceed one p
*then please SEND IT BACK TO: **eaba@eaba-association.eu** or to **fax +32 2 763***

Pls insert here your LOGO

NAME ……
(name of your company, institution or personal name in case of individuals)
ADRESS: …….. City and Postcode ……..…. Country ……..……..
Phone ……..…… Fax ……..……
email……Website……..……
***Facultative line: n. of employees- active people in algae activity: ……. Tot company-institution annual turnover(€) : ……..*
Contact person1: ……..…… position: ……..……..
email……..……phone:……..……..
Contact person2: ……..…… position: ……..……..
email……phone: ……..
Please qualify yourself – for companies-institutions – (cross one of the two options) : □ profit □ non-profit
Please further qualify yourself (cross) : □ industry □ academia and/or research □ individual □ technology provider

General description: *(please provide a general description of your activities and/or your interest on algae biomass):*
……
……..……
……..……
……..……
……..……
……
……..……
Main interests: 1.
……
……
(or main focus) **2.**
……..……
……

ALGAE BIOMASS PRODUCTION and/or RESEARCH

- if production: *pls specify – installed production capacity (tonnes/year) ……. as from (month, year)……*
- if project: *pls specify – projected production capacity (tonnes/y) ……. project to start (month, year)……*
- if laboratory or pilot(s) *pls describe:*
  pilot1 ……
  pilot 2 …….. pilot 3: ……..

Final use of the products *(specify kind of –intended?– feeding, aquaculture, energy, cosmetics, nutriceuticals, others...)*

1. …… **2.** …….. **3.** …… **4.** …… **5.** …….. **6.** ……

ALGAE STRAINS produced and/or researched upon – including micro and macro and seaweeds *please list the main ones:*

1. ……. **2.** ……. **3.** ……. **4.** ……. **5.** ……..
6. ……. **7.** ……. **8.** ……. **9.** ……. **10.** ……..

Eventual work on metabolism and or on genes *pls describe*:
……
……
……
……

TECHNOLOGY employed, researched or provided – in case of technology providers

Kind of technology and/or processing *cross*: □ Bioreactors □ Open ponds : □ Others ……..

additional information:

Other processing and/or technology and/or materials specialisation: *pls describe*
……
……
……
……..

RESEARCH PROJECT INVOLVEMENT (International, EU, national) *pls specify project name and website:*

1. …… **2.** …….. **3.** …… **4.** …… **5.** …….. **6.** ……

I herby accept and acknowledge that the attached information can be used for public and publication purposes.

Name: …… ***Date:*** …… ***Signature:*** ……

Ref: /MIS/09
17/4/2010

WHO'S WHO SURVEY QUESTIONNAIRE
Part 2 – DETAILED QUESTIONNAIRE PAGES

If your time schedule is tight you can limit your answers to the questions of part 1 (only page 1) of this questiionnaire. However should you have more time, your answers to the question detailed in the next pages will be extremely helpful. If you prefer you can eventually send your answers to part 2 at a later stage. Contrary to part 1 you can ask that information provided by you remains confidential. You can skip parts for which you do not have an answer, please note however that asterisked (**) parties are MANDATORY.

THE TERMS ALGAE BELOW REFERS TO ALL KIND OF MICRO, MACRO ALGAE AND SEAWEEDS AND AQUATIC BIOMASS (rivers, lakes, etc.)

Please fill in the blanks (preferably using "insert" Word format)
where and if appropriate
*then pls SEND IT BACK TO: **eaba@eaba-association.eu** or by **fax** to **+32 2 7630457***

NAME ……
(name of your company, institution or personal name in case of individuals)
Contact person: …… position: ……
email……phone:……

**** HOW LONG HAVE YOU BEEN ACTIVE IN THE ALGAE SECTOR?**
Number of years:

Field of activity: *(research, industrial develop., food related issues, aquaculture, feed, investment, technology provider, etc. etc.)*:

Area(s) of your activities
(cross) : □ Europe □ US-Canada □ Asia □ Africa □ Middle-East □ South America □ Oceania

