

Initial Futures search on the subtopic Biofuels
Conducted by Stacie Marinelli, Reference Librarian, ASRC
December 2005

“Futurism” terms:

Future
New
Green / sustainable / clean energy
Renewable energy / “Renewable Energy Technologies” (RET)
Trends
Creative
Innovative/innovation
Alternatives / Alternative fuels / Alternative technology

Bioenergy Terms

Biofuels, biogas, sludge gas, natural gas, biodiesel, fuel cell, fuel processor, bioethanol, biomass, biotechnology, e-diesel, hydrogen production

Books (most from searches in the DOE “OSTIbridge” database

Biofuels for Transport: An International Perspective

International Energy Agency (May 31, 2005) **Paperback:** 210 pages **ISBN:** 9264015124

In the absence of strong government policies, the IEA projects that the worldwide use of oil in transport will nearly double between 2000 and 2030, leading to a similar increase in greenhouse gas emissions. Bio fuels, such as ethanol, bio diesel, and other liquid and gaseous fuels, could offer an important alternative to petroleum over this timeframe and help reduce atmospheric pollution. This book looks at recent trends in bio fuel production and considers what the future might hold if such alternatives were to displace petroleum in transport.

[The MTBE Crisis and the Future of Biofuels: Hearing Before the Committee on Agriculture...](#)

[by Nutrition, and Forestry. Subcommittee on Research, Nutrition, and General Legislation United States. Congress. Senate. Committee on Agriculture - 2001 - 144 pages](#)

[Review of the Research Strategy for Biomass-Derived Transportation Fuels](#)

[by National Research Council - Nature - 1999 - 60 pages](#)

Page 1 - During this period, a number of complex, interacting factors, including **advances** in the technologies used to produce **biofuels** at a competitive cost, ...

[Renewable Energy Technologies: Hearing Before the Subcommittee on Energy and Power of the...](#)

[by United States. Congress. House. Committee on Energy and Commerce. Subcommittee on Energy and Power - 1989 - 153 pages](#)

EPA Headquarters Collection:

Toward a sustainable energy future, International Energy Agency, OECD (2001)

EJEB INTL collection HD9502.A2T69 2001

Contents:

In chapter, Sustainability Issues for Developing Countries, section on **bioenergy begins on p. 201**

Policy issues of sustainable development

Energy safety

Energy market reform

Improving energy efficiency

Renewable energy

Preventing climate change risk

Stevens, Christian V. ; Verhe, Roland. Renewable bioresources: scope and modification for non-food applications. (2004) TP155.2.E58R46 2004

'Renewable resources' is a new and rapidly developing concept in the environmental and chemical sciences that concerns the broad use of renewable raw materials for industry. In today's environmentally aware society, sustainable development, clean technology and pollution, and green chemistry are integral to this area. Renewable Bioresources: scope and modification for non-food applications is the first text to consider the broad concept of renewable materials from the socio-economic aspects through to the chemical production and technical aspects of treating different raw products. The text sets the context of the renewables debate with key opening chapters on green chemistry, and the current situation of US and EU policy regarding sustainability and industrial waste. The quantitative and technical scope and production of renewable resources is then discussed with material looking at integral valorisation, the primary production of raw materials, downstream processing, and the identification of renewable crop materials. The latter part of the book concludes with a discussion on the uses for renewable materials such as carbohydrates, woods, fibres, biopolymers, lipids and proteins in different industrial applications, including a key chapter on the high value-added industries. Covers the broad concept of renewable resources from different points of view. Takes readers through the identification, production, processing and end-applications for renewable raw materials. Considers and compares EU and US renewable resources and sustainability objectives. Devotes one chapter to green chemistry and sustainability, focussing on the green industrial processes. This is an essential book for upper level undergraduates and Masters students taking modules on Renewable Resources, Green Chemistry, Sustainable Development, Environmental Science, Agricultural Science and Environmental Technology. It will also benefit industry professionals and product developers who are looking at improved economic and environmental means of utilising renewable materials.

Websites

Liquid Biofuels document from the European Union:

http://europa.eu.int/comm/energy_transport/atlas/htmlu/lbint.html

Excerpts:

Liquid Biofuels:

Biofuels are liquid fuels produced from biomass feedstocks via a number of chemical processes. The two biofuels that have advanced the most are biodiesel (produced from vegetable oil) and bioethanol and its derivative ethyl tertiary butyl ether, ETBE (produced from plant sugars). Other liquid biofuels have been researched and trialled, such as biomethanol and its derivative MTBE (methyl tertiary butyl ether) from lignocellulosic material, but have not gained the commercial potential and market share that biodiesel and bioethanol/ETBE have.

Therefore this module covers the two key liquid biofuels, biodiesel and bioethanol / ETBE, that have been extensively researched and developed across much of the EU and the world. It covers the issues associated with the production of the feedstock and the production of the fuel. It does not cover the use of the biofuel; information on this is given in the Transport Sector of the ATLAS Information Base. These two fuels can substitute fossil fuel (with or without engine modification) and mainly have a transport application, although they are used in small scale heating production in certain countries. The main advantages of using biofuels include their direct substitution for fossil fuels, an existing pipe distribution network, and a commonly held acceptance that the levels of harmful emissions are lower than their fossil fuel equivalent.

The technologies for the production of these liquid biofuels are well understood chemical processes using proven techniques. Typical feedstocks for these fuels are mainstream agricultural crops such as oilseed rape (Northern Europe) and sunflower oil (Southern Europe) for biodiesel; and, wheat and sugar beet (Northern Europe) and sweet sorghum (Southern Europe) for bioethanol/ETBE. Other feedstocks being researched are all kinds of virgin or waste oils or fats of plant or animal origin and lignocellulosic material such as wood. Since the main cost element to fuel production is the expensive feedstock, these cheaper feedstocks are predicted to help reduce the overall fuel production costs.

Technical Development Status

The conversion technology in itself is low risk because it is well proven; as such, advances in the traditional production techniques are unlikely. The development of the liquid biofuel industry was quite quick because of this, but major reductions in the cost of biofuel production have not occurred because of the relatively high feedstock

costs. Since the liquid biofuel market largely depends upon the availability of tax relief on the fuel produced, it could be considered somewhat uncertain which makes investment in plant rather risky.

