UTILIZATION OF ALGAL AND PLANT BASED BIOMASS FOR BIOFUEL PRODUCTION - A REVIEW

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ABSTRACT

The global energy demand is raising rapidly day by day, due to the exhaustion of fossil fuels for causing harmful impacts on the surrounding and fuel shortages have led for alternative energy resource to develop solid biomass, liquid fuels, and various biogas. So, converting waste energies to alternative sources or bio-fuels is positive aspect due to the continuous waste. This review has focused on various energy of biomass from marine resources, bio-wastes, and additionally some technologies for the conversion of biofuel production. Algal biomass has been implemented for the economic conversion processes for Biofuel production and lignocellulosic biomass which have been considered as a feedstock for biofuels. All these factors have attracted the researcher's attention to find some alternative renewable energy resources by using algae, types of bio-waste like agriculture, forest, and waste oils. This review discusses the generation types, policies in many countries and future development of biofuel production.

KEYWORDS: Bio-ethanol, Biodiesel,Biogas,Algae,Cyanobacteriaand Lignocellulosic biomass.

INTRODUCTION

Biofuels is a type of liquid fuels, that created directly or indirectly from organic material and square measure developed from completely different sources like microbe, plant biomass and animal waste. Biofuels are the renewable transportation fuels created from biomass that square measure mentioned solid, liquid and aerosolized fuels. Main biofuel feedstocks like woods, crops, wastes et al. like algae. Biofuels are low in carbon intensity so as that they don't directly have an effect on warming and referred to as clean fuel by physiochemical and fermentation processes. Biofuelsthat designed to exchange a fuel and it is usually principally harvested from plants and organic waste. There are 3 main kinds of liquid biofuel: bioethanol, biodiesel, biobutanol, biohydrogen, and biogas from organic by-products(Maximilian Lackner, 2017). The apace raising world population were consume a lot of energy provides for rising their quality of life. Biofuels are associate alternative to the current petroleum-based fuels as they're going to be utilized as transportation fuels and have vital potential to reinforce property and decrease greenhouse emissions. Biofuels might even be categorized into 2 majors: Primary, and Secondary biofuels. The primary biofuels are essential biofuels which creates directly from plants, firewood, forest, animal waste and crop residue. The secondary biofuels are directly derived from plants and micro-organisms, and produces among the type of solids, liquids and in gases kind(Poonam Singh Nigam et al, 2011). Biofuels which additional divided into four generations: First, Second, Third and Fourth supported the chemical and complicated nature of the biomass. The first-generation fuels (edible biomass) is the assembly of fermentation alcohol from starch oil, sugar, wheat, corn etc. and biodiesel from soybean, animal fat. This generation has been created from the made food crop plants and conjointly referred to as typical biofuels. The second-generation fuels (non-edible biomass) of bioethanol and biohydrogen, has been created from agricultural by-products and from energy plants and forest residues like energy crop and woody plants. This generation is in addition brought up as advanced biofuels and should be factory-made from different kinds of biomass. The biomass contains lignocellulosic material like wood, straw, genus Jatropha and waste plastic (Rodionova et al, 2017). The third-generation fuels, (biogas, bioethanol and biobutanol) are extracted from microbes and algae principally from marine algae resources includes seaweeds and eubacteria that foremost engaging sources for this generation. The fourth-generation biofuels (breakdown) are transformation, solar to fuel, chemical process (Ashish Bohre et al, 2015). As an example, gasoline, that

involves among the conversion of genetically designed microbes. As we have a tendency to all grasp, biodiesel, triglycerides, ethanol, fatty acids, cellulose, lipids, carbohydrates, or the biomass of organisms are the most biofuel, which they're usually created by many species of protoctist, microorganism or yeast (Rodionova et al, 2017). The energy demand in developing countries is calculable to induce up to eighty-four and regarding 1/9th of this fuel is sometimes non-inheritable from different renewable sources like biofuels. Biofuels plays a heavy role as a supply of energy for quite 0.5 the whole population globally, that accounts up to ninetieth of consumption of energy in less developed nations(Muhammad Rizwan Javed et al, 2019).

TYPES OF BIOFUELS

Bioethanol

Bioethanol is also a burnable and renewable liquid fuel created by the fermentation of super molecule made supply which contains sugarcane, starch from corn, cellulose, sugar beet, agricultural waste etc. Fermentation alcohol if created by utilizing a renewable substrate is brought up as bioethanol. The fermentation alcohol fuel is utilized in many ways in which associated it's frequently used as an aerated fuel to decrease carbon monoxide gas emissions. (Carere et.al, 2008). Bioethanol is obtained from lignocellulosic biomass and it includes the steps square measure 1) pre-treatment 2) chemical reaction of hemicellulose and polysaccharide, 3) sugar fermentation, 4) separation of polymer, 5) purifying and recovery the bioethanol (Shahabaldin Rezania et al. 2020). Bioethanol is created sometimes by fermentation of aldohexose victimization genetically changed organisms like baker's yeast which converts the lignocellulosic sugars into fermentation alcohol. Corn is taken into account as a crucial supply for the bioethanol production. Sugarcane square measure usually used as associate alternate feedstock for the biofuel production. The value of fermentation alcohol production from starch crops and sugars like sugarcane square measure terribly high as vie to lignocellulosic whereas fermentation alcohol is created by victimization the lignocellulose as a feedstock(Muhammad Rizwan Javed et al, 2019).In USA and Brazil, bioethanol fuel is in higher usage and it can also be mix into typical fuel. Chiefly created be corn in USA and sugarcane in Brazil. The fuels of E5 and E10 had five & 100 percent of fermentation alcohol fuel usually (Maximilian Lackner, 2017, 1201-1230).

Biodiesel

Biodiesel is associate alternate fuel and is created from renewable sources like vegetable oils and animal fats. It's nearly like, the crude oil fuel in structure of building block acid cluster substance and type of carbon atoms concerning ten to twenty-one. It's renewable, non-toxic, and spoilable. The biodiesel is usually ready by the natural process of triglycerides with alcohol. Biodiesel could even be generated from entirely altogether entirely fully completely different species of little or no protoctist(Saifullah et al, 2014). It's fictitious from a mixture of alcohol with recycled oil, fat or oil. It is a terribly flammable liquid that burns and blend with petroleum-based fuel. Primarily biofuels were obtained from oil howeverit's on the purpose of wear and tear down food preparation. So, we have targeted to hunt out bearing plants to supply non-edible oil for the assembly of biodiesel(Elshahed, 2010).

Biobutanol

Biobutanol is additionally a technique of fuel which could be a promising varied. Bio-butanol derived from organism or being tiny low amount like biodiesel or by fermentation of biomass like alcohol. This fuel is usually directly utilized in ancient compound engines with none modification. It's fictitious from little or no protoctist biomass and it's a cultured biofuel production and is expected to exchange bioethanol at some purpose(John JMilledge et al, 2014). It's less corrosive than alcohol and not absorbent additionally alcohol could even be obtained substance. It's accessible through super molecule fermentation by *Clostridium acetobutylicum* in degree very methodology named as ABE fermentation (acetone-butanol-ethanol) with a product relation of 3:6:1 (Maximilian Lackner, 2017).

Biohydrogen

Bio-hydrogen gas could even be fictitious from renewable sources area unit cited as green technology, the key factor's area unit compound content, handiness, price and spoilable(Muhammad Rizwan Javed et al, 2019). It's thought-about as necessary fuel as a result of its eco-friendly, low emission and doesn't evolve any GHG and it's going to be regenerated into electricity by cell. Favorite fictitious from organic waste or biomass nor either biologically or photobiologically is believed as biohydrogen. The anaerobic fermentation methodology is used for the assembly of biohydrogen(Jahangir Imam et al, 2013). The microorganisms like cyanobacteria and algae are used for the biohydrogen production. The pigment isthe foremost economical for the biohydrogen production through entirely altogether entirely fully completely different processes. There are unit of try processes for the assembly of biohydrogen, light dependent and light freelance methodology. The fixation of gas into starch in pigment and glycogen in cyanobacteria, is fermented of those and keep energy reserves for H production at a lower place anaerobic condition(Divjot kour et al. 2019).

