Handbook Of Bioenergy Crop Plants

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as the world s population is projected to reach 10 billion or more by 2100 devastating fossil fuel shortages loom in the future unless more renewable alternatives to energy are developed bioenergy in the form of cellulosic biomass starch sugar and oils from crop plants has emerged as one of the cheaper cleaner and environmentally sustainable alternatives to traditional forms of energy handbook of bioenergy crop plants brings together the work of a panel of global experts who survey the possibilities and challenges involved in biofuel production in the twenty first century section one explores the genetic improvement of bioenergy crops ecological issues and biodiversity feedstock logistics and enzymatic cell wall degradation to produce biofuels and process technologies of liquid transportation fuels production it also reviews international standards for fuel quality unique issues of biofuel powered engines life cycle environmental impacts of biofuels compared with fossil fuels and social concerns section two examines commercialized bioenergy crops including cassava jatropha forest trees maize oil palm oilseed brassicas sorghum soybean sugarcane and switchgrass section three profiles emerging crops such as brachypodium diesel trees minor oilseeds lower plants paulownia shrub willow sugarbeet sunflower and sweet potato it also discusses unconventional biomass resources such as vegetable oils organic waste and municipal sludge highlighting the special requirements major achievements and unresolved concerns in bioenergy production from crop plants the book is destined to lead to future discoveries related to the use of plants for bioenergy production it will assist in developing innovative ways of ameliorating energy problems on the horizon

ethanol as an alternative fuel is receiving a lot of attention because it addresses concerns related to dwindling oil supplies energy independence and climate change the majority of the ethanol in the us is produced from corn starch with the us department of energy s target that 30 of the fuel in the us is produced from renewable resources by 2030 the anticipated demand for corn starch will quickly exceed the current production of corn this plus the concern that less grain will become available for food and feed purposes necessitates the use of other feedstocks for the production of ethanol for the very same reasons there is increasing research activity and growing interest in many other biomass crops genetic improvement of bio energy crops focuses on the production of ethanol from lignocellulosic biomass which includes corn stover biomass from dedicated annual and perennial energy crops and trees as well as a number of important biomass crops the biomass is typically pretreated through thermochemical processing to make it more amenable to hydrolysis with cellulolytic enzymes the enzymatic hydrolysis yields monomeric sugars that can be fermented to ethanol by micro organisms while much emphasis has been placed on the optimization of thermo chemical pretreatment processes production of more efficient hydrolytic enzymes and the development of robust microbial strains relatively little effort has been dedicated to the improvement of the biomass itself

this volume of the bioenergy plants compendium contains a collection of chapters that focus on the history economics and practical sciences related to sugarcane as one of the key biofuel crops in the world that is under large scale cultivation sugarcane is attracting interests for its adoption and emulation worldwide with a high ratio of energ

a country s vision for developing renewable and sustainable energy resources is typically propelled by three important drivers security cost and environmental impact the u s currently accounts for a quarter of the world s total oil consumption with domestic demands necessitating at an ever growing cost a net import of more than 50 of the oil used in this country at the same time brazil because of its forward thinking on energy strategy is today energy independent as emerging economies around the world increase their petroleum use by large margins and as large fractions of that new consumption are necessarily supplied from unstable parts of the world the inevitable repercussions on petroleum driven economies will continue to escalate in addition there is an unequivocal imperative to take immediate and aggressive measures to reduce net greenhouse gas emissions by decreasing fossil fuel consumption and increasing our use of carbon neutral or carbon negative fuels as well as improving efficiency of fuel use economic growth and development worldwide depend increasingly on secure supplies of reliable affordable clean energy together with its counterpart societies was convened the first pan american congress on plants and bioenergy which was held in june 2008 in mérida mexico sponsored by the american society of plant biologists this congress was designed to initiate pan american research collaborations in energy biosciences at that congress the organizational committee committed themselves to continue the meeting biennially resulting in the 2nd pan american congress on plants and bioenergy to be held with the endorsement of aspb july 6 10 2010 in são paulo brazil whereas the 1st congress covered a broad range of topics that bioenergy impacted the second congress will focus more on the advances in plant biology the genetic improvement of energy crop plants their fit into regional environments and the development of a sustainable energy agriculture

this book provides concerns useful to promote an increase of the productivity of crops by using functional genomics fundamental thematics have been addressed metabolic engineering plant breeding tools renewable biomass for energy generation fibres and composites and biopharmaceuticals the gained know how is relevant to identify bottlenecks in the major production chains and to propose actions for moving these issues forward