Meeting notes from a 2005 alternative energy conference: <http://www.bio-power.co.uk/svoa/conf.htm>

Innovative technical solutions and **future technologies**

http://www.ifp.fr/IFP/en/ifp/ab13_03.htm

Alternative motor fuels today and tomorrow,

5 page document from [The Institut français du pétrole \(the French Petroleum Institute\)](#).

http://www.ifp.fr/IFP/en/files/cinfo/IFP-Panorama05_06-CarburantsalternatifsVA.pdf

New Energy Technologies, 8 pages

http://www.ifp.fr/IFP/en/ifp/ab04_02.htm

Fischer-Tropsch technology: fuels from gas, coal or biomass

Biofuels and biomass energies

Hydrogen: An energy vector for the future?

http://www.ifp.fr/IFP/en/files/cinfo/IFP-Panorama04_11-HydrogeneVA.pdf

U.S. Department of Energy (DOE) Biomass Program

<http://www.eere.energy.gov/biomass/>

UK Biofuels Portal

http://www.biodiesel.co.uk/babfo_links.htm

Emerging technologies and their implications for the future

http://future.iftf.org/2005/11/biofuels_and_su.html

Forests paying the price for biofuels

<http://www.newscientist.com/article.ns?id=mg18825265.400>

Desktop's Current Contents results (hand picked) from 55 titles

Search statement (in keyword search): (biofuel? OR biodiesel? OR green fuel?) AND (future OR trend?)

New heterogeneous process for biodiesel production: A way to improve the quality and the value of the crude glycerin produced by biodiesel plants

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Inst Francais Petr, BP3, F-69390 Vernaison, France, (REPRINT); Inst Francais Petr, , F-69390 Vernaison, France, ;
Inst Francais Petr, , F-92852 Rueil Malmaison, France, ; Axens, IFP Grp Technol, , F-92508 Rueil Malmaison,
France,
CATALYSIS TODAY, 2005, Volume: 106, Number: 1-4 (OCT 15), Page: 190-192
Language: English

Abstract: With over 10 years of development and commercial use in Europe, biodiesel has now proved its value as a fuel for diesel engines. A sharp increase in the production of this kind of biofuel is expected in the near future. Biodiesel is obtained through transesterification reaction of vegetable oil by methanol. Several commercial processes to produce fatty acid methyl esters from vegetable oils have been developed and are available today. These processes use homogeneous basic catalysts such as caustic soda or sodium methylate which lead to waste products after neutralization with mineral acids. This paper provides a general description of a completely new continuous biodiesel production process, where the transesterification reaction is promoted by an heterogeneous catalyst. This process requires neither catalyst recovery nor aqueous treatment steps: the purification steps of products are then much more simplified and very high yields of methyl esters, close to the theoretical value, are obtained. Glycerin is directly produced with high purity levels (at least 98%) and is exempt from any salt contaminants. With all these features, this process can be considered as a green process. (c) 2005 Elsevier B.V. All rights reserved. (9 References)

Subjects:

- biodiesel production
- transesterification
- vegetable oils
- heterogeneous catalysis
- glycerin
- OILS

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Dialog® File Number 440 Accession Number 21865910

Conceptual design and selection of a biodiesel fuel processor for a vehicle fuel cell auxiliary power unit

Specchia S (REPRINT); Tillemans FWA; van den Oosterkamp R; Saracco G (E-Mail: stefania.specchia@polito.it)
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Turin, Mat Sci & Chem Engn Dept, , I-10129 Turin, Italy, ; Netherlands Energy Res Ctr, Fuel Cell Technol Dept, ,
NL-1755 ZG Petten, Netherlands,
JOURNAL OF POWER SOURCES, 2005, Volume: 145, Number: 2,SI (AUG 18), Page: 683-690
Language: English

Abstract: Within the European project BIOFEAT (biodiesel fuel processor for a fuel cell auxiliary power unit for a vehicle), a complete modular 10 kW(e) biodiesel fuel processor capable of feeding a PEMFC will be developed, built and tested to generate electricity for a vehicle auxiliary power unit (APU). Tail pipe emissions reduction, increased use of renewable fuels, increase of hydrogen-fuel economy and efficient supply of present and future APU for road

vehicles are the main project goals. Biodiesel is the chosen feedstock because it is a completely natural and thus renewable fuel.

Three fuel processing options were taken into account at a conceptual design level and compared for hydrogen production: (i) autothermal reformer (ATR) with high and low temperature shift (HTS/LTS) reactors; (ii) autothermal reformer (ATR) with a single medium temperature shift (MTS) reactor; (iii) thermal cracker (TC) with high and low temperature shift (HTS/LTS) reactors. Based on a number of simulations (with the AspenPlus (R) software), the best operating conditions were determined (steam-to-carbon and O₂/C ratios, operating temperatures and pressures) for each process alternative. The selection of the preferential fuel processing option was consequently carried out, based on a number of criteria (efficiency, complexity, compactness, safety, controllability, emissions, etc.); the ATR with both HTS and LTS reactors shows the most promising results, with a net electrical efficiency of 29% (LHV). (c) 2005 Elsevier B.V. All rights reserved. (18 References)

Subjects:

- biodiesel
- fuel processor
- fuel cell
- auxiliary power unit
- conceptual design
- HYDROGEN

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Dialog® File Number 440 Accession Number 21680719

Tax exemption for biofuels in Germany: Is bio-ethanol really an option for climate policy?

