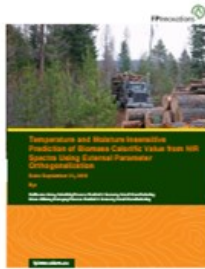


Temperature and moisture insensitive prediction of biomass calorific value from NIR spectra using external parameter orthogonalization


<https://library.fpinnovations.ca/fr/permalink/fpipub52660>

- Auteur: Hans, Guillaume
Allison, Bruce J.
- Collaborateur: Natural Resources Canada. Canadian Forest Service
- Date: September 2018
- Genre du document: Research report
- Description physique: 27 p.
- Secteur: Wood Products
- Domaine: Bioproducts
- Champ de recherche: Biomass Conversion
- Sujet: Biomass
Optimization
Spectroscopy
Temperature
Moisture content
- Série: Transformative Technology ; TT 2018
- Langue: English
- Résumé: In the pulp and paper and biofuel industries, real-time online characterization of biomass gross calorific value (GCV) is of critical importance to determine its quality and price and for process optimization. Near-infrared (NIR) spectroscopy is a relatively low-cost technology that could potentially be used for such an application. However, the NIR spectra are also influenced by biomass temperature (T°) and moisture content (MC). In this paper, external parameter orthogonalization (EPO) is employed to remove simultaneously the influence of T° and MC on the spectra before predicting GCV. EPO is of particular interest when one desires to transfer information from one modeling experiment to another, such as when developing a calibration model for a new property from the same material, or when it would be more efficient to divide the experimental effort. EPO was found to be an effective method for desensitizing a PLS calibration model to the influence of T° and MC, enabling robust and accurate prediction biomass GCV. Partial least squares (PLS) regression models developed with EPO always provided equal or better performance than models developed without EPO. The paper shows that experimental efforts and costs can be reduced by approximately one half while maintaining prediction accuracy and model robustness.
- PDF: Ajoutez cet article à votre liste de sélections pour demander le PDF - Add this item to your selection list to request the PDF

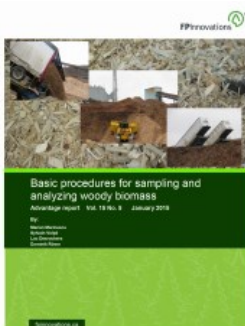
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Basic procedures for sampling and analyzing woody biomass

<https://library.fpinnovations.ca/fr/permalink/fpipub3318>

Auteur: Marinescu, Marian

Volpé, Sylvain

Desrochers, Luc

Roser, Dominik

Date: January 2015

Édition: 39982

Genre du document: Research report

Description physique: 15 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Biomass

Bioenergy

Sampling

Physical properties

Moisture content

Particle size

Bulk density

Standards

Advantage

Série: Advantage ; Vol. 15, No. 5

Langue: English

Résumé: Biomass sampling and analysis play decisive roles in determining the characteristics and value of the woody biomass fuel used in bioenergy systems in Canada. Sampling and analysis standards help harmonize the procedures that are used to monitor biomass quality. Because there are no Canada-wide biomass sampling standards, facilities that produce and use woody biomass have developed and implemented in-house sampling procedures of varying degrees of complexity. Given that the use of woody biomass in Canada is predicted to increase, the ability to ensure the quality of biomass will become increasingly important in order to control costs and maximize system efficiency.

BIOMASS

Biofuels

Bioenergy

MOISTURE CONTENT

BULK DENSITY

Bark content

Contamination

ASH

Lignin

CARBOHYDRATES

EXTRACTIVES


Résumé: L'échantillonnage et l'analyse de la biomasse jouent un rôle décisif dans la détermination des caractéristiques et de la valeur des combustibles de biomasse ligneuse utilisés dans les systèmes de bioénergie au Canada. Les normes d'échantillonnage et d'analyse contribuent à harmoniser les méthodes utilisées pour évaluer la qualité de la biomasse. Il n'existe pas de normes d'échantillonnage pancanadiennes; les usines qui produisent ou utilisent la biomasse ligneuse ont donc élaboré et appliqué des méthodes d'échantillonnage maison de niveau de complexité variable. Comme on prévoit une augmentation de l'utilisation de la biomasse ligneuse au Canada, les compétences permettant de garantir sa qualité deviendront de plus en plus importantes pour limiter les coûts et maximiser l'efficacité des systèmes.