the volume on industrial crop breeding will be part of the series handbook of plant breeding this volume will focus on the emerging area of plant breeding for sustainable production of transportation fuels and bio based products using the current advances in the field the book is scheduled to consist of a total number of 30 chapters divided into four sections the sections will emphasize crops being considered for different challenge areas including oil crops for biodiesel sugar starch and cellulosic crops for biofuel crops for bio products and issues and future prospects a chapter introducing the first three sections will also be included outstanding scientists for each crop species are proposed as senior authors who may invite co authors to contribute part of a chapter to provide additional expertise or perspective the proposed authors will represent various national and international institutions to get a more diverse view on the topic and somehow get a global view on the common issues that researchers on industrial crops are facing the book will comprise primarily of specific issues available germplasm breeding techniques and potential geographical areas of production

pertaining to individual crops being considered for industrial uses we hope to encourage the proposed authors of new crops to provide an estimate of the crop readiness for commercial development and discuss the limitations this book will be will be of interest and envisioned to serve as an updated reference to researchers in both academic and industrial setting to students and teachers of plant breeding and to policy makers who are looking for alternative solutions to dependency on imported petroleum products

this book evaluates maize as a bioenergy fuel source from two perspectives it explores whether the input energy needed to generate fuel significantly exceeded by the energy harvested in examining this issue the chapters provide assessments of the social economic and political impact on fuel pricing food costs and the environmental challenge with corn biomass the engine of change it then examines whether corn be genetically improved so that its biomass is significantly increased its cellulose lignin complex made more amenable to harvesting and to processing and grown in regions not normally associated with its cultivation of food

agricultural biomass is organic material produced directly from agricultural activities including cereal grains sugar crops oilseeds and other arable crops along with straw and also livestock by products such as manure and animal fat resulting in the production of bioenergy and biomaterials this oecd workshop examines the potential of developing energy and materials produced from the agricultural biomass that may act as a replacement for fossil fuels the workshop discussed whether agriculture could become a valuable source of bioenergy and biomaterials as well as food and fibres can the agricultural biomass be integrated into policies of sustainable development what policies should be developed by governments to expand and develop this market the workshop concluded that countries need to weigh the cost and benefits of adopting such an approach considering the effect on farmers and the environment that any policy strategies for biomass development should focus on demand as opposed to supply

this book is a collection of chapters concerning the use of biomass for the sustainable production of energy and chemicals an important goal that will help decrease the production of greenhouse gases to help mitigate global warming provide energy security in the face of dwindling petroleum reserves improve balance of payment problems and spur local economic development clearly there are ways to save energy that need to be encouraged more these include more use of energy sources such as among others manure in anaerobic digesters waste wood in forests as fuel or feedstock for cellulosic ethanol and conservation reserve program crp land crops that are presently unused in the us the use of biofuels is not new rudolf diesel used peanut oil as fuel in the rst engines he developed chap 8 and ethanol was used in the early 1900s in the us as automobile fuel songstad et al 2009 historical perspective of biofuels learning from the past to rediscover the future in vitro cell dev biol plant 45 189 192 brazil now produces enough sugar cane ethanol to make up about 50 of its transportation fuel needs chap 4 the next big thing will be cellulosic ethanol at present there is also the use of miscanthus x giganteous as fuel for power plants in the uk chap 2 bagasse sugar cane waste to power sugar cane mills chap 4 and waste wood and sawdust to power sawmills chap 7

there is an unmistakable link between energy and sustainable human development approximately one third of the world s population has little or no access to modern energy services and a majority of these people live in poverty the united nations development programme has initiated a global programme in sustainable energy in recognition of the fact that conventional energy strategies that rely on supply focused fossil intensive large scale approaches do not address the needs of the world s poor bioenergy relates to energy that is derived from wood and other plant matter this publication is a product of the global programme and its purpose is to help countries and communities realise the potential for bioenergy to become an important contributor to sustainable energy strategies

the energy short falls of the 1970 s made clear both individual and national vulnerability when reliance is on a single energy source such as petroleum further the situation was a sharp reminder that fossil fuels are finite and that their supplies will become limiting whether short supplies are for political economical or geological reasons they signal the need to plan for a future with diverse options so that needs can be met without disruptive consequences when supplies of one source become limiting conservation plays a major role in any strategy however it should be recognized that such steps can only buy time by extending the supply not create new energy supplies proven petroleum reserves in the united states currently are stated to be equivalent to only 8 years consumption at current rates assuming no imports or additional petroleum discoveries another important strategy is to develop biomass solar and other alternative energy supplies and integrate their use into contemporary society a fundamental difference between fossil fuels and biomass involves the concept of stock versus flow resources for example the amount of crude oil is basically a fixed or stock level which is being rapidly mined