Henke JM (REPRINT); Klepper G; Schmitz N (E-Mail: jm.henke@ifw-kiel.de)

Kiel Inst World Econ, Dusternbrooker Weg 120, D-24105 Kiel, Germany, (REPRINT); Kiel Inst World Econ, , D-24105 Kiel, Germany, ; Meo Consulting Team, , D-50735 Cologne, Germany,

ENERGY, 2005, Volume: 30, Number: 14 (NOV), Page: 2617-2635

Language: English

Abstract: In 2002 the German Parliament decided to exempt biofuels from the gasoline tax to increase their competitiveness compared to conventional gasoline. The policy to promote biofuels is being justified by their allegedly positive effects on climate, energy, and agricultural policy goals. An increased use of biofuels would contribute to sustainable development by reducing greenhouse-gas emissions and the use of non-renewable resources. The paper takes a closer look at bio-ethanol as a substitute for gasoline. It analyzes the underlying basic German, European, and worldwide conditions that provide the setting for the production and promotion of biofuels. It is shown that the production of bio-ethanol in Germany is not competitive and that imports are likely to increase. Using energy and greenhouse-gas balances we then demonstrate that the promotion and a possible increased use of bio-ethanol to reduce greenhouse-gas emissions are economically inefficient and that there are preferred alternative strategies. In addition, scenarios of the future development of the bio-ethanol market are derived from a model that allows for variations in all decisive variables and reflects the entire production and trade chain of bio-ethanol, from the agricultural production of wheat and sugar beet to the consumption of bio-ethanol in the fuel sector. (c) 2004 Elsevier Ltd. All rights reserved. (36 References)

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Dialog® File Number 440 Accession Number 21423673

Crop biotechnology provides an opportunity to develop a sustainable future

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TRENDS IN BIOTECHNOLOGY, 2005, Volume: 23, Number: 7 (JUL), Page: 339-342

Language: English

Document Type: EDITORIAL MATERIAL

Abstract: The current reliance on petro-based fuels and chemicals is not sustainable. New technologies typically take similar to 25 years to penetrate the market; consequently, the development of viable alternatives is required in the near future. Plant-based systems capture solar energy and can be produced in a renewable manner. However, the harvestable parts are not well optimized for energy transfer and this has been a significant limitation to the development of economically viable and sustainable biomass energy systems. Biotechnology has provided a new toolset that can be used to design and optimize the capture of solar energy through crops. Further development of biotechnology and genomics tools will enable the development of crops with specific traits that are optimized for biofuels and bioenergy. The implementation of such a system will enable a sustainable platform for centuries to come and should be given a high priority in society. (11 References)

Subjects:

- GENOMICS

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Dialog® File Number 440 Accession Number 21348484

New opportunities resulting from cogeneration systems based on biomass gasification

Demirbas A (REPRINT) (E-Mail: ayhandemirbas@hotmail.com)

PK 216, , TR-61035 Trabzon, Turkey, (REPRINT); Selcuk Univ, , Konya, Turkey,

ENERGY SOURCES, 2005, Volume: 27, Number: 10 (JUL 15), Page: 941-948

Language: English

Abstract: Cogeneration (COGEN) is defined as the combined production of two forms of energy (electric or mechanical power plus useful thermal energy) in one technological process. The COGEN is considered worldwide as the major option to achieve considerable energy saving with respect to traditional systems. The heat produced from the electricity generating process is captured and utilized to produce domestic purposes and can be used in steam turbines to generate additional electricity. Facilities with COGEN systems use them to produce their own high and low level steam. Currently, advanced biomass gasification and gas turbine combined cycle has been found to be a promising cogenerative conversion technology for the recovery of heat present in biomass fuel. Increased biofuel based cogenerative power production in the future is clearly dependent on the improvement of both performance and investment costs of new high performance technology, and on the nature of policy instruments designed to promote the technology. (16 References)

Subjects:

- biomass
- cogeneration
- electricity

- gasification
- COMBINED HEAT
- TURKEY
- ELECTRICITY
- POWER

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Dialog® File Number 440 Accession Number 21242486

 Fulltext available through:  

Utilization of liquid biofuels in automotive diesel engines: An Indian perspective

Subramanian KA (REPRINT); Singal SK; Saxena M; Singhal S (E-Mail: kasubramanian@yaboo.com)

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BIOMASS & BIOENERGY, 2005, Volume: 29, Number: 1, Page: 65-72

Language: English

Abstract: This paper deals with the policy and planning issues for utilization of ethanol and biodiesel in automotive diesel engines in the Indian context in view of environmental benefits, energy self-sufficiency and boosting of the rural economy as well as measures related to implementation and barriers. The main focus of this paper is on transport and refinery scenario, land availability for production of biodiesel and potential sources for biodiesel and ethanol. The availability of ethanol and estimations for its consumption as transport fuel are made and necessary remedial measures to increase the availability of ethanol in the country in future are suggested. (c) 2005 Elsevier Ltd. All rights reserved. (22 References)

Subjects:

- biodiesel-diesel blend
- ethanol-diesel blend
- emission
- rural economy
- JATROPHA-CURCAS
- FUELS
- EMISSIONS

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Dialog® File Number 440 Accession Number 20993079

Biofuels and other approaches for decreasing fossil fuel emissions from agriculture

Powlson DS (REPRINT); Riche AB; Shield I (E-Mail: david.powlson@bbsrc.ac.uk)

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ANNALS OF APPLIED BIOLOGY, 2005, Volume: 146, Number: 2, Page: 193-201

Language: English

Abstract: Biofuels offer one method for decreasing emissions of carbon dioxide (CO₂) from fossil fuels, thus helping to meet UK and EU targets for mitigating climate change. They also provide a rational option for land use within the EU that could be economically viable, provided that an appropriate financial and policy environment is developed. If 80% of current set-aside land in the UK were used for production of biomass crops for electricity generation, about 3% of current UK electricity demand could be met from this source. Considering possibilities for increasing yields and land area devoted to such crops over the coming decades, this could possibly rise to 12%. These estimates exclude consideration of developments in electricity generation which should increase the efficiency of conversion. Also, the use of combined heat and power units at local level (e.g. on farms or in rural communities) gives additional energy saving. Dedicated biomass crops such as willow, poplar, miscanthus, switchgrass or reed canary grass are perennials: in comparison with annual arable crops they would be expected to deliver additional environmental benefits. The elimination of annual cultivation should give a more stable environment, beneficial for farmland biodiversity. Some increase in soil organic matter content is likely, leading to some sequestration of carbon in soil and long-term improvements in soil quality. The impact on water quality may be positive as nitrate losses are small and a similar trend is expected for phosphate and pesticides. However, these crops may well use more water than arable crops so their impact on water resources could be negative - an issue for further research. Agricultural land can also be used to produce liquid fuels for use in transport. At present biodiesel can be produced from oilseed rape and ethanol from either sucrose in sugar beet or cellulose from virtually any plant material. In the short-term, liquid biofuels are an easy option as they require little change to either agriculture or transport infrastructure. However, their benefits for CO₂ emissions are much less than for biomass used for generating electricity. It is therefore necessary to debate the priorities for land use in this context. (31 References)



