

Case Study

Dunaliella for glycerol production

Foibe Nghoongoloka - fnghoongoloka@mfmr.gov.na

Gonçalo Murta - mail@gmurta.com

Time of interview: 80 minutes

Recorded interview

Mr. Philip Hooks, Project Manager and Promoter, Glycal Namibia

No restrictions on use of information

The Biofuel/energy supply chain

The business model presented in the report is not yet established. The ideas and concepts are being outlined. Their ultimate goal is to establish a biorefinery. The location for this biorefinery is not yet identified, since it is dependent on the establishment of the microalgae production facility.

At present, efforts are being done to identify the natural conditions of the microalgae in Namibia. There are a number of questions that needed to be answered before the commercial project takes place. Anyway identification of suitable land to establish the commercial project is also being done. Once the location is identified and the system is operating, the transport of the microalgae or the glycerol will be minimised in a first phase. It is intention to use the product at the production site. Expansion will depend on the production and market accessibility, however local fishing companies, may have interest to convert one vessel to glycerol usage. Once the project grows and excess of product is produced, the transport and new markets will be explored. The expansion to other links of the supply chain by the company will be done as the development occurs.

There is no defined technology to use yet, there is a range of options that need to be discussed and evaluated to identify the appropriate option for Namibia. Several international stakeholders with experience in research, in production of microalgae, in extraction of glycerol and other areas will bring their knowledge and help to establish the appropriated system.

The case study.

The company registration was done in April 2013. The shareholders of the company are two Namibian shareholders with background in human resources and in bivalves aquaculture.

The business project started to be outlined in middle of 2012. The size of the company allows the manager to be involved in all the operations and it is his will to have a comprehensive knowledge of any development that occurs at any level of the supply chain. The business models are still being analysed to identify what would be the appropriated option to be implemented in Namibia, to achieve the biorefinary and product export levels.

The business idea in microalgae production occurred after the Manager and Promoter of the project read some information on Dunaliella production for alternative energy. It was understood that contacts already occurred in Namibia to establish a similar project. The country is keen in having independent energy sources, and alternative energies is seen as a great potential of development in Namibia.

The business is identifying local stakeholders (salt companies, diamond mining) that may accommodate any of the technologies that may be chosen. The technological options being identified are from harvesting the natural production of Dunaliella in different ponds that already exist in Namibia; production of algae in raceways systems; or a high-tech system like bioreactors.

The size of the project and any contract with technology supplier will be not only dependent from the results of the research that is established at the moment, but mainly by the availability of funds. It is recognised that certain size standards will need to be achieved if the projects does want to have some impact in future stakeholders decisions. In some estimations, the production of glycerol will have to match actual fuel needs by one vessel (four tons of fuel per day) to be able to present some consistent results of alternative energy usage.

Drivers.

The drivers that allowed the project to initiate was the willing of the Manager and Promoter of the project to identified alternative energy project that could be suitable for Namibia. The research of information lead him to a workshop held by ACP S&T and SANUMARC in March 2010. From this information contacts were established with ACP S&T partner Prof. Patricia Harvey that provided guidelines to establish further international contacts. Efforts are being done that these contacts become external drivers to promote the establishment of the project in Namibia. There is a strong will by local and international identities to promote this project. The international stakeholders that are further a way in the line of research and infrastructure seen keen to support and share their knowledge with Namibia.

Local drivers would be the national and local energy distributors. It is known that other alternative energy projects were established in Namibia and the national energy provider and local energy distributors do have already in place or are in action to establish structures that allow the feeding of energy for alternative sources to the power grid. The fishing companies and other business that operate with diesel combustion engines will also be potential drivers, since the fuel produced can be used for these type of engines with some small adaptations.

The environmental footprint of the project will need to be properly assessed once the location and technology of the project is identified. In principle and by comparison with other alternative energy producers this business model would have less impact in fresh water resources. Depending on the location it may provide a rehabilitation to land that was disrupted by mining activity and no longer will recover to the natural status.

Regarding pollution, the product is biodegradable and indeed is one of the concerns of how to transport it. Below certain concentrations it disintegrates very quickly. Sub-products and chemicals that may be used in any level of the supply chain will need to be evaluated and proceed a proper environment impact assessment.

Support.

International support group - The first support to establish the ideas and allow the implement of the project guidelines was provided by Prof. Patricia Harvey. This contact provided access to other people with knowledge and support in different areas (researchers, business people, biologists, investors) and from different countries (United Kingdom, Israeli, South Africa, Portugal, Germany). The international group is seen as a key support for the development of the project, in such way that the workshop planned to the end of April will bring the specialist in different areas from the different countries together to discuss the way forward for this project.

Ministry of Fisheries and Marine Resources (aquaculture department) - The support that exists is an informal partnership with the aquaculture department, being the contact person Mrs. Bronwen Currie. This partnership will change soon to a formal partnership. At the aquaculture department facilities are being kept some microalgae under culture; it was recently possible to extract glycerol in their laboratory, from natural field samples. This extraction was possible from the knowledge exchange from international support group (United Kingdom) that provided the protocol and guidelines.

University of Namibia/ Sam Nujoma Marine & Coastal Resources Research Centre (SANUMARC) - It is also intent to get more research support, from Universities of Namibia, more precisely from SANUMARC. It is seen as a good potential the increase in research and students knowledge in this sector. Also this institute is already a partner for the ACP S&T main project.