Bio-alcohol

Bio alcohols can be produced from fermentation of sugar and starch or catalytic conversion of biogas. Bio alcohols are produced by thermal and biochemical fermentation of carbohydrates resulted by thehydrolysis of biomass. Biomass sources like corns and cellulose are first hydrolyzed to extract sugars and then fermented followed by distillation to get bio-alcohol. It can be produced from a wide range of biomass feedstock like agricultural wastes, wood, forest residues and wastes. Alcohol as aeronautics fuel needs special delivery storage system and infrastructure. Blending of alcohol with conventional fuels is not feasible because of its poor fuel properties which will cause aviation issues (Thushara Kandarmath Hari et al, 2015)

Biogas

The anaerobic digestion of organic matter lands up within the formation of fuel noted as biogas orbiomethane. Biogas is implausibly intentional by aliphatic compound and acid gas and additionally arenewable offer. Biogas might even be fairly biofuel that's naturally fabricated from the decomposition of organic waste. aliphatic compound might even be a notably valuable fuel(Archana Tiwari et al, 2018). Biogas is created from four main sources: 1) waste product treatment plants, 2) landfills, 3) cleanup of organic industrial waste streams and 4) mesophilic and thermophilic digestion of organic waste. Organic matters like food scraps and animal waste acquire from manure, fruit and vegetable waste (Ahmed Kadhim Hussein et al, 2015). Europe policy estimates that twenty fifth of all bioenergy might even be derived from biogas. Biogas is created by the breakdown of organic waste by being whereas not anaerobic atmosphere that they undo a combination of gases, primarily aliphatic compound and acid gas (Muhammad Rizwan Javed et al, 2019). It's environmentally-friendly energy offer. Biogas is within the main a combination of aliphatic compound and acid gas aboard entirely completely different trace gases. Biogas is often created from wastes however might even be created from biomass energy feedstocks and biogas derived from biomass(Alaswad et al, 2015).

CLASSIFICATION OF BIOFUELS SUPPORTED GENERATIONS

On the thought of feedstock obtaining used for biofuel production of biofuels unit of measurement typically classified into four generations: Initial, Second, Third and Fourth are shown (Fig 1)

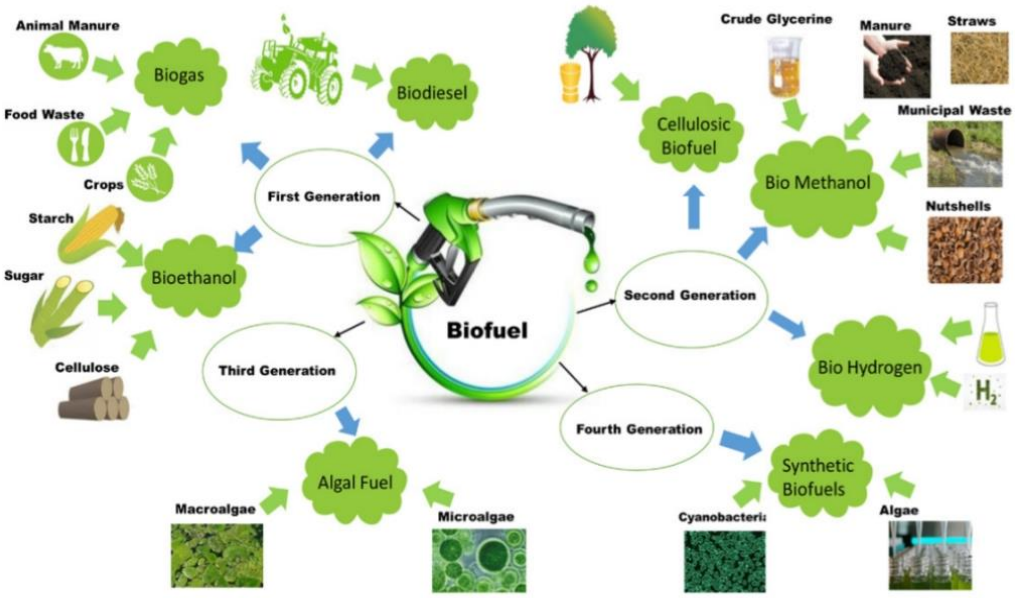

Figure 1A schematic representation of generation and types of biofuels

First generation

The first-generation includes production of diesel and alcohol by typical technique. It's created directly from food crops. The transesterification technique is utilized for the assembly of biodiesel. The transesterification uses catalyst catalyzers or acids, basic and alcohol or methyl alcohol and produces alcohol and fatty acids as a residue and it converts the oil and fats into fuels(S N Naik, 2010). It has always used by engines directly and international increase in food costs and endangering food security. Their actual profit in reduction of gas is additionally thought-about as debatable(Carlos Eduardo Zavala-Gomez et al, 2020). Around forty-millions of gross hectares unitof measurement in the main uses for biofuel production as bioethanol, biodiesel, biogas and additionally used for bioenergy crops. The standard feedstock for first-generation biofuels like, oil seeds for biodiesel, starch and sugar crops for bioethanol(Dang P. Ho et al, 2014).

Secondgeneration

The second-generation biofuel production technique is super molecule reaction by sugar fermentation. It's helpful for the assembly of synthesis gas (syngas) by action technique. Syngas might even be regenerate into liquid biofuels with the help of multi-catalytic technique. It's developed to beat the restrictions of first-generation(Alalwan et al, 2019). They're going to be fabricated from non-food crops like wood, garbage, organic waste and lignocellulosic materials, which can be divided into 3 groups: 1) same like wood chips from energy crops, 2) quasi-homogeneous like forest and agriculture residues, 3) non-homogeneous that has low-valued municipal and industrial solid waste. They indicate an internet energy gain and so guarantee reduction of gas emission. In past years, The unit of measurement comprehensive analysis on vital progress and potential feedstocks for increasing the second-generation technologies (Dang P. Ho et al, 2014).

Thirdgeneration

The third-generation biofuels unit of measurement aquatic microorganisms and it ought to be derived from protoctist. The term protoctist unit of measurement is a varied cluster of organisms that has microalgae, macroalgae–seaweed and cyanobacteria–blue protoctist. Algae oils might even be accustomed manufacture a varied product, migrate from alcohol, biodiesel, butanol, syngas, fertilizers, tracheophyte and chemical feedstocks(Jim Bowyer et al, 2018). The biomass algal can even be flamed on to manufacture electricity and another product choice is H. Algal biomass production ways unit of measurement is: photobioreactor and open raceway ponds. The drawbackof this generation to supply biofuel can be a smaller amount stable than the opposite generation technique as a result of its high oil yields and fewer usage of land(Yue Wang, 2013)

Fourth generation

The fourth generation of biofuel is very important thanks to genetically designed algae and cyanobacteria. It's supported raw materials that unit of measurement just accessible and low price. This generation is as like third generation biofuels wherever each unit of measurement synthesized by action microorganisms like moneran, yeast, microalgae and fungi to come back duplicate with renewable fuels. This might be created by designer action microorganisms to supply photobiological solar fuels, by electro-biofuels and organism fuel production or by artificial cell for production of biofuels (Eva-Mari Aro, 2016). By exploitation these organisms, we've a bent to convert acid gas into energy. This generation is beneficial in reducing the emission of greenhouse gases that makes them superior to the second and third generation biofuels. Fourth generation biofuels are created by action microorganisms to form photobiological solar fuels, electro- biofuels. This generation is especially supported designed algae and uses recombinant biological techniques for propulsive the properties by modifying organism metabolic pathways to elevate the assembly of biofuels(Eva-Mari Aro, 2016).