Evaluation of greenhouse gas emission risks from storage of wood residue

Wihersaari M (REPRINT) (E-Mail: margareta.wihersaari@vtt.fi)

VTT Proc, POB 1603, FIN-40101 Jyväskylä, Finland, (REPRINT); VTT Proc, , FIN-40101 Jyväskylä, Finland, *BIOMASS & BIOENERGY*, 2005, Volume: 28, Number: 5, Page: 444-453

Language: English

Abstract: The use of renewable energy sources instead of fossil fuels is one of the most important means of limiting greenhouse gas emissions in the near future. In Finland, wood energy is considered to be a very important potential energy source in this sense. There might, however, still be some elements of uncertainty when evaluating biofuel production chains. By combining data from a stack of composting biodegradable materials and forest residue storage research there was an indication that rather great amounts of greenhouse gases may be released during storage of wood chip, especially if there is rapid decomposition. Unfortunately, there have not been many evaluations of greenhouse gas emissions of biomass handling and storage heaps. The greenhouse gas emissions are probably methane, when the temperature in the fuel stack is above the ambient temperature, and nitrous oxide, when the temperature is falling and the decaying process is slowing down. Nowadays it is still rather unusual to store logging residue as chips, because the production is small, but in Finland storage of bark and other by-products from the forest industry is a normal process. The evaluations made indicate that greenhouse gas emissions from storage can, in some cases, be much greater than emissions from the rest of the biofuel production and transportation chain. (c) 2005 Elsevier Ltd. All rights reserved. (41 References)

Subjects:

- storage
- logging residue
- biomass
- dry matter loss
- greenhouse gases
- N₂O
- CH₄

- ORGANIC HOUSEHOLD WASTES
- ENERGY-SYSTEMS
- NITROUS-OXIDE
- TRACE GASES
- N₂O
- CH₄

OptStrain: A computational framework for redesign of microbial production systems

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GENOME RESEARCH, 2004, Volume: 14, Number: 11 (NOV), Page: 2367-2376

Language: English

Abstract: This paper introduces the hierarchical computational framework OptStrain aimed at guiding pathway modifications, through reaction additions and deletions, of microbial networks for the overproduction of targeted compounds. These compounds may range from electrons or hydrogen in biofuel cell and environmental applications to complex drug precursor molecules. A comprehensive database of biotransformations, referred to as the Universal database (with >5700 reactions), is compiled and regularly updated by downloading and curating reactions from multiple biopathway database sources. Combinatorial optimization is then used to elucidate the set(s) of non-native functionalities, extracted from this Universal database, to add to the examined production host for enabling the desired product formation. Subsequently, competing functionalities that divert flux away from the targeted product are identified and removed to ensure higher product yields coupled with growth. This work represents an advancement over earlier efforts by establishing an integrated computational framework capable of constructing stoichiometrically balanced pathways, imposing maximum product yield requirements, pinpointing the optimal substrate(s), and evaluating different microbial hosts. The range and utility of OptStrain are demonstrated by addressing two very different product molecules. The hydrogen case study pinpoints reaction elimination strategies for improving hydrogen yields using two different substrates for three separate production hosts. In contrast, the vanillin study primarily showcases which non-native pathways need to be added into *Escherichia coli*. In summary, OptStrain provides a useful tool to aid microbial strain design and, more importantly, it establishes an integrated framework to accommodate future modeling developments. (56 References)

Subjects:

- METHYLOBACTERIUM-EXTORQUENS AM1
- ESCHERICHIA-COLI
- METABOLIC PATHWAYS
- HYDROGEN-PRODUCTION
- GEOBACTER-SULFURREDUCTENS
- GENOME
- RECONSTRUCTION
- DATABASE
- BACTERIA
- MODEL

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Dialog® File Number 440 Accession Number 19618228

Current utilization and future prospects of emerging renewable energy applications in Canada

Islam M (REPRINT); Fartaj A; Ting DSK (E-Mail: islam1f@uwindor.ca)

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RENEWABLE & SUSTAINABLE ENERGY REVIEWS, 2004, Volume: 8, Number: 6 (DEC), Page: 493-519

Language: English

Document Type: REVIEW

Abstract: Canada has vast renewable energy resources due to its extensive geography and traditionally they have played an important role, particularly prior to the turn of the 20th century. Public interest in new renewable energy technologies (RETs) emerged and grew during the oil shocks of the 1970s and early 1980s. Even though many Canadian provinces had been deriving most of their electricity from hydroelectric power, the first oil crises of the 1970s ignited a strong interest in all forms of renewable energy. Though Canada has huge prospects for low-impact RETs, it is falling behind most industrialized nations in the expansion of these technologies due to a lack of supporting market structures and the absence of appropriate government policies and initiatives. This review focuses on only applications of low-impact emerging RETs that refer to wind, solar, small hydro, geothermal, marine and modern biomass energy. Today, these technologies are mostly in the dissemination, demonstration and early stage of commercialization phase in Canada and currently they contribute less than 1% of the total primary energy consumption. It is evident from the past experience of Europe and Japan that environmentally benign RETs can contribute significantly toward Canada's Kyoto target of reducing greenhouse gas emissions by displacing the use of conventional fossil fuels, and help Canada take an essential step toward a sustainable energy future. In this paper, the current energy utilization scenario of Canada has been analyzed and an array of emerging RET applications has been presented under the category of. (i) green power technologies; (ii) green heat technologies; and (iii) green fuel technologies. (C) 2003 Elsevier Ltd. All rights reserved. (32 References)

Subjects:

- renewable energy
- Canada
- solar
- wind
- small hydro
- geothermal
- biomass
- earth energy

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Dialog® File Number 440 Accession Number 19418127

Biofuel cells select for microbial consortia that self-mediate electron transfer

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APPLIED AND ENVIRONMENTAL MICROBIOLOGY, 2004, Volume: 70, Number: 9 (SEP), Page: 5473-5482

