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A biomass energy flow chart for Fiji

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ABSTRACT

Terrestrial above ground biomass production and utilization was analyzed for Fiji for the years 2003–2012. The total production of biomass was estimated to be 72.67 PJ of which 24% is from food, 44% of agricultural residues, 10% dung and 22% from forestry. Of the 72.67 PJ biomass produced only 11% was used as fuel, 12% as industrial wood and 24% as food. The unutilized biomass resulted into a loss of 38.5 PJ of energy (44 GJ per capita or 2.56 Mt of wood equivalent) which is 53% of the total biomass theoretically produced. Scrutiny of the availability and use of biomass resources is important if biomass energy is to be used on a sustainable basis. Lack of detailed literature in this area in Fiji potentially opens a path for further detailed studies to understand the full contribution of biomass to future sustainable energy supply.

1. Introduction

Fiji is a small island nation situated between 177°E and 178°W Longitude and 12° to 22° S Latitude in the Pacific comprising of over 300 islands, spread over a land mass of 18,272 km^2. The largest island is Viti Levu, which covers 10,390 km^2, followed by Vanua Levu with 5538 km^2. Together they account for 87 percent of the land area and 90 percent of the population. The larger islands, especially Viti Levu, Vanua Levu, Taveuni, Kadavu and the Lomaiviti group, are quite mountainous and of volcanic origin.

Fiji has 1,827,000 ha of total land area of which 815,000 ha (45%) are forests, approximately 10% is arable, 4% is under permanent crops, 10% is under permanent pastures, and 31% under other land-use categories [1]. Although bagasse has been used as a primary energy source for many years, methodologies for assessing the potential of other sources of biomass energy potential are still developing in Fiji. Sugar production has been an industry in Fiji from 1872 [2] and since then it has played an important role in the country's economy and has been providing biomass (bagasse) energy for all four sugar mills, with surplus electricity production being exported to grid.

From the 769,439 MWh electricity generated nationally in 2008 [3], 66.8% is from renewable energy resources and the other 33.2% is met from imported petroleum for diesel generators. From the renewable energy sources 4.1% is met from biomass which is supported by bagasse and wood chips. Fig. 1 below depicts the energy consumption of 41.7 PJ [4] by sector in Fiji and Fig. 2 shows the electrical energy supported by different sources.

The objective of this research is to assess the biomass potential by means of a biomass energy flow chart. Terrestrial above ground biomass production and usage in Fiji was analyzed for ten years from years 2003–2012 using FAOSTAT-derived data [6] and specific energy values were derived from past work [7–10].

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