YOUR PERSPECTIVES OF INTEREST IN THE ALGAE BIOMASS SECTOR

Are you broadly interested to the algae sector or your interest related to one or two specific areas?
Pls cross: □ Broad interest □ Specific interest in one or two areas

Please state in a few words what is your perspective of interest in algae biomass:

Are you (*pls cross*) □ AN END USER (eventually also a potential one) OF ALGAL PRODUCTS □ A PRODUCER □ AN INTERMEDIARY PROCESSOR □ a RESEACHER

In the above perspective **which kind of end uses** are you targeting?: (*biofuels, aviation biofuels, feed, algae oil, aquaculture, food, pharma, nutriceuticals, CCS, water management, electricity generation, fertiliser, etc.* ..)
Pls specify and rank them:
1.
2.
3.
4.
…

Animal feeding end uses:
please provide here a detailed list of the major species of algae that you employ (or plan to employ) for the production of animal feeding – this answer is very important for feed since the overall results will be used to indicate in the next weeks to the EC Commission the major (micro and macro)algae species to be listed in the *Community Catalogue of Feed Materials* (implementing art. 24 of EC Regulation 767/2009):
-
-
-
-
...

Aquaculture end uses:
please provide here a detailed list of the major species of algae that you use (or plan to) use for aquaculture pls also detail the specific use:
-
-
-
-

LIQUID BIOFUELS PRODUCTION PROCESSES and END USES
Targeted biofuel: (*biodiesel, hydro-treated diesel, BTL, bioethanol, biogas, others, …*)
Pls specify:
-Biofuel: ……. Production process: ……
-Biofuel: ……. Production process: ……
-Biofuel: ……. Production process: ……
-Biofuel: ……. Production process: ……

Reason(s) for which the above biofuel(s) has(ve) been targeted (*pls specify*):

Main co-product foreseen and targeted use(s):

Co-product: ..... % of dry biomass: ... Targeted use(s) :.....
Co-product: ..... % of dry biomass: ... Targeted use(s) :.....
Co-product: ..... % of dry biomass: ... Targeted use(s) :.....
Co-product: ..... % of dry biomass: ... Targeted use(s) :.....

SUSTAINABILITY AND ENERGY BALANCE OF ALGAE BIOFUELS PRODUCTION

Please provide eventual reference of known works already performed on algae biomass and biofuels sustainability

.....

Please provide eventual of individuals/ institutions working on algae biofuels LCA and sustainability

.....

Energy balance of algae to biofuels production chains:

Have you ever measured what is the algae energy balance of the algae you are eventually producing?

.....

If yes what was the result?

.....

**** STAKEHOLDERS: please SEND US YOUR LIST OF CONTACTS – MAJOR STAKEHOLDERS IN YOUR REGION**

In order to make this survey as complete as possible your contribution is very welcome, thanks in advance to forward this questionnaire to your main and regional contacts and also **thanks to indicate us**:

1. the main stakeholders you are in touch with (at international level) in the algae sector
2. the stakeholders directly or indirectly involved in algae (also minor) present in your region

You can send such a list by separate mail or you can also send us an email with eventually your ready made contact lists or surveys (you do not need to change their format) which you may have available in your computer to the following address:
eaba@eaba-association.eu.

Alternatively, if they are only a few you can list them here:
-
-
-
-
…

R&D PATWAYS AND RESEARCH PROJECTS

What is your investment level per year over the next 10 years on algae? (*also approx in €*):

Main technology challenges for algae development: pls list and rank them:
1.
2.
3.
4.
5.
…

Research project in which you/ your company-institution is/was involved
Please list them also adding the name and reference web-site (only eventually a comment)
1.
2.
3.
4.
5.
…

BIOLOGY OF ALGAE and ALGAE STRAINS (facultative)

General description of major divisions and classes.
Please select and rank main classes and families of algae that you research on and please also detail (if info available) what could be the realistic productivity per ha on large scale production pr each strain:

1. …….. expected productivity of dry biomass tonnes/ha: …
2. …….. expected productivity of dry biomass tonnes/ha: …