Language: English

Abstract: Microbial fuel cells hold great promise as a sustainable biotechnological solution to future energy needs. Current efforts to improve the efficiency of such fuel cells are limited by the lack of knowledge about the microbial ecology of these systems. The purposes of this study were (i) to elucidate whether a bacterial community, either suspended or attached to an electrode, can evolve in a microbial fuel cell to bring about higher power output, and (ii) to identify species responsible for the electricity generation. Enrichment by repeated transfer of a bacterial consortium

harvested from the anode compartment of a biofuel cell in which glucose was used increased the output from an initial level of 0.6 W m⁻² of electrode surface to a maximal level of 4.31 W m⁻² (664 mV, 30.9 mA) when plain graphite electrodes were used. This result was obtained with an average loading rate of 1 g of glucose liter⁻¹ day⁻¹ and corresponded to 81% efficiency for electron transfer from glucose to electricity. Cyclic voltammetry indicated that the enhanced microbial consortium had either membrane-bound or excreted redox components that were not initially detected in the community. Dominant species of the enhanced culture were identified by denaturing gradient gel electrophoresis and culturing. The community consisted mainly of facultative anaerobic bacteria, such as *Alcaligenes faecalis* and *Enterococcus gallinarum*, which are capable of hydrogen production. *Pseudomonas aeruginosa* and other *Pseudomonas* species were also isolated. For several isolates, electrochemical activity was mainly due to excreted redox mediators, and one of these mediators, pyocyanin produced by *P. aeruginosa*, could be characterized. Overall, the enrichment procedure, irrespective of whether only attached or suspended bacteria were examined, selected for organisms capable of mediating the electron transfer either by direct bacterial transfer or by excretion of redox components. (41 References)

Subjects:

- GRADIENT GEL-ELECTROPHORESIS
- 16S RIBOSOMAL-RNA
- FUEL-CELL
- PSEUDOMONAS-AERUGINOSA
- FE(III)-REDUCING BACTERIUM
- SHEWANELLA-PUTREFACIENS
- ELECTRICITY-GENERATION
- REDUCING BACTERIUM
- GLUCOSE
- PERFORMANCE

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Dialog® File Number 440 Accession Number 19273724

The costs of using E-diesel to reduce emissions from agricultural machinery

Rejesus RM (REPRINT); Hornbaker RH; Hansen A (E-Mail: roderick.rejesus@ttu.edu; hornbake@uiuc.edu; achansen@ujuc.edu)

Univ Illinois, Dept Agr & Consumer Econ, MC-710,1301 W Gregory Dr, Urbana, IL, 61801 (REPRINT); Univ Illinois, Dept Agr & Consumer Econ, , Urbana, IL, 61801; Univ Illinois, Dept Agr Engr, , Urbana, IL, 61801
JOURNAL OF SUSTAINABLE AGRICULTURE, 2004, Volume: 24, Number: 2, Page: 63-75

Language: English

Abstract: E-Diesel is an alternative diesel fuel developed to lower emissions and meet more stringent regulatory standards in the future. It is a diesel blend composed of ethanol, standard #2 diesel, and a fuel additive which prevents separation of the ethanol and diesel while also providing beneficial lubricity and ignition attributes. This paper examines the on-farm economic costs of using E-diesel in agricultural machinery, based on data collected from an on-farm experimental program. Results show that E-Diesel use in agricultural machinery may increase an individual farm's cost of production by a range of \$0.30 to \$1.78 per hectare due to the higher fuel consumption and its higher estimated price. Nevertheless, E-diesel is found to be cost competitive with other emission reducing alternatives such as exhaust control technologies and biodiesel. Furthermore, corn producers can potentially recover the higher costs if E-Diesel is further utilized in both off-road and on-road markets, which may then expand ethanol and corn demand to increase corn prices. (21 References)

Subjects:

- agricultural machinery
- alternative fuel
- E-diesel
- emissions reduction
- environmental quality
- on-farm cost

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Dialog® File Number 440 Accession Number 19202289

Fuel cells, hydrogen and energy supply in Australia

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JOURNAL OF POWER SOURCES, 2004, Volume: 131, Number: 1-2 (MAY 14), Page: 1-12

Language: English

Abstract: Australia is unique in terms of its geography, population distribution, and energy sources. It has an abundance of fossil fuel in the form of coal, natural gas, coal seam methane (CSM), oil, and a variety renewable energy sources that are under development. Unfortunately, most of the natural gas is located so far away from the main centres of population that it is more economic to ship the energy as LNG to neighboring countries. Electricity generation is the largest consumer of energy in Australia and accounts for around 50% of greenhouse gas emissions as 84% of electricity is produced from coal. Unless these emissions are curbed, there is a risk of increasing temperatures throughout the country and associated climatic instability. To address this, research is underway to develop coal gasification and processes for the capture and sequestration Of CO₂. Alternative transport fuels such as biodiesel are being introduced to help reduce emissions from vehicles. The future role of hydrogen is being addressed in a national study commissioned this year by the federal government. Work at the University of Queensland is also addressing full-cycle analysis of hydrogen production, transport, storage, and utilization for both stationary and transport applications. There is a modest but growing amount of university research in fuel cells in Australia, and an increasing interest from industry. Ceramic Fuel Cells Ltd. (CFCL) has a leading position in planar solid oxide fuel cells (SOFCs) technology, which is being developed for a variety of applications, and next year Perth in Western Australia is hosting a trial of buses powered by proton-exchange fuel cells. (C) 2004 Elsevier B.V. All rights reserved. (38 References)

Subjects:

- fuel cells
- hydrogen
- energy supply
- Australia

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Dialog® File Number 440 Accession Number 18512053

Grey relative analysis and future prediction on rural household biofuels consumption in China

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FUEL PROCESSING TECHNOLOGY, 2004, Volume: 85, Number: 8-10 (JUL 15), Page: 1231-1248

Language: English

Abstract: By using the method of grey relative analysis, which can account for the time sequence, this paper carries out analyses for the relative relationship among the four major factors affecting the rural household biofuels consumption of each province/region in China through period 1991-1999. Based on the analytical results of the relative degrees and relative polarities, forecast models on the future consumption of crop residues and firewood in Chinese rural households are proposed. Furthermore, the future consumption of rural crop residues and firewood up to the year of 2020 is forecasted. These four factors include population per rural household, income per rural household, educational situation of laborers per rural household and food area per rural household. Results show that these four factors are closely related to rural household biofuels consumption in China. Among these, the relative relationship of population and food area per rural household to rural household biofuels consumption is positive, and that of the income and educational situation of laborers per household is negative. Forecast results show that the precision accuracies of forecast models are higher. The future total rural household biofuels consumption will decrease to 3388 PJ in 2020 from 6032 PJ in 1999 in China. The average annual decline rate in this period will reach 2.8%. This indicates that the rural household energy consumption will enter into a new stage in which biofuels will be gradually replaced by the high-quality energy types (with high combustion efficiency and easy to use), such as coal, gas, LPG and electricity, along with improvements in living standards and educational level in the rural household. (C) 2004 Elsevier B.V. All rights reserved. (15 References)