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Méthodes de base pour l'échantillonnage et l'analyse de la biomasse ligneuse

<https://library.fpinnovations.ca/fr/permalink/fpipub39994>

Auteur: Marinescu, Marian
Volpé, Sylvain
Desrochers, Luc
Roser, Dominik

Date: January 2015

Genre du document: Research report

Description physique: 15 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Biomass
Bioenergy
Sampling
Physical properties
Moisture content
Particle size
Bulk density
Standards
Advantage

Série: Advantage ; Vol. 15, No. 5

Langue: English

Résumé: Biomass sampling and analysis play decisive roles in determining the characteristics and value of the woody biomass fuel used in bioenergy systems in Canada. Sampling and analysis standards help harmonize the procedures that are used to monitor biomass quality. Because there are no Canada-wide biomass sampling standards, facilities that produce and use woody biomass have developed and implemented in-house sampling procedures of varying degrees of complexity. Given that the use of woody biomass in Canada is predicted to increase, the ability to ensure the quality of biomass will become increasingly important in order to control costs and maximize system efficiency.

BIOMASS

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MOISTURE CONTENT

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Extraction and economics of value-added chemicals from bark and forest biomass

<https://library.fpinnovations.ca/fr/permalink/fpipub40034>

Auteur: Blanchard, Vincent
Yang, D.-Q.
Barry, A.

Date: March 2015

Genre du document: Research report

Description physique: 22 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Biomass Conversion

Sujet: Extractives
Bark
Biomass

Série: 301009286
E-4930

Localisation: Québec, Québec


Langue: English

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Further development and commercialization of ultra-low density composites : investigation of the formulations impact on drying (I)

<https://library.fpinnovations.ca/fr/permalink/fpipub39877>



Auteur: Zhang, Yaolin
Deng, James
Cai, X.

Collaborateur: Canadian Forest Services

Date: June 2014

Genre du document: Research report

Description physique: 22 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Biomaterials

Sujet: Composites
Drying
Density
Packaging

Série: Transformative Technologies Program
Project no.301007944
E-4901

Localisation: Québec, Québec

Langue: English

Résumé: This study is a subtask under the "lab experiment on drying" project. This investigation consists to: 1) screen the main factors of the formulations impact on the drying process of the ultra-low density fiber composites (ULDC); 2) evaluate the effects of these main factors and try to optimize the formulations to shorten the drying process of ULDC; 3) have parameters for setting-up the new dryer.

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Development of lignin-based natural wood bio-protectant
against fungal attack and checking



<https://library.fpinnovations.ca/fr/permalink/fpipub40005>

Auteur: Yang, D.-Q.
Zhang, Yaolin

Collaborateur: Natural Resources Canada.

Date: March 2014

Genre du document: Research report

Description physique: 36 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Biomaterials

Sujet: Lignin
Preservation
Fungi

Série: 301008439
E-4923

Localisation: Québec, Québec

Langue: English

Résumé:

Checking, mold and decay cause major problems for wood utilization and market value. About one third of wood products were used to replace old building materials that failed due to these problems caused by fungal infection. Products currently used for protecting wood materials from mold, decay and checking damages are mostly toxic chemicals. Development of a new generation of natural pesticides is urgently needed for meeting new regulatory requirements. Lignin produced by plants and chitosan from crustaceans have both natural antifungal and antibacterial properties. Combining both natural compounds to synergize a natural bio-protectant against molds, decay and checking is the major objective of this project.

The approaches of this project include formulate lignin and chitosan into a harmonized coating mixture for using as a bio-renewable and eco-friendly bio-protectant against fungal infection in different applications such as:

End coating on logs and green lumber against fungal attack and checking;

Protective coating on wood siding materials against fungal infection and weathering.

The results showed that chitosan and Kraft lignin are compatible. After mixing the 2 materials by stirring, it formed a homogenized brownish coating material without any precipitation. Fifteen formulations with different concentration and ratio of lignin and chitosan were evaluated. Based on the texture, color, uniformity, efficacy against fungi and economic criteria, 4 formulations were finally selected for the tests at 6% solid content of lignin: chitosan ratios of 2:1 & 1:1 and 9% solid content of lignin: chitosan ratios of 2:1 and 3.5:1.