a potent argument for bioenergy development lies in the ability of the sector to unlock agricultural potential by bringing in much needed investments to raise agricultural productivity to spur food security and poverty reduction this document presents the befs analytical framework af developed to test this argument agriculture lies at the heart of the befs af and allows governments to consider viable pro poor strategies for bioenergy development the set of tools within the befs af offers an integrated approach to decision making that combines the technical viability with the country s prevailing social and economic development objectives this document explains the rationale and structure of the befs af provides a general overview of the tools and their application and illustrates how the analytical information generated assists policy makers in making informed decisions concerning the many varied consequences of bioenergy developments on food security poverty reduction and agriculture development and economic growth provided by publisher

the globally escalating population necessitates production of more goods and services to fulfil the expanding demands of human beings which resulted in urbanization and industrialization uncontrolled industrialization caused two major problems energy crisis and accelerated environmental pollution throughout the world presently there are technologies which have been proposed or shown to tackle both the problems researchers continue to seek more cost effective and environmentally beneficial pathways for problem

solving plant kingdom comprises of species which have the potential to resolve the couple problem of pollution and energy plants are considered as a potential feedstock for development of renewable energy through biofuels another important aspect of plants is their capacity to sequester carbon dioxide and absorb degrade and stabilize environmental pollutants such as heavy metals poly aromatic hydrocarbons poly aromatic biphenyls radioactive materials and other chemicals thus plants may be used to provide renewable energy generation and pollution mitigation an approach that could amalgamate the two aspects can be achieved through phytoremediation using plants to clean up polluted soil and water and subsequent generation of energy from the phyto remediator plants this would be a major advance in achieving sustainability that focuses on optimizing people social issues planet environmental issues and profit financial issues the phytoremediation cellulosic biofuels pcb process will be socially beneficial through reducing pollution impacts on people ecologically beneficial through pollution abatement and economically viable through providing revenue that supplies an energy source that is renewable and also provides less dependence on importing foreign energy energy independence the utilization of green plants for pollution remediation and energy production will also tackle some other important global concerns like global climate change ocean acidification and land degradation through carbon sequestration reduced emissions of other greenhouse gases restoration of degraded lands and waters and more this book addresses the overall potential of major plants that have the potential to fulfil the dual purposes of phytoremediation and energy generation the non edible bioenergy plants that are explored for this dual objective include jatropha curcas ricinus communis leucaena leucocephalla milletia pinnata canabis sativa azadirachta indica and acacia nilotica the book addresses all possible aspects of phyto remediaton and energy generation in a holistic way the contributors are one of most authoritative experts in the field and have covered and compiled the best content most comprehensively the book is going to be extremely useful for researchers in the area research students academicians and also for policy makers for an inclusive understanding and assessment of potential in plant kingdom to solve the dual problem of energy and pollution

world production and needs of oil seeds and vegetable oils plant breeding and management their role in modifying the availability and composition of certain vegetable oils and fats status of breeding and prospects for mutation breeding in peanuts sesame and castor beans achievements and prospects of sunflower genetics breeding and induced mutation utilization safflower genetics and breeding status and aspects of rapeseed breeding aspects of olive tree breeding mycotoxins in soil seed and other crops seed oils as renewable resource for industrial use cuphea the first annual oil crop for the production of medium chain triglycerides mct variation of chemical composition of cotton seeds with respect to species picking time and location control of cotton stickiness through breeding cultivars resistant to whitefly bemesia tabaci genn orientations recents dans l amelioration genetique du cotonnier jute breeding in bangladesh natural and induced genetic variation in the biosynthesis of alkaloids and other secondary metabolites quality aspects of oil crop raw materials in relation to their use extraction and processing improvement of soil seeds from an industrial point of view non edible use an introduction to biomass concepts for plant breeders biomass production a plant breeder s view safflower breeding and its propescts

in india current breeding programme on industrial crops in indonesia new varieties bred by mutation breeding in oil seed and industrial crops

increasing the use of renewable energies offers significant opportunities for european countries to reduce greenhouse gas emissions and improve the security of energy supplies however the substantial rise in the use of biomass from agriculture forestry and waste may result in additional pressures on farmland and forest biodiversity as well as on soil and water resources it may also counteract other current and potential future environmental policies and objectives such as waste minimisation or environmentally oriented farming this report makes an assessment of the potential contribution of biomass to energy production without increasing pressures on the environment based on the development of a number of environmental criteria for bioenergy production on a european wide scale

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