VARIOUS BIORESOURCES FOR THE PRODUCTION OF BIOFUEL

Biofuels can be generated from numerous biomass sources along with by-products from agriculture, forest, organic and industrial waste. Here we can see the various sources are using to produce biofuels:

Algae as a source of biofuel

Algae biofuel is an alternate to liquid fuels that uses algae as its energy source. Algae that fix the CO_2 from atmosphere andalgae that are used as biodiesel production and are usually aquatic green algae. Algae are photosynthetic organisms associated with plants that grow in water and produce energy indaylight(Alaswad et al, 2015). Algae based biofuel production is about hundred times higher than that of higher plants. The algae biomass can be further processed to produce biofuels during fermentation by microorganisms. Currently using microorganisms to produce biofuels are: 1)genetically modified cyanobacteria, 2) dark fermentation by bacteria to convert sugars to biohydrogen, 3) photobiological methods to make biohydrogen by microalgae, 4) selectionof microalgae that can produce more oil for the biodiesel production, 5) optimization of hydrogen assembly for biofuel production in bacteria. The high density, high yield biomass is right for intensive agriculture and should be a superb source for biodiesel production. The process of algae into energy products includes whole algal biomass conversion, metabolites extraction such as oils, fatty acids, steroids etc., processing and collection of direct algal secretions (Rodionova et al, 2017).

Conversion of algae to biofuels

The Process of algae conversion into biofuel are:

1) Conversion of whole algal biomass
2) Extraction of metabolites e.g. oils, fatty acids, carotenoids etc...
3) Collection and processing of direct algal secretions

The steps involved in the extraction technologies are employed in the conversion of algae to liquid fuel, steps in processing include harvesting, dewatering, extraction and processing to energy products and co-products. The cell structure of algae is broken down by solvents or sound waves to extract lipids, proteins and carbohydrates by chemical, biochemical or thermochemical processes for conversion of algal oil to fuels(Jim Bowyer et al, 2018).

Marine resource

Macroalgae

Seaweed or marine macro-algae is said many species of marine algae, non-phylogenetic cluster of macroscopical aquatic eukaryotes organisms. The term includes some forms of division Rhodophyta (red), Chlorophyta and Streptophyta (green) and Phaeophyta (brown) macroalgae(Milla Suutari et al, 2015). Seaweeds from marine are presently used as a valued biomass for renewable energy production. Its cellulose content is found to be necessary with less polymer content. The lower level of polymer content of the biomass

is employed within the production of biofuel and it's the third-generation fuel production method. It doesn't need land and deforestation for the cultivation. The temperature management is a smaller amount and also the culture space is movable and also the cultivation media is water. The marine atmosphere is that the massive reservoir for the property biomass during which the macroalgae are used for the applying of medication, ancient food and fertilizers. Seaweeds have a lot of usage, they're consumed as food in several cultures, notably in Asia(Gaurav et al, 2017). Macroalgae on the opposite hand, derive all their nutrients directly from the encircling water through their tissue. The macroalgae biomass has potential for the assembly of biofuels. The alga biomass has been tried for alkane production by anaerobic digestion method. The recent analysis concentrates on the potent usage of protoctist biomass for the assembly of liquid biofuel like butyl alcohol and ethyl alcohol via sugar production by catalyst reaction and fermentation by relevant microbes(Rui Jiang et al, 2016). The utility of seaweeds for biofuel analysis are: the expansion rate of biomass production and seaweeds are on top of angiosperms, no needs of water, pesticides and fertilizers for growth; low demand of land for the cultivation. About 250 macroalgae species are look over as a valued product in business outlook. During which one hundred fifty species are found to be used as accessible food for animal and human, fertilizers in agriculture sector, organic process supplements and medication within the phycocolloids and pharmaceutical company field(Gaurav et al, 2017). Macroalgae provides a promising bioethanol feedstock to their high biomass yield with a desirable production kind of like the assorted terrestrial crops. Want of huge sized culture areas within the open ocean for the resources of biofuel production. The biofuel from the macroalgae offers a superb different to the presently used fossil fuels(Ranganathan Rajkumar et al, 2014).

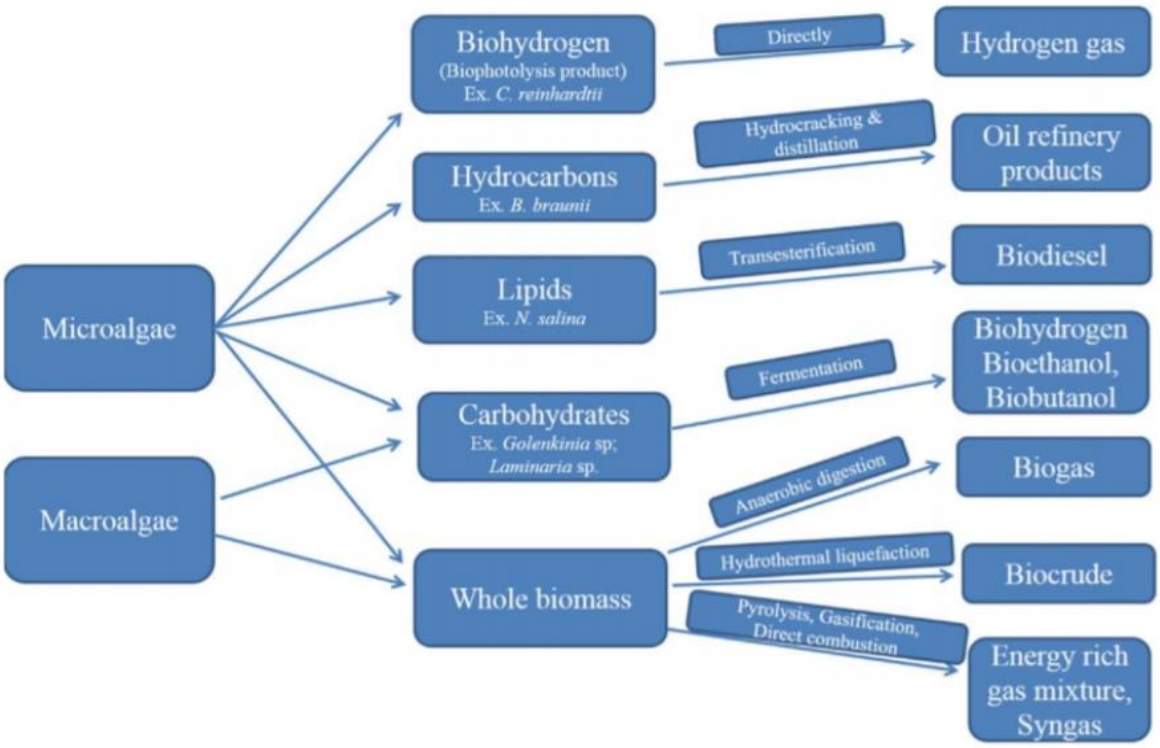

Figure 2 Various route for biofuel production from Marco-algae and Micro-algae

Microalgae

Microalgae are a various cluster of being chemical process microorganisms that grow apace thanks to their structure which are found in each marine and water habitat. The oil content of microalgae is eightieth of their dry weight and a few microalgae will double up their biomass among one day and shortest doubling time is three - five hours that makes microalgae a perfect renewable supply to provide biofuel(Firoz Alam et al, 2015). Microalgae are classified supported totally different characteristics like pigmentation, arrangements of chemical process membranes and storage product and alternative morphological options (Ranganathan Rajkumar et al, 2014). They'll in all probability use for the assembly of biofuels in an efficient and property

manner. Microalgal farming is perform with brine using marine microalgal species as producer. Microalgae are thought-about for the assembly of a lot of totally different biofuels like bio-syngas, biodiesel and biohydrogen. Nitrous oxide unharness can be reduced once biofuel made from microalgae(Yanqun Li et al, 2008). Microalgae represent green algae, Dinoflagellates, Bacillariophyta and have lipoid content. Green microalgae turn out the next amount of biofuel compare to*blue-green alga sp., Chloro-coccum sp. and Neochlorosis oleabundans* are found to be biodiesel feedstock. Haematococcus genus Pluvialis, a red microalga conjointly looks to be an honest possibility for the assembly of biofuel. The many analysis reports that microalgae as a best and potential supply for the extraction of oil than the normal biofuel crops(Madhumanti Mondal et al, 2017). Microalgae are one in every of the foremost positive candidates for embarrassment of biofuels are straightforward, cheap and easy cultivation system. Aplethora of biofuels is derived from microalgae by virtue distinctive potential. They grow simply with basic organic process needs like water, air and mineral salts with light because the solely energy supply. They possess rate and high chemical process levels which might be used for the specified biofuels productions(Dominik anotoni et al, 2007).