As a log end coating, the 4 formulations were tested to protect freshly-cut sugar maple and lodgepole pine against mold, stain and checking in an outside storage for 8 weeks. On both wood species, the effectiveness of the best lignin/chitosan coating formulation was similar or better than the currently used commercial chemical product Anchorseal.

After exposure of lignin/chitosan coated or uncoated black spruce wood samples to a high humid condition for 2 weeks, the uncoated wood samples started to grow molds with 100% infection rate. Slight mold infection was found on wood samples coated with 3 formulations after 4 weeks and no mold growth was found on wood samples coated with 1 formulation (LC921) until the end of the test of 8 weeks.

After exposure to the 4 lignin/chitosan formulations coated black spruce wood samples to white-rot and brown-rot fungi for 16 weeks, the formulations LC611 and LC921 were moderately resistant to decay, as effective as using currently chemical wood preservative by dipping treatment.

The lignin/chitosan coatings were able to prevent wood fiber erosion, but they are photo degradable. However, the formulations LC611 and LC921, that contained 3% of chitosan, are more resistant to weathering than the formulations LC621 and LC972 that contained 2% of chitosan.

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Caractéristiques cruciales de la biomasse pour les applications les plus courantes en bioénergie et biocarburants

<https://library.fpinnovations.ca/fr/permalink/fpipub3102>

Auteur: Marinescu, Marian

Date: September 2013

Édition: 39759

Genre du document: Research report

Description physique: 12 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Biomass

Bioenergy

Moisture content

Physical properties

Avantage

Série: Avantage ; Vol. 14, No. 3

Langue: French

ISSN: 14933381

Résumé: Le présent document décrit les caractéristiques cruciales de la biomasse comme le format et la taille, la teneur en humidité, la densité apparente, la teneur en feuillage/écorce, la contamination, la teneur en cendres, en lignine, en hydrates de carbone et en produits d'extraction ainsi que la valeur calorifique pour les applications les plus courantes de production de bioénergie et de biocarburants : combustions directe, gazéification, pyrolyse, torréfaction, fermentation et densification. Le document est destiné aux professionnels de la foresterie, de la transformation du bois, des pâtes et papiers et de la biomasse qui cherchent de l'information de base sur ces caractéristiques essentielles.

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Critical biomass attributes of the most common bioenergy and biofuel applications

<https://library.fpinnovations.ca/fr/permalink/fpipub39735>

Auteur: Marinescu, Marian

Date: September 2013

Genre du document: Research report

Description physique: 12 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Biomass

Bioenergy

Moisture content

Physical properties

Advantage

Série: Advantage ; Vol. 14, No. 3

Langue: English

ISSN: 14933381


Résumé: This primer presents critical attributes such as format and size; moisture content; bulk density; foliage/bark content; contamination; ash, lignin, carbohydrate, and extractive contents; and calorific value of the most common bioenergy and biofuel applications; direct combustion, gasification, pyrolysis, torrefaction, fermentation, and densification. The primer is aimed at forestry, wood processing, pulp and paper, and biomass professionals who are interested in basic information about these critical attributes.

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Études sur les coûts d'établissement des plantations à croissance rapide en milieu forestier

<https://library.fpinnovations.ca/fr/permalink/fpipub39761>

Auteur: St-Amour, Michel

Date: Novembre 2013

Genre du document: Research report

Description physique: 21 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Costs

Hybrids

Plantations

Productivity

Advantage

Série: Avantage ; Vol. 14, No. 7

Langue: French

ISSN: 14933381

Résumé: Dans le cadre de son programme de technologies transformatrices, FPInnovations participe à un projet de recherche sur les sources de biomasse forestière de remplacement pour alimenter la bio-industries émergente. Une série d'études a été menée sur quatre différents sites au Québec pour déterminer la productivité, la qualité et le coût des différents traitements nécessaires pour l'établissement des plantations de peupliers hybrides en milieu forestier. Les études démontrent que les conditions de terrain et l'organisation du travail sont les facteurs qui ont le plus d'influence sur l'efficacité et le coût total des traitements.

Peuplier hybride

PLANTATIONS

Préparation de terrain

Monticules

Coûts


productivity

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Studies on establishment costs of fast-growing tree plantations on forest land

<https://library.fpinnovations.ca/fr/permalink/fpipub39808>

Auteur: St-Amour, Michel

Date: November 2013

Genre du document: Research report

Description physique: 21 p.

