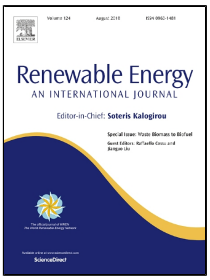
Accepted Manuscript



Estimation of Pine Needle Availability in the Central Himalayan State of Uttarakhand, India for use as Energy Feedstock

L.D. Kala, P.M.V. Subbarao

PII:	S0960-1481(18)30575-5
DOI:	10.1016/j.renene.2018.05.054
Reference:	RENE 10106
To appear in:	*Renewable Energy*
Received Date:	23 March 2017
Accepted Date:	15 May 2018

Please cite this article as: L.D. Kala, P.M.V. Subbarao, Estimation of Pine Needle Availability in the Central Himalayan State of Uttarakhand, India for use as Energy Feedstock, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.05.054

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Estimation of Pine Needle Availability in the Central Himalayan State of Uttarakhand, India for use as Energy Feedstock

L.D. Kala[*]*, P.M.V. Subbarao*
Mechanical Engineering Department
Indian Institute of Technology Delhi, Hauz Khas, New Delhi – 110016 (India)
[*]Corresponding author. Email - ldkala@yahoo.com;
Phone - +91-9313899865; Fax - +91-11-26581121

Abstract

Results of an attempt to estimate the availability of pine needles (*pinus roxburghii*) in the state of Uttarakhand, India that can be used as energy feedstock have been presented. Three somewhat different approaches have been used to estimate the gross annual availability of pine needles in the state. By taking into account several different factors that are expected to reduce the availability of pine needles for their use as energy feedstock; the likely net availability of the same has been estimated. The gross annual availability of pine needle is found to vary from 1.37 to 2.37 million tons in the three approaches. The annual availability of pine needles for energy applications is estimated to be in the range of 0.96 to 1.66 million tons. The annual primary energy potential of pine needles available as energy feedstock in the state has also been estimated. Annual energy delivery potential of pine needles likely to be available has also been estimated in terms of thermal and electrical energy generation.

Highlights

- Pine needles can be an important energy feedstock though not being used presently.
- Annual gross availability of pine needles in Uttarakhand have been estimated alongwith identification of factors affecting their net availability as energy feedstock.
- Annual gross availability of pine needles estimated in the range of 1.37 to 2.37 million tonnes.
- Net annual availability of pine needles estimated between 0.96 and 1.66 million tonnes.
- The annual primary energy potential of pine needles estimated in between 18 PJ to 32 PJ and annual electrical energy delivery potential in the range of 1035 GWh to 1791 GWh.

Keywords

Pine needles, Gross annual yield , Pine needle gasification, Factors affecting availability as energy feed-stock , Primary energy delivery potential.

Download English Version:

https://daneshyari.com/en/article/6764001

Download Persian Version:

https://daneshyari.com/article/6764001

Daneshyari.com