Cyanobacteria

Cyanobacteria are mainly called blue green algae because of their colour as well as resemblance with microalgae. It is small in size and grow in floating surroundings. Cyanobacteria are the only bacteria that carry chlorophyll. They have a comparatively small genome and many of them have already been sequenced, thus it is easy to genetically modify their biological features in sequence to increase the biofuel productivity(Mai Anh Nguyen et al, 2016). It reveals the advantage of rapid growth, high photosynthetic effectiveness, genetic control, and genome availability and release of variety of important biochemical product outcomes in biofuels production. The simple nutrient requirement of Cyanobacteria are light, water and CO2 make it a perfect applicant for biofuel production. Cyanobacteria have been engineered to produce many varieties of biofuel related compounds. The first example of biofuel production in cyanobacteria is *Synechoccus elongatus sp.* strain PCC 7942 was engineered successfully to generate ethanol by adding alcohol dehydrogenase and pyruvate decarboxylase turning carbon from pyruvate(Nozzi, 2013). Cyanobacteria can better serve the cause of biofuel production in a more economical and environmentally sustainable way and may replace the major proportion of fossil fuel usage. It can be used to produce biofuels and other valuable co-productssuch as biofertilizers, biodegradable polymers, antioxidants and color substances(Zahra zahra et al, 2020)

VEGETABLE OIL

Vegetable oils or fats that are mainly produced by oil or fat containing parts of plants, which can derive from edible oil plants namely cooking oils are classified into two groups they are saturated oils likecoconut andpalm kernel oils another is unsaturated oils like soybean and sunflower oils. Non-edible oil feedstock plants are *Jatropha curcas*(Physic nut), *Pongamic pinnata*(Karanja tree), *Azadirachta indica*(Neem) etc. But some edible is similar to non-edible oils such as *J. curcas* and *P. pinnata* oils that similar to *Glycine max* (soybean) and *Arachis hypogaea* (peanut) oils.It is mechanical solid-liquid separation or by extraction(Ruengwit Sawangkeaw, 2013).Firstly, the oil is separated from the plant parts and consequently refined and upgraded to the desired degree. Next the biomass containing oil or fat is cleaned or sterilised and the material is crushed to remove the oils. Then the process is pressing the oilseeds, which has high oil content and removing the oil contained originally within the biomass nearly two-thirds up to three-quarters then extract the remaining press cake by using a solvent recycled internally within the overall process. Two product streams are provided: the extraction oil and the remaining oil-free biomass. After pressing and extraction process, the oil undergoes a post-treatment to reduce the share of undesired substances e.g. calcium, phosphorous or magnesium. This includes mainly bleaching and in some cases degumming. At last the reaction products as well as the solid seed components were separated. After these procedures the pre-refined oil can be used for further conversion into a biofuel with clearly defined fuel characteristics based on different conversion routes(Ulf Neuling et al, 2017).

Vegetable oil crops as a biofuel source

Palm oil (Edible vegetable oil)

Palm oil has a high potential as a biofuel feedstock due to having the highest productivity and it is extracted from mesocarp fruit of *Elaeis guineensis* – oil palm tree and native to the West Africa. The oil palm is examined as most capable oilseed crop in the world due to its high yield per hectare(Teuku Meurah Indra Mahlia et al, 2019). Comparing with the major oil plant and oil seeds (e.g., soybean, ground, rapeseed, cotton)oil palm has higher oil yield ability around 4000 Kg/ha. The various types of palm oil biomass with waste palm oil are more capable resources for the production biofuel. Palm oil composes 33% of global vegetable oil production were sustaining from the domestic and needs of export for many countries includes Malaysia, Indonesia and Thailand. The production of biofuel from palm oil ca be separated into two mains classify: catalytic cracking and transesterification(Jundika C. Kurnia et al, 2016). The fruitlet has endocarp shell which containing the kernel it contains carbohydrate and oil reserves for the embryo. The oil palm has a long lifespan of over 2000 yrs. It will be in the production for about 25 years or more. Oil palm has the higher productivity of average which compared to the other major crops(Ramli Abdullah et al, 2010).

Jatropha (Non-edible vegetable oil)

Jatropha curcas plant scientist oil could be the multi-purpose drought resistant tree that can get increase thanks to the doubtless of cultivation of dry and insignificant land. JCL has high oil content seeds which may be regenerate to biodiesel. Jatropha biodiesel fuel properties square measure examined nearly as good as Petro-diesel(Wilson Parawira, 2010). Jatropha curcas has been seen as an ideal crop for cheap production of biodiesel and additionally an excellent feedstock for the biofuel. It's 30-40% of oil content seeds and seed contains 40-42% husk and 58-60% kernels. Jatropha oil is used for fuel vehicles, diesel generators, or cookery stoves into biodiesel while not transesterification. Jatropha for production of bio-diesel is eco-friendly, simple oil extraction, simple to supply the material and transesterification(Vimal Chandra Pandey et al, 2012). The tactic of biodiesel production from crude Jatropha curcas seed oil with high free fatty acids (15% FFA) was accomplished by Berchmans and Hirata. The high FFA level of Jatropha oil was down to but I Chronicles by 2 steps pre-treatment method. The primary step was acid pre-treatment method and therefore the second step square measure alkali base catalyzed transesterification method. This ballroom dancing esterification method provides with yield of 90-95% for Jatropha biodiesel(H C Ong et al, 2011). The project Jatropha has been started by 2007 and therefore the dearest goal of this project is to decrease the emission of dioxide by rising the usage of biodiesel. The Jatropha plant has the mechanical energy around 300-400Lt/ha/yr. (N Gaurav et al, 2017).

Rice bran oil

Rice bran could be a low-value by-product of rice sharpening and it containing around 15–23% of oil. It's most likely an inexpensive feedstock for the assembly of biodiesel(Salwa A El Khatib et al, 2018). Most profitable biodiesels square measure shaped from edible vegetable oils like sunflower-seed oil, palm oil, oil and copra oil. It's low cost as a result of rice bran is treated as agriculture-waste of raw materials in most rice manufacturing countries. A ballroom dancing enzyme catalyzed methodology and ballroom dancing chemical catalyzed methodology square measure developed victimization crude rice bran oil for the biodiesel production. The economic aggressiveness of biodiesel is improved by applying “in-situ process”(Pei-Jing shiu et al, 2010). Its oil is used as an oil for the ballroom dancing unmoved process of transesterification reaction with alcohol, victimization acid or basic catalyst to supply a carboxylic acid methyl group organic compound and alcohol as a by-product(Salwa A El Khatib et al, 2018). Alkali-catalyzedtransesterification is employed within the industrial of biofuel production. Acid transesterification could be capable thanks to turn out biodiesel if material oil has high free carboxylic acid content. RBO with high level free carboxylic acid content and industrial rice bran oil is extracted by victimization organic solvents (Sh K Amin et al, 2012). Rice bran oil is thought to be one amongst the foremost nutritive oils thanks to its carboxylic acid composition and a singular combination of present biologically active and inhibitor compounds. The crude rice bran oil is extremely tough to refine attributable to its high content of free fatty acids. However, it's one amongst less utilized non-edible oil and fewer researches have done to use this oil to interchange the mineral fuel(Lai et al, 2005).