Secteur: Forest Operations

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Costs
Hybrids
Plantations
Productivity
Advantage

Série: Advantage ; Vol. 14, No. 7

Langue: English

ISSN: 14933381


Résumé: As part of its Transformative Technologies Program, FPInnovations is taking part in a research project on alternate sources of forest biomass to supply the emerging bio-industry. A series of studies was conducted on four different sites in Quebec to determine productivity, quality and cost of various treatments required to establish hybrid poplar plantations on forest land. The studies showed that site conditions and work organization had the most impact on the effectiveness and total cost of treatments.

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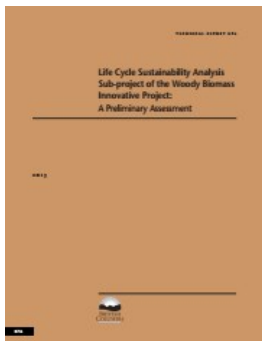
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Life cycle sustainability analysis sub-project of the Woody Biomass Innovative Project : a preliminary assessment

<https://library.fpinnovations.ca/fr/permalink/fpipub6017>

Auteur: Mahalle, Lal
Berch, S.
Dymond, C.
Tedder, S.
Titus, B.
Todd, M.

Collaborateur: Province of British Columbia.

Date: March 2013

Édition: 42913

Genre du document: Research report

Description physique: 40 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Test methods

Série: Technical Report 076
W-3015

Localisation: Victoria, British Columbia


Langue: English

Résumé: This preliminary study addresses the life cycle sustainability analysis subproject of the Woody Biomass Innovative Project, which proposed to assess the future bioenergy potential for British Columbia from a broad perspective that includes energy, greenhouse gas considerations and climate change, impacts on soil and biodiversity, and socio-economic sensitivities and to consider the need for guidance and policy development. This preliminary study reviews currently available assessment methodologies and proposes a framework for a life cycle sustainability assessment of current and emerging wood-based biofuel products used in three sectors (i.e., residential, institutional, and industrial) in British Columbia. In addition, this study defines data requirements and data availability for a detailed assessment, and outlines the possible policy implications that might be drawn from a detailed study.

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Reinforcing phenolic resins with nanocrystalline cellulose (NCC) for manufacturing wood composite panels

<https://library.fpinnovations.ca/fr/permalink/fpipub6018>

Auteur: Wang, Xiang-Ming
Bouchard, Jean
Zhang, Yaolin
Jiang, Z.H.

Collaborateur: Québec Ministère des Ressources naturelles

Date: January 2013

Édition: 42915

Genre du document: Research report

Description physique: 57 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Transformation & Interfaces

Sujet: Test methods
Nanocrystalline cellulose (NCC)
Adhesives
Phenolic Resins
Wood composite panels

Série: E-4822

Localisation: Québec, Québec

Langue: English

Résumé: The main objective of this project was to introduce NCC into the phenolic resin system as a reinforcing agent for improving the resin's bond quality and durability in the manufacture of oriented strand board (OSB). The approaches adopted in this project can be outlined as follows: Develop a procedure or a new process technology to uniformly incorporate NCC into the phenolic resin system including phenol-formaldehyde (PF) and lignin-based PF resin; Develop new formulations for the NCC-phenolic adhesive system in both liquid and powder forms; Characterize NCC-PF and NCC-lignin-PF resins with differential analytical techniques; Manufacture OSB panels with NCC-PF and NCC-lignin-PF resins; Quantify the performance improvement of OSB panel by evaluating the resulting panel for physical and mechanical properties.

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FPJoule

<https://library.fpinnovations.ca/fr/permalink/fpipub39450>

Auteur: Volpé, Sylvain
Date: February 2012
Genre du document: Research report
Description physique: 4 p.
Secteur: Forest Operations
Domaine: Bioproducts
Champ de recherche: Biomass Conversion
Sujet: Value added

Residues
Heating
Heat
Boilers
Biomass
Advantage

Série: Advantage ; Vol. 13, No. 4

Langue: English

ISSN: 14933381

Résumé: FPJoule is a web-based tool that can be used to evaluate the amount of energy contained in harvest residues according to their origin (species group and part of tree) and moisture content. The tool can also be used to quantify the financial advantages when using biomass as a fuel source compared to conventional fossil fuels. A more comprehensive spreadsheet model is also available to FPInnovations members. The latter version can be modified to match a particular facility, such as boiler efficiency.

