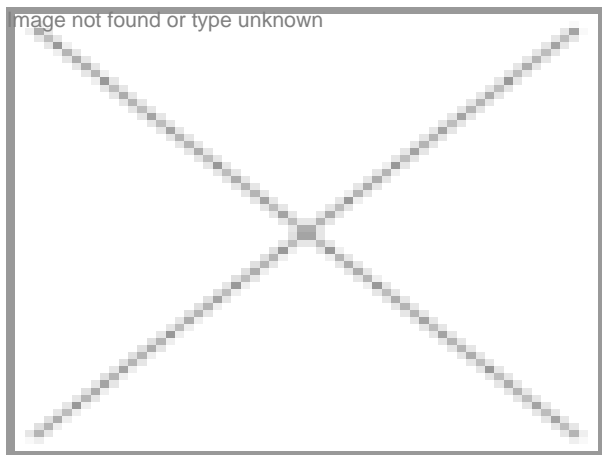


## Biofuels set for a Sea-Change

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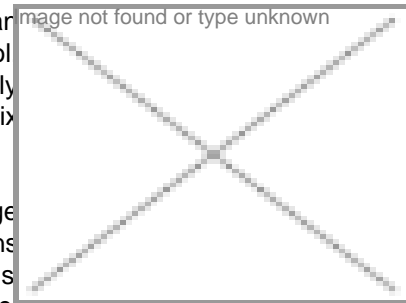


*Oceans have the potential to be the largest farm for biofuels. A new wave of investment in marine biofuels is gaining momentum as the world*

Seventy percent of the earth's surface is covered by salt water which provides breeding space for all varieties of seaweeds. For centuries, China and other Asian countries have grown seaweeds — also known as macro-algae — for food, animal feed, pharmaceutical remedies and cosmetic purposes. This expertise gives Asian countries the advantage of the benefits of marine algae as a biofuel. Both micro and macro algae

Marine biofuel, which is considered third generation biofuel, has many advantages that make it preferable over first and second generation biofuels, that are derived from sources such as starch, sugar, animal fats and vegetable oil; and lignocellulosic crops respectively.

According to the algae market study, Algae 2020, the seaweed grows faster than terrestrial crops; has high sugar content for conversion to advanced biofuels and ethanol absorbs more airborne carbon than land-based plants, has no lignin, can be easily harvested, requires no pretreatment for ethanol production, and can be harvested up to six times a year in warm climates.



"The bioenergy demand is increasing exponentially. Increasing fuel prices encourage biofuel research. Organization of the Petroleum Exporting Countries (OPEC) too has plans to reduce oil production. If the price of fuel goes beyond \$100 per barrel, then it is time to consider alternate sources. As opposed to first and second generation biofuel production, algae-based biofuel production is the efficient way to get long-term result," says Choul-Gyun Lee, professor, Department of Biological Engineering, Inha University, South Korea.

Commenting on the advantages of marine micro algae, Dr Dinabandhu Sahoo, secretary, Indian Phycological Society, Marine Biotechnology Laboratory, Department of Botany, University of Delhi, India, says, "Marine algae have several advantages. They do not need fresh water — as algae can grow in sea water — it is environment-friendly as it alleviates acidification of the ocean, it can be cultivated on a large scale; provides employment to coastal population, and the byproducts from algae can be used in food, pharmaceutical and nutraceutical industries besides use as biofertilizers."

**APAC Market Scenario**  
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After a significant presence in first and second generation biofuels, countries in Asia Pacific region are now shifting focus to third

According to the report released by APAC Biofuel Consultants, Australia's biofuel capacity is expected to go from 636 million litres in 2010 to 1.5 billion litres by 2015. In order to achieve this goal, the country promotes marine biofuel companies. The collaboration between companies is the way to achieve the target. Recently US-based algae biofuel developer, Aurora Algae announced expansion plans in Australia, by opening new regional headquarters in Perth (Western Australia) and ramping up commercial operations in the region.

South Korea has pledged about \$1,200 million to develop macro-algae biofuel capacity, over the next 10 years. They hope to be able to produce 400 million gallons of ethanol from macro-algae, which would replace 13 percent of their fuel demand. The project will create an offshore seaweed forest of approximately 86,000 acres in size.

"South Korea is the world's fourth largest oil importer and the world's seventh largest oil consumer. South Korea's foreign energy reliance is 97 percent, that is, nearly all the energy South Korea consumes is imported. Thus, the economy and national security of South Korea greatly depends on foreign energy. The South Korean government is also planning to support bioethanol-related technology development projects, in order to boost energy efficiency, and will also launch a bioethanol quality monitoring system, before putting it to commercial use," says Myungkyo Shin, CEO & vice president, Biolsystems, South Korea.

The Philippines government has allotted \$23 crore (\$5 million) to develop a 250-acre seaweed-based ethanol plant and aqua farm cluster. The aqua farms will be located in four places, and will utilize South Korean ethanol; extraction technology, developed at the Korean Institute for Industrial Technology.

South Korea-based Biolsystems is expanding operations in the Philippines. The company is checking seaweed (red algae) farms in the coastal towns of Bohol in the Philippines, to determine if the area can supply adequate raw materials for the processing of bio-ethanol, and the quality of seaweed grown in these areas.

In the context of international perspectives and national imperatives, the Ministry of New and Renewable Energy (MNRE), Government of India, formulated National Policy on Biofuels in December 2009. The policy, approved by the Cabinet envisages development of next generation, more efficient biofuel conversion technologies, based on new feed stocks. Through this policy, India has set an indicative target of 20 percent blending of biofuels, both for bio-diesel and bio-ethanol, by 2017. India has great potential in algae biofuel, as it can utilize its 7,000 km of coastal line, and the country is intensifying research activities.

India-based seaweed cultivation company Aquagri, along with Central Salt and Marine Chemical Research Institute (CSMCRI, Bhavnagar) is part of a European Union-funded project on marine micro algae, Biowalk4biofuels. The company

will use the expertise gained through the partnership, to venture into marine biofuel production, says Abhiram Seth, managing director of Aquagri.

“Asia Pacific region has the tropical advantage as algae need more sunlight. APAC countries have already gained awareness about the immense potential of algae biofuels. International events like UNESCO's Global Conference on Oceans, Coasts and Islands in Paris; and International Marine Biotechnology Conference in China; and joint R&D initiatives like the Asian Network for Using Algae as a CO<sub>2</sub> Sink, under Asian Pacific Phycological Association (AAPA); and India-Brazil-South Africa (IBSA), a trilateral developmental initiative, are positive initiatives in that direction,” elaborates Dr Sahoo.

Even global automobile majors like Ford Motor Company, US are promoting research on exploring algae as an alternative biofuel. The US House of Representatives passed the Green Jobs Act of 2010. The Act offers investment tax credits for algae-based bio-refineries. APAC countries need algae-specific policies like this, to intensify the growth of marine biofuel research and commercialization.

Increasing levels of pollution and depleting levels of fossil fuels are driving the need for renewable biofuels. If marine biofuel can fulfill the huge demand for biofuels, it is the best bet.

**Pradeep Kumar** in Bangalore