Subjects:

- biofuels
- consumption
- grey-relative analysis
- relative degree
- relative polarity
- rural household
- China

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Dialog® File Number 440 Accession Number 18457031

A new dawn for mandated fuel-ethanol programmes: Separating fact from fiction

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Language: English

Abstract: The new dawn for bioethanol([1]) production and use appears to be gathering pace on the back of a raft of new governmental initiatives as outlined below, which will result in a substantial increase in the total volume of fuel ethanol use over the next decade, including ethanol produced from sugar crops. The benefits arising from these programmes remain contentious with opponents stating four main reasons against this trend:

1. Ethanol remains uncompetitive at today's high oil prices which anyway are likely to fall over the coming decade.
2. The greenhouse gas (GHG) benefits are overstated.

3. The energy balance is marginal at best or even negative.
4. Governments will loose interest in providing the long term support necessary to maintain such programmes.

The proponents hotly refute these arguments by claiming:

1. The world's leading ethanol scheme in Brazil has shown that significant reductions in cost are possible and that further reductions are likely to be achieved in the future with increased efficiencies and productivities in the near term and new technologies in the medium to long term.
2. There are significant GHG benefits from the existing programmes and these will only improve over time.
3. The opponents are plainly wrong about the energy balances which for sugarcane are strongly positive.
4. Political interest is growing because policy makers link biofuels with a range of issues including energy security, rural employment, health and pursuing climate change commitments.

In addition, the transport sector GHG and pollution emissions are increasing rapidly and are extremely difficult to abate without the use of biofuels. This article examines the basis to these arguments in the context of the significant increase in ethanol fuel use already committed through existing and new government programmes. Although governments still need to kick-start the development of fuel ethanol industries, the sceptics have not convincingly undermined the justifications for government support. In addition if the proponents are proved correct then future gains in efficiency and yields will mean that open-ended commitments by governments will not be necessary. (15 References)

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Dialog® File Number 440 Accession Number 18093147

Sulfur-free transport fuels and biofuels. Development perspectives and environmental assessment

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PRZEMYSŁ CHEMICZNY, 2003, Volume: 82, Number: 8-9,1 (AUG-SEP), Page: 516-520

Language: Polish

Abstract: A review covering the effect of sulfur on toxicity of the gases exhausted by energy-saving engines, catalyst needs, hydrodesulfurization route and its modifications to low-S (<10 ppm) fuels (e.g., FCC gasoline in the production of gasolines and middle fractions in the production of diesel fuels), and biofuels as components of low-S transport fuels. S-free fuels will remove the technical barrier for introduction of low gasoline consumption vehicles emitting little carbon dioxide. Bioethanol produced from cellulose was indicated as an attractive component of future fuels. Outlooks for developing clean fuels were presented. (32 References)

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Predicting the physical properties of biodiesel for combustion modeling

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Language: English

Abstract: As the use of biodiesel becomes more widespread, researchers have shown a strong interest in modeling the combustion processes in the engine in order to understand the fundamental characteristics of biodiesel combustion. In the early phase of the simulation, accurate prediction of the physical properties of biodiesel is critical in the representation of spray, atomization, and combustion events in the combustion chamber. The objective of this article is to present methods for predicting key physical properties including critical properties, vapor pressure, latent heat of vaporization, density, surface tension, and liquid viscosity for biodiesel that can be used for combustion modeling. Predicted results were compared with published data where available, and for some properties, errors were less than 1%. While no published data were available at temperatures above 373 K to check the accuracy of the predictions from the models at the higher temperatures, the trends in the fuel properties were regarded as representative of what would be expected in the combustion chamber. These models could be used in a detailed combustion model such as KIVA to make relative comparisons between fuels. (15 References)




Subjects:

- biodiesel
- combustion modeling
- critical properties
- heat of vaporization
- liquid density
- methyl ester
- physical properties
- surface tension
- vapor pressure
- viscosity
- DIESEL FUEL
- BLENDS
- OIL

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Dialog® File Number 440 Accession Number 17768634

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The release of organic compounds during biomass drying depends upon the feedstock and/or altering drying heating medium

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BIOMASS & BIOENERGY, 2003 , Volume: 25 , Number: 6 , Page: 615-622

Language: English

Abstract: The release of organic compounds during the drying of biomass is a potential environmental problem, it may contribute to air pollution or eutrophication. In many countries there are legal restrictions on the amounts of terpenes that may be released into the atmosphere. When considering bioenergy in future energy systems, it is important that information on the environmental effects is available. The emissions of organic compounds from different green and dried biofuels that have been dried in hot air and steam medium, were analyzed by using different techniques. Gas chromatography and gas chromatography mass spectrometry have been used to identify the organic

matter. The terpene content was significantly affected by the following factors: changing of the drying medium and the way the same biomass was handled from different localities in Sweden. Comparison between spectra from dried and green fuels reveal that the main compounds emitted during drying are monoterpene and sesquiterpene hydrocarbons, while the emissions of diterpene hydrocarbons seem to be negligible. The relative proportionality between emitted monoterpene, diterpene and sesquiterpene change when the drying medium shifts from steam to hot air. The obtained result of this work implies a parameter optimization study of the dryer with regard to environmental impact. With assistance of this result it might be foreseen that choice of special drying medium, diversity of biomass and low temperature reduce the emissions. A thermo-gravimetric analyzer was used for investigating the biomass drying rate. (C) 2003 Elsevier Ltd. All rights reserved. (20 References)

Subjects:

- biomass drying
- organic emission
- Terpenes
- volatile organic compounds
- gas chromatography
- TGA
- SOLID-PHASE MICROEXTRACTION
- WOOD
- EMISSIONS
- COMBUSTION

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Dialog® File Number 440 Accession Number 17203253

Cool flame partial oxidation and its role in combustion and reforming of fuels for fuel cell systems