ENERGY CROPS FOR BIOFUEL PRODUCTION

***Miscanthus spp.* (Miscanthus)**

Miscanthus could be a high yielding bioenergy crop and lignocellulosic stuff is one amongst the foremost voluminous biomass resources. The sugar present within the lignocellulosic is hard into alcohol. Miscanthus possesses the C_4 chemical action pathway. The C_3 plants C_4 plants have the next dioxide fixation rate for the high rates of chemical action(Gunnur Kocar et al, 2013). The genus Miscanthus encompasses of regarding dozen genus with origin from geographic region. Its yield angular distances from 8-15-ton dry weight per ha. It is most cold-tolerant C_4 plants that may capable to take care of a high dioxide adaptation at below 15^{o}C and its an aggressive perennial C_4 grass. Miscanthus square measure typically won't to turn out heat and electricity directly by combustion and additionally indirectly through conversion to be used as biofuels like alcohol and paraffin (Divjot kour et al. 2019)

***Panicum virgatum*(Switchgrass)**

Switchgrass is one amongst the necessary biofuel crops. Thisresource could be a heat season perennial C_4 grass and associated ecosystems of North America with 2 chief ecotypes together with the lowland and therefore the upland sort(Yasir Iqbal et al, 2017). Switchgrass is very versatile and is ready to grow in numerous regions of the country like regions with but ideal soil quality. It's additionally glorious to exhibit an honest tolerance to illness, insects and cold. As a biofuel resource, it's a really productive crop; really, some studies have shown yields of fifteen Mg ha−1 or a lot(Kasi David et al, 2010). The biomass is regenerate into energy-rich liquid or in vaporous forms. The conversion of the biomass has 2 ways like biological platform and thermo-chemical technologies(Divjot kour et al. 2019). The primary methodology involves the conversion of biomass to alcohol or liquid fuels by a saccharification and fermentation method & thermochemical methodology embody chemical action and shift. Thus, switchgrass as a feedstock for biofuels has earned nice interest due to its ability, high productivity, and potential straightforward integration into existing agricultural operations(Divjot kour et al. 2019).

***Sorghum bicolor* (Sweet sorghum)**

Sweet sorghum (sorghum colored (L.) Moench) could also be a high biomass and it consists of stalks that contain sugar-rich juice and it is a water-use economical crop. It had every soluble and insoluble sugars in nearly same quantity and its super-molecule, glucose, hemicelluloses and sugar as associate honest substrate for the assembly of bio-ethanol(Rouf Ahmad Dar et al, 2018). It is a reusable crop serving as Associate in Nursing order of food, animal feed, and biofuel. It's C_4 Graminaceous crop native to tropical and semi tropic regions of all countries that is sowed once air temperatures unit on the way at 12^{o}C, and it grows larger to a lower place heat(Mashapa E Malobane et al, 2018). It's frequently used as a feedstock for ethanol production as a result of, it's higher acceptance to salt, salinity, drought contrastive to sugarcane and corn that unit presently used for biofuel production. It along has higher carbohydrates and potential sugar content in sorghum stalk makes it to be rather further applicable for the fermentation to ethanol (Ratnavathi et al, 2011). It along has high natural process organization, possesses promptly potential sugars at intervals its stem. Sorghum does not need molecule conversion of starch to sugar as a result of its economic advantage over starch-based crops, it's extra energy that is accustomed depolymerize the starch(Sylvester Elikana Anami et al, 2015).

Sugar and starch-based crops

Crops that unit created in starch and sugar unit corn (maize), sugarcane and ethanol are created by these crops. The selection major crops unit is wheat, sorghum, sugar beet and cassava. Technologies for the conversion of sugar and starch unit commercially and technologically mature late. The technology of adjusting corn into ethanol is by the strategy of fermentation. The yield of ethanol from an outsize population plant might even be around one L from 2.69 weight unit of corn grains. The sugarcane involves a lower place of effective crops among the assortment of alternative energy and its conversion to energy. Sugarcane pulp could also be a lignocellulosic material. Cellulosic, hemicellulose and ligninare are the key constituents of lignocellulosic

materials. Separation of compound and hemi plastic from sugar that present in pulp, the pre-treatment step is applied for rising the quality of pulp and it's simple to vary the sugar(Ubaid Rasool et al, 2016).

BIOFUELS FROM LIGNOCELLULOSIC BIOMASS

Biological conversion technologies unit-based on being and molecule methodology for producing sugars from lignocellulosic biomass, that has sugar, hemicellulose and lignin components unit found in plant cell walls neither starch nor sugar that represent the bulk of non-woody and woody vegetative tissues manufacture a useful and versatile feedstock for a various of biofuel production. Lignocellulosic biomass refers to higher plants, softwood or hardwood. The sugars might even be regenerate into alcohol and varied fuels and chemicals and far of plant species unit presently used or unit being developed for biomass production(S N Naik, 2010). Biomass to ethanol analysis emphases on reduced costs that desires improved sugar and hemicellulose conversion to sugar combined sugar and sugar fermentation, lower pre-treatment energy desires, conversion of compound to value extra product, and economical separation methodology for alcohol. Sugar is crystalline sugar substance and hemicellulose is amorphous polymers of sugar, arabinose and ligninassociate outsize polyaromatic components. Not like maize and soybeans, that unit annuals, lignocellulosic bioenergy crops unit typically perennials, beside every woody species like *Salix spp*. (willows), *hamamelid genus spp*. (poplars) and varied hardwoods, nonwoody species like millet (switchgrass), Miscanthus spp. (miscanthus). Throughout this millet has received specific attention, having been chosen by u. s. of America Department of Energy's Bioenergy Feedstock Development Program as a model energy crop because of its high biomass yields, broad geographic vary, economical nutrient utilization, low erosion potential, carbon sequestration capability, and reduced fuel input desires relative to annual crops(Jason Hill, 2009). Biomass might even be regenerate into ethanol through molecule reaction of the plastic fractions into sugars followed by fermentation of these sugars as in maize grain ethanol production. The conversion of biomass feedstocks to liquid fuels like ethanol desires variety of basic unit operations beside pre-treatment, molecule production, hydrolysis, fermentation and ethanol recovery. There is the chance of victimization agricultural, forest residue and municipal solid waste. Lignocellulosic biofuel feedstocks from ancient agriculture as a result of they contend less directly with food crops. The yield of lignocellulosic biomass might even be exaggerated by using the waste residue and internet GHG emissions might even be reduced(Philippe Girard et al, 2006).