Salt providers - The local salt companies were approached to support the project in any technology that may be used at their facilities. The local desalination plant was also contacted since they produce high volumes of sterile brine, that may be useful for the project.

Jobs.

At the moment there is no permanent job created from this business model. Only principles can be evoked facing the current situation of unemployment in Namibia. The number of jobs available will depend in the business model. In general, if the microalgae production intensive system is chosen with more mechanisation, less jobs will be created, but higher skilled labour will be required. If the microalgae production system is more labour intensive, with less mechanisation, more labour will be created. However in either systems long term vision to train and upgrade the labour skills is envisage. In higher levels of the supply chain as at the extraction of glycerol and biorefinery, opportunities for skilled labour will be available.

Business targets and wealth creation.

The long term expectation to establish the biorefinary and export the excess product is currently not possible to achieve. The achievements made since the initial thoughts were positive. The contacts, meetings and workshops organised are giving a clarification in the way forward for the project, helping to understand how to reach the long term expectations. From the first meeting in October of 2012, some developments were established at the research point of view, especially in contacts and know-how level. The development that is happening at the research is making the first steps, but will push forward the local knowledge in culturing the microalgae and glycerol extraction, opening the potential to establish the project.

Achievements were also made in involving local stakeholders and bringing the community awareness to the potential of the project.

Training.

The basic training that was done is mainly at the aquaculture department, where maintenance of the microalgae cultures was explained. Some training will also be done for the glycerol extraction, following the protocol received from the international stakeholders. The training was done mainly for the biologist staff members of the aquaculture department. In total three people (two women and one man) receive training on how to maintain and prepare culture media to maintain the microalgae in small compartments. From the three staff members, one woman is actively maintaining the microalgae culture.

Once the project is established training opportunities will occur in: building the system with appropriated materials; maintain the microalgae growth parameters under control; extract the glycerol and other techniques that may be required to operate the power plant or biorefinery.

Local community stakeholder groups.

The local community stakeholders to be target depend in the model and location of the business. Several groups were identified at different locations. At the south coastal area of the country it was identified the NamDeb company (government is a shareholder). This company have portions of land that have been disrupted during their mining activity and are seeking for alternative projects to rehabilitate them. At the central coastal area, the stakeholders engaged were the private salt work companies of Walvis Bay and Swakopmund. Both salt work companies do have already in natural conditions the *Dunaliella*. Engaging with these stakeholders in establishing the project would required that their salt production is not disrupted. It also was engaged the desalinisation plant of Areva (french mining company) as a potential brine supplier in any technology that would require high levels of salt.

The engagement between the central stakeholders was similar, contacts and group meetings were establish to present the idea and concept of the business. Slightly variations occur from case to case due to different business policies of each company. The Walvis Bay Salt company had more strict policies and required to approach them more often to have a final agreement for research. Regarding the NamDeb engagement, a preliminary contact was made and it was requested a more detailed plan of the project to be established (at research or commercial level). Further engagements with these stakeholders would depend on the progress of the project.

Other stakeholders listed to be engaged, once the project arrives at different step will be the local Municipality, Ministry of Environment and Tourism, Ministry of Land, National Plan Commission, Nacoma. Apart of these stakeholders being receive some notifications raising awareness for the project, as soon as the location for the project is establish contacts will be done to involve them in the project development.

In what concerns to policy makers, the listed activities will require by law an environmental impact assessments and will require permits for water use and algae cultivation. The level of assessment that would be required is dependent on the business model adopted.

In what concerns to specific legislation to alternative production and use of energy there is no formal legislation in place. It is intention of the company to follow international legislation that regulates and directs the production of bioenergy. Allowing that once there is approved legislation in Namibia, the business is seen as an example.

Impact on agricultural practice and livelihood

The strengths that made the project manager to consider in moving forward with the idea was that the concept of this alternative energy production as very few impacts in agricultural land or crop production. The main advantage for other biofuel projects is the use of brackish and saltwater to produce the microalgae. In Namibia, the potential locations that are being identified will not affect any potential fertile land for agricultural.

The products from *Dunaliella* are not only the glycerol, but also the β -carotene. Being able to extract β -carotene in Namibia, will provide an extra health complement in the community and in the country. Nevertheless, recently the local pharmacies removed products with β -carotene from the market. The information obtain was that recent research says that receiving extra increment of β -carotenes gives detrimental effects to the body. Not being an impact in agricultural, this decisions may remove the opportunity to Namibia to produce β -carotenes locally, improving the range of national products.

The Namibian law does have a well established and structured labour law, not only an affirmative action policy that provides the employment to previously disadvantage people (disability people, women and man), but also the labour law gives time and protection to the family welfare.

Regarding the household incomes, there is no income to any of the project partners and there is nobody employed. Although facing the unemployment level in the country it is predictable that if would be possible to employ at least one family member in a house, that family livelihood will have benefits for it.

Future growth plans and recommendations.

From what was done until the present, very few things would have been changed.

From the personal point of view, more time on the academic literature and in R&D needed to be spend. As manager and promoter the level of knowledge in several links of the supply chain are seen as essential to maintain integrity of the project. More time is needed to be allocated to deeply understand the different stages of the project.

The short term plans - Receive the most information as possible from the upcoming workshop. The information will be critical to define the technology that should be adopted and the way forward of the project.