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PROGRESS IN ENERGY AND COMBUSTION SCIENCE, 2003, Volume: 29, Number: 2, Page: 155-191

Language: English

Document Type: REVIEW

Abstract: The purpose of this review was to integrate the most recent and relevant investigations on the auto-oxidation of fuel oils and their reforming into hydrogen-rich gas that could serve as a feed for fuel cells and combustion systems. We consider the incorporation of partial oxidation under cool flame conditions to be a significant step in the reforming process for generation of hydrogen-rich gas. Therefore, we have paid particular attention to the partial oxidation of fuels at low temperature in the cool flame region. This is still not a well-understood feature in the oxidation of fuels and can potentially serve as a precursor to low NO_x emissions and low soot formation. Pretreatment, including atomization, vaporization and burner technology are also briefly reviewed. The oxidation of reference fuels (n-heptane C₇H₁₆, iso-octane C₈H₁₈ and to a lesser extent cetane C₁₆H₃₄) in the intermediate and high temperature ranges have been studied extensively and it is examined here to show the significant progress made in modeling the kinetics and mechanisms, and in the evaluation of ignition delay times. However, due to the complex nature of real fuels such as petroleum distillates (diesel and jet fuel) and biofuels, much less is known on the kinetics and mechanisms of their oxidation, as well as on the resulting reaction products formed during partial oxidation. The rich literature on the oxidation of fuels is, hence, limited to the cited main reference fuels. We have also covered recent developments in the catalytic reforming of fuels. In the presence of catalysts, the fuels can be reformed through partial oxidation, steam reforming and autothermal reforming (ATR) to generate hydrogen. But optimum routes to produce cost effective hydrogen fuel from conventional or derivative fuels are still

debatable. It is suggested that the use of products emanating from partial oxidation of fuels under cool flame conditions could be attractive in such reforming processes, but this is as yet untested. The exploitation of developments in oxidation, combustion and reforming processes is always impacted by the resulting emission of pollutants, including NO_x, SO_x, CO and soot, which have an impact on the health of the fragile ecosystem. Attention is paid to the progress made in innovative techniques developed to reduce the level of pollutants resulting from oxidation and reforming processes. In the last part, we summarize the present status-of the topics covered and present prospects for future research. This information forms the basis for recommended themes that are vital in developing the next generation energy-efficient combustion and, fuel cell technologies. (C) 2003 Elsevier Science Ltd. All rights reserved. (192 References)

Subjects:

- cool flame
- oxidation
- combustion
- . kinetics
- reforming
- fuel cell
- LOW-TEMPERATURE OXIDATION
- CATALYTIC PARTIAL OXIDATION
- N-HEPTANE OXIDATION
- JET-STIRRED REACTOR
- NONCATALYTIC PARTIAL OXIDATION
- HIGH-PRESSURE OXIDATION
- GAS-PHASE OXIDATION
- SOUR NATURAL-GAS
- DROPLET VAPORIZATION
- FAST-PYROLYSIS

Biodiesel - a European overview

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OCL-OLEAGINEUX CORPS GRAS LIPIDES, 2002, Volume: 9, Number: 5 (SEP-OCT), Page: 299-303

Language: English

Abstract: The interest around the biodiesel sector has been growing steadily during the last years. However, the EU biodiesel industry is not a new one and the important advantages linked to the development of this product have been well known for many years. Among others, these advantages are very important for the environment (reduction of CO₂ emission), agriculture (rural development), the energy sector (independence of supply). In the past years EU member states have created different instruments for supporting the biodiesel industry as well as the growing of oilseeds for non-food purposes. Today, the EU biodiesel industry is expanding. Meanwhile, it appears that a clear and solid juridical frame for the development of biodiesel is needed in order to attract investors and guarantee its future development.

The two recent Commission proposals on biofuels are going in the right direction, however they are likely to be adopted only in the summer 2003 at the earliest. Once approved, this new legislation will certainly have a strong and positive impact on biodiesel production in the EU. In any case the future development of this sector is primarily in the hands of EU biodiesel producers whose duty is to provide their customers with a high quality product in order to enhance the positive image that biodiesel already has among the representatives of the petrol and car industry, as well as among EU consumers and Member States' authorities. (0 References)

Subjects:

- biofuels
- biodiesel
- European Union
- legislation environment
- air pollution
- renewable energies

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Dialog® File Number 440 Accession Number 15451957

Efficient use of biomass in black liquor gasification plants - Excess biofuels ought to be used more efficiently, and exported

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PULP & PAPER-CANADA, 2002, Volume: 103, Number: 12 (DEC), Page: 67-73

Language: English

Abstract: Black Liquor Gasification can considerably increase electricity production in future energy-efficient chemical pulp mills with excess available biofuel. If this excess fuel is used for increasing on-site electricity generation, the resulting total efficiency is low, indicating a poor use of the available biomass fuel stream. This study broadens the perspective by investigating possible export of lignin and bark from the mill for external use, thereby increasing the biofuel use efficiency. (19 References)

Subjects:

- gasification
- black liquor
- biomass
- energy production
- lignin
- bark
- PULP

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Dialog® File Number 440 Accession Number 15410846

Future prospects for production of methanol and hydrogen from biomass

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JOURNAL OF POWER SOURCES, 2002, Volume: 111, Number: 1 (SEP 18), Page: 1-22

Language: English

Abstract: Technical and economic prospects of the future production of methanol and hydrogen from biomass have been evaluated. A technology review, including promising future components, was made, resulting in a set of promising conversion concepts. Flowsheeting models were made to analyse the technical performance. Results were

used for economic evaluations. Overall energy efficiencies are around 55% HHV for methanol and around 60% for hydrogen production. Accounting for the lower energy quality of fuel compared to electricity, once-through concepts perform better than the concepts aimed for fuel only production. Hot gas cleaning can contribute to a better performance. Systems of 400 MWth input produce biofuels at US\$ 8-12/GJ, this is above the current gasoline production price of US\$ 4-6/GJ. This cost price is largely dictated by the capital investments. The outcomes for the various system types are rather comparable, although concepts focussing on optimised fuel production with little or no electricity co-production perform somewhat better. Hydrogen concepts using ceramic membranes perform well due to their higher overall efficiency combined with modest investment. Long-term (2020) cost reductions reside in cheaper biomass, technological learning, and application of large scales up to 2000 MWth. This could bring the production costs of biofuels in the US\$ 5-7/GJ range. Biomass-derived methanol and hydrogen are likely to become competitive fuels tomorrow. (C) 2002 Elsevier Science B.V. All rights reserved. (66 References)

Subjects:

- biomass
- biofuels production
- fuel cell vehicles
- INFRASTRUCTURE
- VEHICLES
- SYSTEMS

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Dialog® File Number 440 Accession Number 14790170

Development of a biodiesel activity

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Language: English

Abstract: The circumstances that led to the significant French biodiesel activity will be examined: the oilseed producers and transformers actions, the partnership with the oil refiners, the government support - regulation and detaxation....