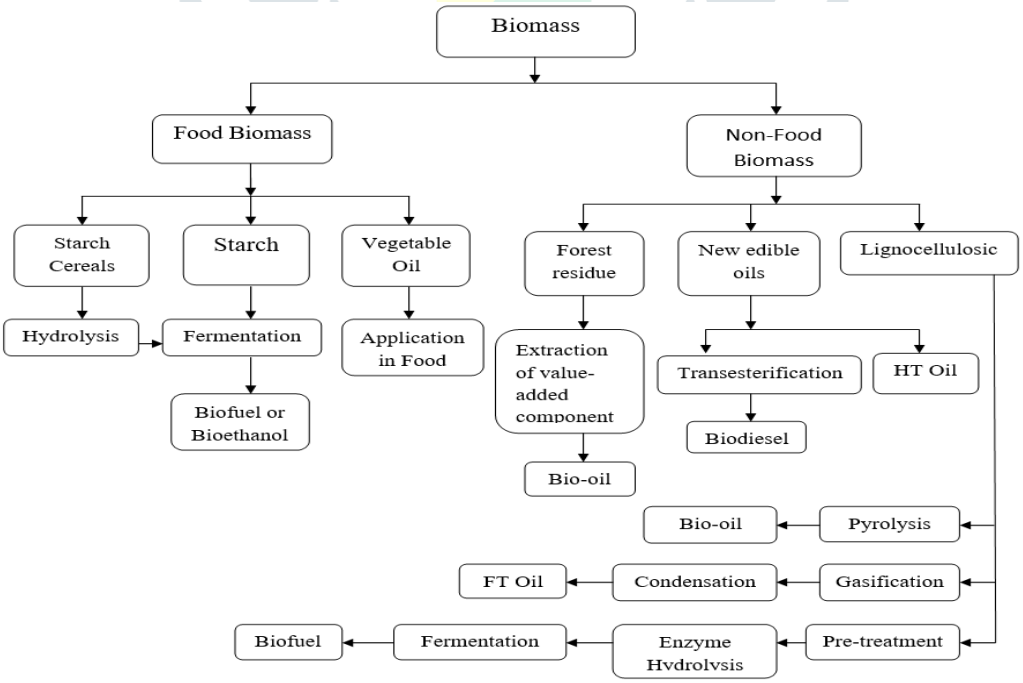

Figure 3 Biomass to Biofuel production

BIOFUEL CONVERSION TECHNOLOGIES

Transesterification

Biodiesel contains a mixture of acylated fatty acids (FA), obtained from transesterification of TAG – triacyl glycerides or by esterification method ofFA with alcohols. Once triglycerides react with alcohol within the presence of base catalyst, this can be known as transesterification or alcoholysis. Biodiesel is another fuel from renewable sources with alcohol, within the presence of solid and heterogeneous catalyst(S Rangabhashiyam et al, 2017). Biodiesel from the oil is predicated on the celebrity - carboxylic acid alkyl group esters and its environment-friendly fuel diesel. FAME may be generated from marge wealthy crop oils and FA may be made from oil. Catalysts like base, acid, critical fluids and enzymes like enzyme. Lipases area unit are economical catalyzing of each esterification of free fatty acids and transesterification of TAG(Abdul Raheem et al, 2018). Acid-catalyzed transesterification area unit less presence of water and free fatty acid; thus, it relives reaction and emulsification risks that up the recovery product. To eliminate reaction oil may be pre-treated with acid catalyst, that change state FFA to make esters of free carboxylic acid of biodiesel. It is terribly helpful once stuff contains high proportion of FFA. Base-catalyzed reactions area unit is 4000 times quicker than the acid-catalyzed(A Gnanaprakasam et al, 2013). Base-catalyzed reaction is upgrade at 60^{o}C underneath atmospheric pressure for ninety min and also the optimum conditions for acid-catalyzed reaction is 100 percent catalyst like sulphuric acid methanol-oil quantitative relation is 56:1and temperature of 30^{o}C. Transesterification by mistreatment enzyme as a catalyst at lower temperature that yields a lot of biodiesel once compare to different transesterification strategies. The quantity of enzyme disturbs the speed of reaction thus mistreatment immobilized enzyme of seventy fifth with 100 percent water offers ninety-eight15% conversion in twelve hrs. Transesterification method by mistreatment enzyme is a lot of expansive and by mistreatment waste oils or fats will scale back the price for the assembly of biodiesel(Ali Bahadar, 2013). Different types of transesterification approaches are shown(fig4)

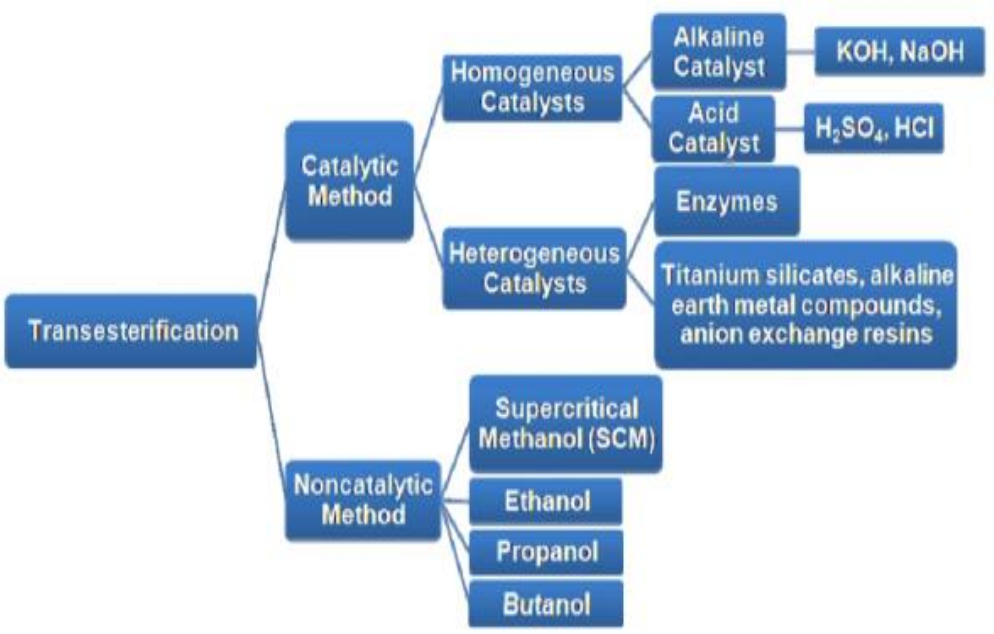

Figure 4Classification of Transesterification processes

Fermentation

Fermentation can be a method that converts the simple sugar and simple sugar sugars into alcohol by the mode of action of the microorganisms to ferment sugar into alcohol, and fermentation of bioethanol could also be conducted in batch, fed-batch and continuous mode.Pre-treatment and chemical reaction, chemical method, chemical change, chemical action methods unit of measurement designed to optimize the fermentation process. *S. cerevisiae* can generate a high yield of alcohol from simple sugar sugars and it has been used for corn- and sugar-based biofuel industries as a result of the first fermentation strain.In catalyst or acidic reaction, the

plastic suspension of pre-treated wasregenerate into doable free sugar(Alya Limayem et al, 2012). The separate reaction and fermentation (SHF) consecutive steps unit of measurement utilized in bioethanol production.Fermentation could also be done pattern utterly totally different strategies like synchronic saccharification and fermentation (SSF), separate reaction and co-fermentation (SHCF), synchronic saccharification co-fermentation (SSCF) and consolidated bioprocessing (CBP). The first two ways are in which unit of measurement most typically enforced. The SSF and CBP are developed to form positive the combo of reaction and fermentation in one singe reactor and thus cut back product inhibition and operation costs(Yogita Lugani, 2019). There unit of measurement utterly totally different groups of microorganisms like yeast, being and fungi, which could be used for the fermentation of the pre-treated and saccharification microorganism biomass(Alya Limayem et al, 2012).An organism is taken under consideration to be an ideal for biomass-ethanol technology, that have many choices like resistance to restrictive product created by pre-treatment of lignocellulosic waste, wideusage of substrate, capability to tolerate beneath high sugar and alcohol concentrations, high yield of alcohol and minimum by-product formation (Yogita Lugani, 2019).

BIOFUEL PRODUCTION FROM WASTE RESIDUES

Agriculture waste

Agriculture residues will be any divided into field residues and method residues. Field residues square measure residues that turn out within the field once the procedure of crop harvest home. These field residues contain of leaves, stalks, seed pods, and stems. The method residues square measure residues turn out even once the crop is processed into alternate valuable resource. Immense quantity of field residues is generated and plenty of them are underutilized(Pardeep Kumar Sadh et al, 2018). So as to manufacture butyl alcohol cost-competitively, use of a lot of economical substrates should be recognized and evaluated. These substrates might add agricultural residues and energy crops like Corn fiber, Wheat straw, rice straw, and miscanthus. Corn fiber may be a by-product of corn-processing industries. It had been discovered that corn fiber may well be accustomed manufacture butyl alcohol. Tries are created to manufacture butyl alcohol from wheat straw product(Nasib Qureshi, 2008). Pulp and cane trash initiate a crucial potential supply of biofuel feedstock. Cane trash and pulp are factory-made throughout the harvest home and edge amount of sugar cane, that sometimes lasts five to seven months. Cane trash contains of sugar cane topsand leaves. Nowadays, it's chiefly burnt within the field as sugar mills are already extremely self-sufficing in energy. Pulp factory-made is already employed in operation sugar mills to think about their own existing edge and power generation instrumentation have restricted potency and an outsized a part of this pulp may well be gettable through energy potency programmes(Philippe Girard et al, 2006). The foremost agricultural crop residues and by-products generated within the country, supported 2008 crop manufacture information, victimization residue-to-product ratios. These residues have alot of potential for energy production(Moses Hensley Duku et al, 2011).

