Oil al. 2014)). the current commercial algal production

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Oil recovery from algalbiomass and then conversion of oil to biodiesel is not affected by the methodof biomass production, whether it is produced in raceways, photo-bioreactors oropen ponds. Therefore, actual factor responsible for the cost determination iscost of producing biomass for comparative analysis of photo-bioreactors, raceways or open ponds for producing microalgal diesel. The estimated productioncost of a kilogram of microbial biomass is $2. 95 and $3.

80 forphoto-bioreactors, raceways and open ponds, respectively (Chisti, 2007; MolinaGrima et al. 2003). If we increase the biomass production annually, then theproduction cost per kilogram reduces similarly, due to economy of scale. If thebiomass contains 30% oil by weight, then the cost of biomass for producing aliter of oil would be approximately like $1.

40 and $1. 81 for photo-bioreactors, raceways and open ponds, respectively. Low cost biomass enhances the cost ofoil approximately to $2. 80/L. This means that the recovery process of oilcontribute about 50% to the cost of finally recovered oil.

The cost of biodieseldepends upon the cost of biomass produced. To make algal diesel competitive inthe market with petro diesel, then it requires reduction in the cost ofproduction of algal oil from about $2. 80/L to $0. 48/L (Chisti, 2007). The costis reduced significantly to $0. 72, if the algal biomass produced inphoto-bioreactors or raceways contains 70% oil instead of 30% by weight. Thesereductions in the cost are attainable with adopting strategic objective. Microalgal oils can surelyreplace petroleum as a source of hydrocarbon feedstock.

This will happen onlyif microalgal oil needs to be sold at a price which is roughly somewhat relatedto the price of crude oil. For example, if the price of crude oil is$80/barrel, then price of microalgal oil should be $0. 55/L to economically substitutefor crude petroleum. In this example we assume the energy output of algal oilis 80% as compared to 100% of crude petroleum. Overall production cost of algaloil in current cultivation systems is a critical issue of concern (Benemann, 2008; Ullah et al. 2014)). The current commercial algal production is in verysmall scale and inefficient, so to make the process efficient and cheap, technological advances will be required to overcome this gap.

Along with thisresearch and development activities will be required in large scale to massculture algae for maximizing oil productivity and harvesting them cheaply whichwould reduce the production cost of algal biomass to an acceptable level.   1. 8 CONCLUSIONThis chapter suggests thatproduction of biodiesel from microalgae is technically feasible. This is theonly renewable biodiesel that can potentially replace transport fuels derivedfrom petroleum. Economics of microalgal biodiesel production needs improvementto make it competitive with petrodiesel, and the level of improvement necessaryto achieve this is attainable by using technology advancement.

Overall, thepractical feasibility of a production system centers on the key properties ofthe selected algae strain, which indicates a need for species screening, aswell as research on optimizing culture conditions and production systems. Low-cost microalgal biodiesel production requires improvements to algal biologythrough genetic and metabolic engineering.

Biorefinery concept and advances inphotobioreactor engineering will further cut down the production cost. Keepingin view of larger productivity than raceways, tubular photobioreactors arelikely to be used in producing much of the microalgal biomass required formaking biodiesel in terms of net energy balance. However, productivity valueschanges and are significantly lower as compared to heterotrophic production. Photobioreactors provide controlled environmental conditions that can beutilized to produce highly productive microalgae and to achieve good yield ofoil in a year. Harvesting of algal biomass during production accounts for thehighest proportion of energy input, but currently, there are no standardtechniques available for harvesting.

Adaptation of technologies which arealready available and use in the food and wastewater treatment area may providerequired possible solutions. This chapter also suggests that boththermochemical liquefaction and pyrolysis appear to be the most technically andpractically feasible approaches after extraction of oils from algae forconversion of biomass to biofuels.