The French production units will be described, followed by update scientific results highlighting the advantages of biodiesel: functionality and friendly environmentally impact.

The current usage of biodiesel by oil refiners will be described and its future in the oncoming context (fuel specifications, HDI engines and post-treatment) discussed. (7 References)

Subjects:

- biodiesel
- development in France
- advantages
- usage

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Dialog® File Number 440 Accession Number 12874969

A comprehensive energy and economic assessment of biofuels: When "green" is not enough

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CRITICAL REVIEWS IN PLANT SCIENCES, 2001, Volume: 20, Number: 1, Page: 71-106

Language: English

Document Type: REVIEW

Abstract: Biofuel production systems are sometimes claimed to be able to fill in for future fossil fuel shortages as well as to decrease carbon dioxide emissions and global warming. As such, they are often promoted as a "green" alternative to fossil fuels. I present a comprehensive, system-based case study of biofuel production from maize or corn (*Zea mays* L.) and evaluate it critically in this review. The case study is taken as an example of the comprehensive approach that I suggest for any energy crop. I conclude that the biofuel option on a large scale is not a viable alternative based on economic, energy and eMergy (amount of available energy [exergy] of one form [usually solar] that is directly or indirectly required to provide a given flow or storage of exergy or matter) analyses of the case study data and estimated possible improvement of yield and efficiency. This is true for developed countries due to their huge energy demand compared with what biofuel options are able to supply as well as for developing countries due to the low yield of their agriculture and competition for land and water for food production. However, biofuels may contribute to optimizing the energy and resource balance of agricultural, livestock, or industrial production systems at an appropriate scale. I present a proposal to integrate ethanol production with industrial activities within a "zero emission framework" as a suggestion for optimization strategies capable of making the biofuel option more sustainable and profitable in those cases where it is appropriate. (89 References)

Subjects:

- biomass fuels
- eMergy
- renewable energy
- energy analysis
- zero emissions
- UNITED-STATES
- BIOMASS
- ETHANOL
- ENVIRONMENT
- LABOR
- SOIL

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Dialog® File Number 440 Accession Number 12459042

Present and prospective role of bioenergy in regional energy system

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RENEWABLE & SUSTAINABLE ENERGY REVIEWS, 2000, Volume: 4, Number: 4 (DEC), Page: 375-430

Language: English

Document Type: REVIEW

Abstract: Bioenergy is the energy released from the reaction of organic carbon material with oxygen. The organic material derived from plants and animals is also referred to as biomass. Biomass is a flexible feedstock cat,able of conversion into solid, liquid and gaseous fuels by chemical and biological processes, These intermediate biofuels (such as methane gas, ethanol, charcoal) can be substituted for fossil based fuels. Wood and charcoal are important as household fuels and for small scale industries such as brick making, cashew processing etc. The scarcity of biofuels has far reaching implications on the environment. Hence, expansion of bioenergy systems could be influential in bettering both the socioeconomic condition and the environment of the region. This paper examines the present role of biomass in the region's (Uttara Kannada District, Karnataka State, India) energy supply and calculates the potential for future biomass provision and scope for conversion to both modern and traditional fuels. Based on the detailed investigation of biomass resource availability and demand, we can categorise the Uttara Kannada District into two zones (a) Biomass surplus zone consisting of Taluks mainly from hilly area (b) Biomass deficit zone, consisting of thickly populated coastal Taluks such as Bhatkal, Kumta, Ankola, Honnavar and Karwar. Fuel wood is mainly used for cooking and horticulture residues from coconut, arecanut trees are used for water heating purposes. Most of the households in this region still use traditional stoves where efficiency is less than 10%. The present inefficient fuel consumption could be brought down by the usage of fuel efficient stoves (a saving of the order of 37%). Availability of animal residues for biogas generation in Sirsi, Siddapur, Yellapur Taluks gives a viable alternative for cooking, lighting fuel and a useful fertiliser. However to support the present livestock population, fodder from agricultural residues is insufficient in these Taluks. There is a need to supplement the fodder availability with fodder crops as successfully tried in Banavasi village by some progressive farmers. (C) 2000 Elsevier Science Ltd. All rights reserved. (44 References)

Subjects:

- bioenergy
- fuel wood consumption
- integrated energy planning
- energy efficient devices
- per capita fuel consumption
- techno economic analyses
- biogas
- wood gasification
- energy plantation
- KARNATAKA
- BIOMASS
- RAINFORESTS
- INDIA

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Dialog® File Number 440 Accession Number 11996250

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Remote sensing, field survey, and long-term forecasting: an efficient combination for local assessments of forest fuels

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Language: English

Abstract: This article describes and evaluates a method for assessing local biofuel potentials. Such assessments are important, for example, in connection with the establishment of heating plants for local communities. A sparse grid of field sample plots from an existing national forest inventory (NFI) is used as reference data for satellite image based estimates of forest condition. The data thus obtained will be in a format that makes them readily available for existing forestry scenario models, in this case the Swedish Hugin system. Thus, forecasts of future harvesting levels and the corresponding amounts of forest fuels-mainly from branches and tops-can be derived in a straightforward manner. The proposed method was evaluated in two test areas in northern Sweden, the communes of Vindeln and Alvsbyn. Besides a base-line scenario for the forecasts, a scenario with geographical restrictions as to the extraction of forest fuels was tested. With a maximum transportation distance of 300 m to road, the available forest fuel potential was shown to decrease by more than 50%. With the proposed method, this kind of geographical restriction is easily implemented. (C) 2002 Elsevier Science Ltd. All rights reserved. (24 References)

Subjects:

- forest fuel
- satellite image
- kNN