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FPJoule

<https://library.fpinnovations.ca/fr/permalink/fpipub39451>

Auteur: Volpé, Sylvain
Date: February 2012
Genre du document: Research report
Description physique: 4 p.
Secteur: Forest Operations
Domaine: Bioproducts
Champ de recherche: Building Systems
Sujet: Test methods
Value added
Residues
Heating
Heat
Boilers
Biomass
Advantage

Série: Advantage ; Vol. 13, No. 4

ISSN: 14933381


Résumé: FPJoule est une application web permettant d'évaluer la quantité d'énergie fournie par des résidus forestiers selon leur origine (groupe d'essences et partie de l'arbre) et leur teneur en humidité. L'outil permet également de quantifier les avantages financiers liés à l'utilisation de la biomasse comme source d'énergie pour le remplacement des combustibles fossiles. Un modèle de feuille de calcul plus complet est également disponible pour les membres de FPInnovations. Cette version peut être modifiée pour correspondre à une installation particulière, comme l'efficacité des chaudières.

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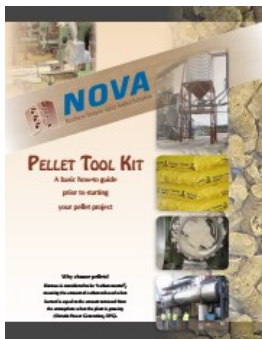
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Pellet tool kit : a basic how-to guide prior to starting your pellet project


<https://library.fpinnovations.ca/fr/permalink/fpipub39872>

Auteur: Asman, P.
Date: 2011
Genre du document: Guide
Research report
Description physique: 12 p.
Secteur: Wood Products
Domaine: Bioproducts
Champ de recherche: Building Systems
Sujet: Pellets
Biomass
Energy
Série: E-4895
Localisation: Québec, Québec
Langue: English
Résumé: Northern Ontario Value Added Initiative NOVA which discusses Pellets, Biomass and energy.
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Evaluation of a four-row disc trencher prototype in western Canada

<https://library.fpinnovations.ca/fr/permalink/fpipub39709>

Auteur: Evans, Craig
 Date: 2011
 Genre du document: Research report
 Description physique: 8 p.
 Secteur: Forest Operations
 Domaine: Bioproducts
 Champ de recherche: Building Systems
 Sujet: Advantage
 Série: Advantage ; Vol. 13, No. 11
 Langue: English
 ISSN: 14933381
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Status of energy use in the Canadian wood products sector = Situation sur la consommation d'énergie dans le secteur canadien des produits du bois

<https://library.fpinnovations.ca/fr/permalink/fpipub39302>

Collaborateur: Natural Resources Canada. Canadian Industry Program for Energy Conservation (CIPEC). Forintek Canada Corp.
 Date: August 2010
 Genre du document: Research report
 Description physique: 68 p.
 Secteur: Wood Products

Domaine:	Bioproducts
Champ de recherche:	Biomass Conversion
Sujet:	Saw mills Power supply Energy Plywood manufacture Plywood Panels manufacturing Panels
Série:	W-2780
Localisation:	Vancouver, British Columbia
Langue:	English
Résumé:	<p>Canada's wood products industry has long played an important role in the Canadian economy. It is a diverse industry, producing both commodity and value-added products in every region of the country.</p> <p>This energy use status report focuses on five commodities produced within the broadly defined wood products sector: softwood lumber, softwood plywood, oriented strand board (OSB), particleboard (PB) and medium density fibreboard (MDF).</p> <p>The study, conducted by FPInnovations – Forintek Division, takes a different approach than other Canadian Industry Program for Energy Conservation (CIPEC) reports. It does not focus solely on gross facility manufacturing energy use, but also puts this energy use in context by relating it to upstream energy required to procure raw material and energy inputs. In addition, the study tracks direct and indirect greenhouse gas (GHG) emissions by fuel type and accounts for the carbon sequestered in wood products and thus, presents a carbon balance for each finished product at the plant gate.</p> <p>Using a life-cycle analysis approach, this report documents the cradle-to-gate energy use in the production of the five commodities, so each industry segment can better appreciate how it draws upon and uses materials and energy resources and how it may reduce its energy use in the future.</p> <p>Chapters include resource extraction, forest management, resource transportation, softwood lumber manufacture, softwood plywood manufacture, oriented strand board manufacture, composite panel board manufacture, gross energy and carbon balance summary and energy use reduction potential in wood product manufacturing.</p>
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Situation sur la consommation d'énergie dans le secteur canadien des produits du bois

<https://library.fpinnovations.ca/fr/permalink/fpipub39304>

Collaborateur: Canada. Ressources naturelles
Forintek Canada Corp.