Forest waste

Forestry residues are contained of work residues, fuel wood extracted from forestlands, and first and secondary wood-processing mill residues. It's calculable that annually 501 million of biological science residues square measure factory-made globally. Solely 10-25% of those may well be used for bioenergy production. Chemical composition, contain chiefly of polysaccharides cellulose, hemicellulose and polymer. These elements square measure a lot of immune to being counteracted than starch, sugar and oils within the typical food crops, manufacture the conversion processes a lot of difficult, and a lot of pricey(Dang P. Ho et al, 2014). The residues caused from the forest product trade may well be divided into 2, work residues and wood process wastes. Work residues add stumps, off-cuts, saw dust, etc. A study organized by Amoah and Becker on industrial work potency in Republic of Ghana manifested a mean work recovery of seventy-fifth. Alike to agricultural crop residues, in observe, not all of the work residues will be used for bioenergy production because of technical constrains, scheme functions, and different uses like animal folder and fertilizer. There also are environmental considerations evaluating an intensive long-run use of work residues. Wood process wastes add discarded logs, bark, sawdust, off-cuts, etc., on the opposite hand, square measure caused through sawmill and laminate mill process activities. A UN agency report on Sector Reform and also the Pattern of the

low energy use and provide such that that sawmill residues square measure round the most promising feedstock for energy functions in Republic of Ghana(Moses Hensley Duku et al, 2011).

Industrial waste

Industrial wastes, chiefly getting from waste water treatment, like yellow grease and brown grease, activated sludge, animal skin trade wastes and waste animal oil, have all been delineate as potential extra feedstocks for biofuel production. Some industrial by-products, adding citrus waste and tomato pomace, have since been examined for eutherian feed(Ruengwit Sawangkeaw, 2013). Giant quantities of each solid and liquid food wastes are caused by the food trade, hotels, building and confectionary trade within the country. Several of the solid food wastes sometimes enter the waste dumps. In valuate food wastes as biofuel feedstock within the country. Waste waters from the food trade consists sugars, starches, and different dissolved and solid organic matter. The potential exists for these food wastes to be digestible using anaerobic method to manufacture biogas, or soured to manufacture alcohol seeable of the massive size of the food trade (Moses Hensley Duku et al, 2011). The food and paper industries square measure manufacture an outsized range of residues and by-products that may be used as biomass for bioenergy production. Industrial solid wastes add however aren't restricted to peelings and scraps from fruit and vegetables, pulp and fiber from sugar and starch extraction, meat and poultry waste, settlings, etc., and everyone will be used as AN energy supply. The waste to energy approach is almost joined to the present waste management practices that have gone far away from disposal towards recovery, reuse, use and reduction(Dang P. Ho et al, 2014). Particularly in oil industries, immense range of processed residues square measure factory-made once oil extraction from the seeds. These residues square measure referred to as oil cakes. These industries generate air, water, and solid waste pollution as a result of these residues consist a lot of concentration of fat, oil, grease, suspended solids, and dissolved solids(Pardeep Kumar Sadh et al,2018).

Municipal waste

Municipal solid waste is caused by households, business and industrial sectors as an answer of the concentration of population, and activities in geographical area (Moses Hensley Duku et al, 2011).Someone 3 billion tons of municipal solid waste containing primarily of spoilable, papers, cardboards and plastics has been factory-made in 2012. Whereas the constitution of municipal solid waste is generally variable, its major fraction is biodegradation with associate out their hot price and makes it acceptable to energy recovery operation. It's evaluated that a weight unit of Municipal Solid Waste manufactures some 8-12GJ, simple fraction of the hot price of coal and creating concerning 600kWh of electricity(Dang P. Ho et al, 2014).

Waste water

Wastewater factory-made at biofuel modification facilities should be treated either onsite or off-site at native sewer water treatment facility. Each organic chemistry and thermochemical plastic plant product biorefineries also are planned for zero sewer water discharge and are anticipated to own effectively all method water recycled through a succession of onsite separation, evaporation, and anaerobic and aerobic sewer water treatment steps. However, cleansing water caused throughout thermochemical modification processes may have off-site sewer water treatment to treat the tars and alternative organic contaminants clean from the syngas(Pamela RD Williams et al, 2009). Waste waters square measure distinctive in their chemical profile and physical properties as compared with contemporary and marine waters. Recent researches given the nice potential of production of protoctist biomass for biofuel and alternative applications victimization wastewaters. Carbon is deficient however atomic number 7 and phosphorus square measure 2 main elements in industrial sewer water, that square measure competent of supporting protoctist growth. Most municipal sewer water square measure wealthy in ammonia, phosphate and alternative essential nutrients that square measure needed to support microalgal biomass production(S Mobin et al, 2014). Several microalgae species like *Scenedesmus sp.,Micractinium sp.,* etc., are tested and were incontestable to be ready to use and take away N and P further as alternative chemical element within the wastewaters. The utilization of animal sewer water for cultivating microalgae inside a biorefinery adapt a twin purpose of providing a supply of water and nutrients for the microalgae and at the same time treating this kind of noxious and galore sewer water to avoid eutrophication of surface and well water bodies, further as reducing greenhouse gases emissions(Eugenia J Olguin et al, 2012). Around natural sources, red-mud with incorporated Fe3O4 nanoparticles has been tested to treat sewer water.

The number of adsorbent doses, pH and sorption amount were out their factors for red mud Fe3O4 nanoparticles to detach antibiotics from sewer water(Nazia Hossain et al, 2020).

BIOFUEL ECONOMY, SECURITY AND NATIONAL POLICY

Economy of biofuel

Oil costs square measure high and biofuel value over typical fuels. The biofuel economy can grow quickly throughout the twenty first century. The biofuel economy and its associated biorefineries are formed by several of an equivalent force that formed the event of the organic compound economy and its refineries over the past century. It's environmental deserves, the effective contribution of biofuel in transport sector can results in rising in close to future. In recent years, the assembly of energy is a crucial actuation of the agriculture development. The event of economy is that the greatest variety of individuals lives in rural areas and their production of agriculture. For economic development the energy production of agriculture plays a crucial role(NGaurav et al, 2017).

Food security

The development of biofuels is exciting significant investment in agriculture: for example, PRC is spending $200 million on a program of research and expansion, such investment will help to increase crop yields, and if food production is line up over that of biofuels, this could enrich rural development and food security. Higher food prices could help to maintain pastoral incomes and even help to drive increased productivity on a global scale. The diversion of grains to biofuels, while only one of a number of complex factors, is estimated to have been responsible for 30-75% of the price increases. If biofuel development is to be socially equitable, the benefits need to be distributed to all affected members of society. The use of cellulosic feedstocks or biofuels derived from waste could in theory avoid many of those problems. Minor crops that can be grown on marginal soils, in particular sweet sorghum are being promoted instead. These factors include increasing energy cost, improve energy intensity of agriculture, shifts in consumer demand towards meat-rich diets, slowdown in yield increase, changes in rainfall patterns and increases in the risk and difficulty of extreme weather events associated with climate change (Ben Phalan, 2009)

National biofuel policies

This half is addressing biofuels policies in main biofuel markets, alcohol policies in Brazil were at the start developed through government intervention as a reaction to the fossil oil shortage caused by 1973 oil crisis. Brazil additionally initiated biodiesel mixing targets of twenty-two in 2008 and five-hitter in 2013. The US biofuel policies were introduced already in 1970. From the gap of the Energy Policy Act of 2005, the US biofuel targets were expressed as mandates in volumetrically terms as a vicinity of the Renewable Fuel customary (RFS) program. The EU biofuels policy isn't caught in a very single document however in a very range of documents equipped by completely different components of the EU governance structure. In 2009, the EU Renewable Energy Directive accepted a “20-20-20 Policy” for the employment(Karel Janda et al, 2012). Republic of India has declared associate degree formidable biofuel policy in 2009 to achievement 2 hundredth of fossil oil fuels in transportation by bioethanol and biodiesel. Biofuel production is targeted for not solely meeting the transportation request however additionally meeting the employment of decentralized power generation(N.H. Ravindranath et al, 2011). Speedy progression and consciousness of biofuels has begun in Germany initially round the EU Member States. The Biofuel Quota Act, 2007 sets a goal of four.4% biodiesel in diesel by 2010 and nearer, National Renewable Energy Action arrange, 2010 has mandated eighteen renewable energy quotas in finale energy consumption by 2020. Closer, a pair of and five-hitter biofuel mixing in traditional diesel is ready as goal in Canada below the atmosphere Protection Act, 1999. In Argentina lower the program of Regulation and Promotion of the producing and property Use of Biofuels, 2006. Thailand additionally set a goal to fulfill five-hitter mixing in Diesel with oil and 100 percent mixing in alcohol with Cassava (Azhaham Perumal Saravanan et al, 2018). In 2009, seventy fifth of total gasoline took in South American nation had 100 percent alcohol content. Money implements and policies are in situ to support the native biofuel business by giving motivation to new agro-industrial comes. France biofuel policies add obligatory mixing of bioethanol and biodiesel similarly as business inducement. Biofuel production has adult