3. ……..... expected productivity of dry biomass tonnes/ha: …
4. ……..... expected productivity of dry biomass tonnes/ha: …
5. ……..... expected productivity of dry biomass tonnes/ha: …

…

Please describe (eventually) multiplication and reproduction strategies:

BIOTECHNOLOGY

Please indicate the kind of technology that you employ/research on or plan to employ in terms of:

Culture media: *examples – 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), others …*

–
–

…

Cultivation methods: *examples –batch, semicontinuous and continuous cultivation methods, others …*

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–

…

Production systems: *examples – a) laboratory, b) pilot c) demonstration, and industrial systems; a) photobioreactors, b) ponds, c) tanks, d) lagoons, others …*

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…

Harvesting methods *examples – (i) Centrifugation, Filtration, Flocculation, Sedimentation (microalgae) (ii) manual or mechanical, others …*

–
–

…

Biomass processing *examples – (i) dewatering (ii) extraction (oil, carbohydrates, proteins), others …*

–

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…

Do you plan or focus algae genetic modifications GMOs or natural selection and reproduction?

……

Please detail eventual <u>scaling up problems or limitations</u> for any of the above specific steps:

–

–

…

<u>CRITERIA FOR STRAIN SELECTION</u>

Please select the criteria for strain selection according to the order of importance:

- *Robustness*
- *Productivity under natural conditions*
- *Chemical composition*
- *Harvestability*
- *Growth on wastewaters and flue gases*
- *Biofuels yields*
- *High growth rate, high temperature and CO2 concentration tolerance*
- *Starch, oil or protein content*
- *Others ……..*

<u>MAPPING OF AVAILABLE RESOURCES</u>

What is the number of available production sites for algae biomass production?

- *In Europe:*
- *In Northern Africa:*
- *Worldwide:*
- *Other regions: ……*

What is in your view their potential cumulate extension?
ha ……

What is the biomass volume potential of natural blooms in your region?
……

Other comments on available resources, their opportunities and limitations:
……

Is there an estimate of marine surfaces in which macro-algae are grown? If yes pls provide reference studies also on the potential of such marine surfaces:
……

Is the interaction with off-shore wind farms possible?
……

**** EABA (EUROPEAN ALGAE BIOMASS ASSOCIATION) STRATEGIES AND ACTIVITIES**

(For more info visit www.eaba-association.eu)

What do you expect from EABA, what should be its role and its focuses? *pls describe:*
……

Interest in participation to EABA activities/ membership:

□ yes, general interest □ yes, please contact me detailing membership conditions

**** PARTICIPATION TO AQUAFUELS Project ACTIVITIES (18 months)**

(For more info visit www.aquafuels.eu)

Next Autumn an **AquaFUELs Round Table** among major stakeholders will be organised the objective of the roundtable will be to promote critical thinking and reasoning on actual state of the art of research, development, and industrial initiatives in EU and outside with particular reference to technological and non barriers, economical, environmental and social implications of algae biofuels.

Are you interested in taking part to this Round Table? □ ***yes, as auditor*** □ ***yes, as speaker*** □ ***no***

Within the AquaFUELs project an Expert Group (EG) is being selected, its members have been and are being selected based on their expertise among internationally recognized organizations worldwide distributed (from EU, to US and Japan). They will actively participate to the validation of AquaFUELs conclusionsand documents

Do you intend to express a qualified interest in taking part to AquaFUELs Expert Group?: □ ***yes*** □ ***no***

PUBLICITY OF YOUR ANSWERS to PART 2 of this Questionnaire: PLEASE CHOSE AN OPTION AND SIGN:

OPTION 1

□ *I herby accept and acknowledge that the attached information can be used for public and publication purposes.*

OPTION 2

□ *I prefer that my answers to part 2 of this questionnaire remain confidential (Internal AquaFUELs project use), they can only be used in order to feed general statistics where the name of my company/institution will not figure information can be used for public and publication purposes. Part 1 is public.*

Company/Institution: *.....*

Name: *.....* ***Date:*** *.....* ***Signature:*** *.....*