Date: August 2010

Genre du document: Research report

Description physique: 68 p.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Biomass Conversion

Sujet: Saw mills
Power supply
Energy
Plywood manufacture
Plywood
Panels manufacturing
Panels

Localisation: Vancouver, British Columbia

Langue: French


ISBN: 9.7811E+12

Résumé: Energy resources
Panels - Manufacture - Power requirements
Plywood - Manufacture - Power requirements
Sawmilling - Power requirements

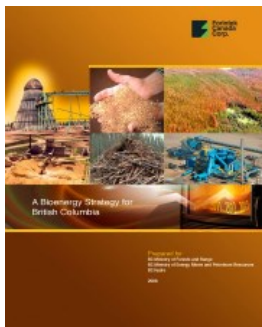
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A bioenergy strategy for British Columbia

<https://library.fpinnovations.ca/fr/permalink/fpipub3049>

Collaborateur: British Columbia. Ministry of Forests and Range
British Columbia. Ministry of Energy, Mines and Petroleum Resources
BC Hydro
Forintek Canada Corp.

Date: November 2006

Édition: 39695

Genre du document: Research report

Description physique: 1 v.

Secteur: Wood Products

Domaine: Bioproducts

Champ de recherche: Building Systems

Sujet: Utilization
Renewable natural resources
Biomass

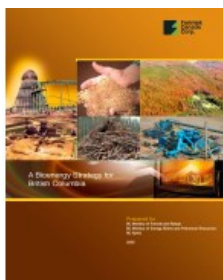
Série: W-2980

Localisation: Vancouver, British Columbia


Langue: English

Résumé: Biomass
Renewable natural resources
Utilization

Documents



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Mill residue utilization in the ILMA region

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Plackett, D.V.



Collaborateur: Forest Renewal BC
Date: January 1997
Genre du document: Research report
Description physique: 20 p.
Secteur: Wood Products
Domaine: Bioproducts
Champ de recherche: Building Systems
Sujet: Waste utilization
Utilization
Saw mills
British Columbia

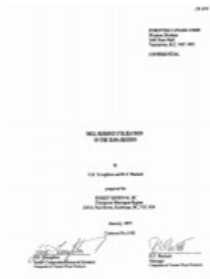
Série: Contract No. 1451
W-1580

Localisation: Vancouver, British Columbia
Langue: English

Résumé: Forest products companies in the ILMA region covering four areas, Cranbrook, Kootenay, Vavenby and Okanagan, were surveyed for their current mill residue utilization. Although the Cranbrook area showed the lowest utilization of bark residues (0 %), it showed the highest utilization for whitewood, sawdust and shavings (98%). Overall, the Okanagan area generated the largest amount of bark and whitewood residues and showed the highest utilization for these residues (69% utilization for bark and 86% for whitewood). The Kootenay area generated the second highest amount of bark and whitewood residues and showed the second highest utilization for these residues (67% utilization for bark and 76% utilization for whitewood). The amounts of bark, sawdust and shavings, slabs, trim ends and yard debris generated and utilized for the above four areas are presented in this report. In 1996, the utilization of bark and sawdust / shavings residues in the ILMA region as a whole was 49.8% and 83.8% respectively compared to 28% and 45% respectively in 1989 showing a substantial increase in utilization. The primary use for sawdust and shavings was found to be pulp furnish followed by particleboard/fibreboard furnish, internal process heat, and agricultural/bedding material. The primary use for the bark residues was for energy generation, either through cogeneration or for internal process heat. There are few value-added product opportunities for bark in comparison to sawdust and shavings. However, a new value-added hog fuel/bark board recently patented by Forintek may have potential to utilize some quantities of bark residues, providing a number of technical, environmental and economic questions can be satisfactorily addressed. Another new product, Biolime™, also shows some potential for utilizing large quantities of bark residues.

Waste - Utilization - British Columbia
Waste - Sawmills

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