considerably despite the recent decline in business inducement. China biofuel policies focus on alcohol production. Renewable energy as a share of total primary energy use ought to rise to 100 percent by 2010 and to fifteen by 2020. In Indonesia the alcohol constituent of gasoline is basically to be three-D in 2010 and increase up to fifteen by 2025. In Malaysia the National Biofuel Policy was started in 2005. In 2007 Malaysia exported 95000 tons of PME, similar to throughout seventy fifth of total biodiesel production. In Australia actual production is far lesser and amounted to eighty-three million liters of ethanoland seventy-seven million liters of biodiesel within the 2006-2007 business years (Giovanni Sorda et al, 2010).

IMPACTS FOR THE BIOFUEL

Environmental consequences

The impact of biofuels production and usage on the environment is intensive and deep. The inter-governmental panel according on global climate change refers that improvement in greenhouse emission because of anthropogenetic activity. Its answerable for the worldwide temperature rise. So as to realize the goal, carbon dioxide emissions ought to be reduced by fifty to eightieth by 2050. Application of biofuels is to switch the Petro-fuels will play a key role to scale back carbon dioxide emissions. The influence of biofuel generation on the encompassing through GHG emissions, co-products generation, impact on variety, water resources and land usage ought to be determined and analyzed for this policy to be effective. (Vineet Singh Sikarwar et al, 2017). There are several edges for the economy, customers and atmosphere in victimization biofuels. The massive distinction between fossil oil feedstocks and biofuels is gas content. Biofuels have 10-45% of gas level. These advantage that indicate the employment of biofuels, their production and finish usage have environmental impacts includes quantity of enormous usage of water, production of food abatement, rise in soil degradation and forests destruction (Ayhan Demirbas, 2009)

Table 1 Environmental issues of Cons and Pros

cons	pros
The use of pesticides and fertilizers can contaminate the land and groundwater	Energy balance is healthier than standard fuel
Biofuel production could overprice than different ways that of reducing carbon dioxide emission	Biofuels are biological degradable
The biofuels production needs fossil energy	Closed carbon cycle, scale back carbon dioxide emission
No SO2 emission, terribly low NOx, CO, no Sulphur content	Growing energy plants evoke monocultures

The biofuels are the cleaner thanks to fulfil the requirements of energy for the transport sector. The environmental impact of biofuels is determined by life cycle assessment (LCA), which implies that the analysis of impacts and consumption all told stages of life cycle of product. In keeping with puppan, the ecological edges are shown throughout the combustion in engines, only if their carbon dioxide emission correspond to the number that was become independent from the atmosphere throughout the plant growth that are leading to a closed carbon cycle for biofuels shown (Fig 5) (Jose C. Escobar et al, 2009).

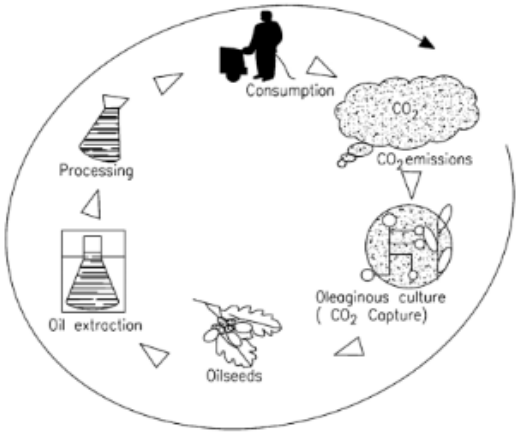

Figure 5 Carbon closed cycle

Sustainability issues

The major property impacts in biofuels principally increase from the aspects of environmental and economic, that area unit associated with the feedstocks, accelerator expense, fermentation efficiency and pre-treatment economy. The plants that generate the biofuel aren't solely provides energy however additionally consumes it. The plants additionally manufacture wastes that area unit in all probability harmful to atmosphere and human health. Whereas industries of biofuels take some steps to gather energy consumption and waste production, environmental property still remains a significant concern. the event for the atmosphere concern, life cycle assessment (LC) is found to be one amongst the foremost effective approach(Hossain M Zabed et al, 2019). It evaluates environmental impacts of whole method or perhaps step of biofuel production. Moreover, LCA will give a comprehensive state of affairs of any biofuel or its production method through quantitative analysis of internet energy and material consumption, together with quantifying the wastes discharge and emission of specific matters, like GHG. Life cycle assessment studies for GHG emissions by totally different biofuels have disclosed that protoctist biodiesel emits considerably lower amounts of gas than the GHG emitted from the corn alcohol. The reduced GHG emissions from microalgal biofuels may well be attributed to the employment of greenhouse emission because the carbon supply for microalgae cultivation (Anoop Singh et al, 2011).

FUTURE PROSPECTS

The future development of biofuels that appears bright, however it's necessary to develop and apply biofuels property criteria as shortly as attainable and in a very consistent method worldwide. This need increased cooperation among an outsized vary of stake-holders and property development was supported by governments and WHO share a typical concern for coping with the world global climate change and oil challenges facing the planet within the twenty first century. Bioenergy is actually turning into a bigger a part of international energy combines and is projected to contribute up to 20-30% of the general primary energy worldwide by 2035. Biofuel production for transport has exhibited the foremost rising, adopted by government support. within the new policies state of affairs, the share of ancient biomass in total primary energy demand is predicted to drop from five&7% - 3.9% between 2011 and 2035. In new policies state of affairs, advanced biofuels area unit expected to achieve market share when 2020 and reach two hundredth of biofuel offer in 2035, there are a unit still some policy barriers to beat before the technologies are often commercialized worldwide. The biofuel offers the immediate potential to scale back the demand for fossil fuel-based diesel within the transportation sector. As a future prospective fuel, biodiesel has got to contend economically with oil thanks to this, demand for biodiesel is predicted to extend sharply within the close to future.

CONCLUSION

This paper has reviewed a range of biofuels and biofuels processes. The discussion is concerning offer aspect that biomass will give alternate resources for the biofuel production and hoe potency the biofuels area unit used. The 1st generation biofuels have some usages however additional limitations. Sugarcane alcohol stands out among first-generation biofuels as suffering fewer limitations, as a result of for process the sugarcane into

alcohol is provided by biomass from the cane itself and greenhouse gas abatement and cost. Second generation biofuels area are unit spectrum energy. This can be made up of lignocellulosic feedstocks. The lignocellulosic materials convert into renewable energy and environmental advantages for 2d generation compared to most first-generation biofuels. The third-generation biofuel is incredibly essential as a result of algal biomass and also the emission of gas. Production of biofuel from biomass wastes has received sizeable attention worldwide amid the efforts to seek out various properties. The trendy world is facing various challenges like oil worth, depletion of the resources, climate changes and directly or indirectly harming the encompassing. Thus, biofuels s an alternate to the fossil fuels in future can for sure be a number one provider of energy in property method with the aptitude to extend the protection of supply; additionally, this can completely cut back the quantity of auto emissions. The employment of biofuels is being benefitted by several governments everywhere the planet. There's a far potential for biofuel market that has been accepted globally and also the use of biofuels as alternate to fossil fuels still needs technological development to scale back the price of production and gas emission and to extend the feasibleness. Hence, each atmosphere and business had promoted from their early identifications and improvement within the field of different fuels.

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