

## POSSIBLE USE OF TROPICAL PEATS AS FUEL: AN EXAMPLE FROM JAMAICA

E. ROBINSON<sup>1</sup>

## ABSTRACT

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Preliminary examinations of two Holocene coastal peat deposits in Jamaica have indicated more than 150 million wet tons of peat, exceeding 10 m depth in places. Most of the peat is of the sedge marsh type, bordered on the seaward side by mangrove peats. It overlies clays, resting in turn on faulted Tertiary limestone blocks. Although ash contents are comparatively high (usually more than 10%, dry weight basis), peats of this type could be attractive as sources of energy in developing countries, such as Jamaica, which have no indigenous supplies of fossil fuel. Deposits similar to those in Jamaica are probably widespread, but few studies appear to have been carried out on peats for fuel in tropical areas.

## INTRODUCTION

Many of the poorer developing nations are situated in tropical areas, deficient in both oil and coal, and it might appear that alternative indigenous energy sources are limited. For instance, in the Caribbean region, only Venezuela, Colombia and Trinidad-Tobago are significant oil producers. Cuba and Barbados have very minor production. Guatemala's production will not be significant for several years (MEYERHOFF, 1977). The remaining 18 or 19 territories in the region not only lack indigenous oil but have no obvious alternatives, except where there may be potential for geothermal energy development.

One possible partial solution lies in utilising the peat resources of coastal wetlands as a fuel to generate electricity. Such resources do exist, on a small scale, in Jamaica (ROBINSON, 1976), and are present in other Caribbean islands, such as Hispaniola and Cuba (OLENIN, 1962; IONIN ET AL., 1969).

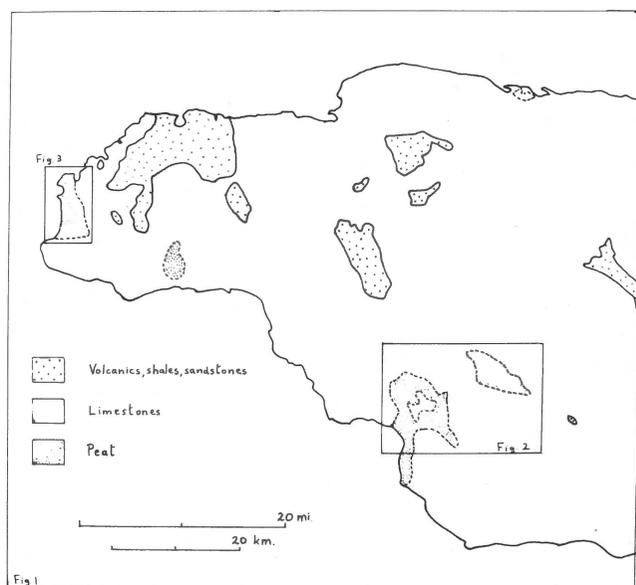


Fig. 1  
Peat deposits in western Jamaica.

<sup>1</sup> Dept. of Geology, University of the West Indies, KINGSTON 7, Jamaica, West Indies.

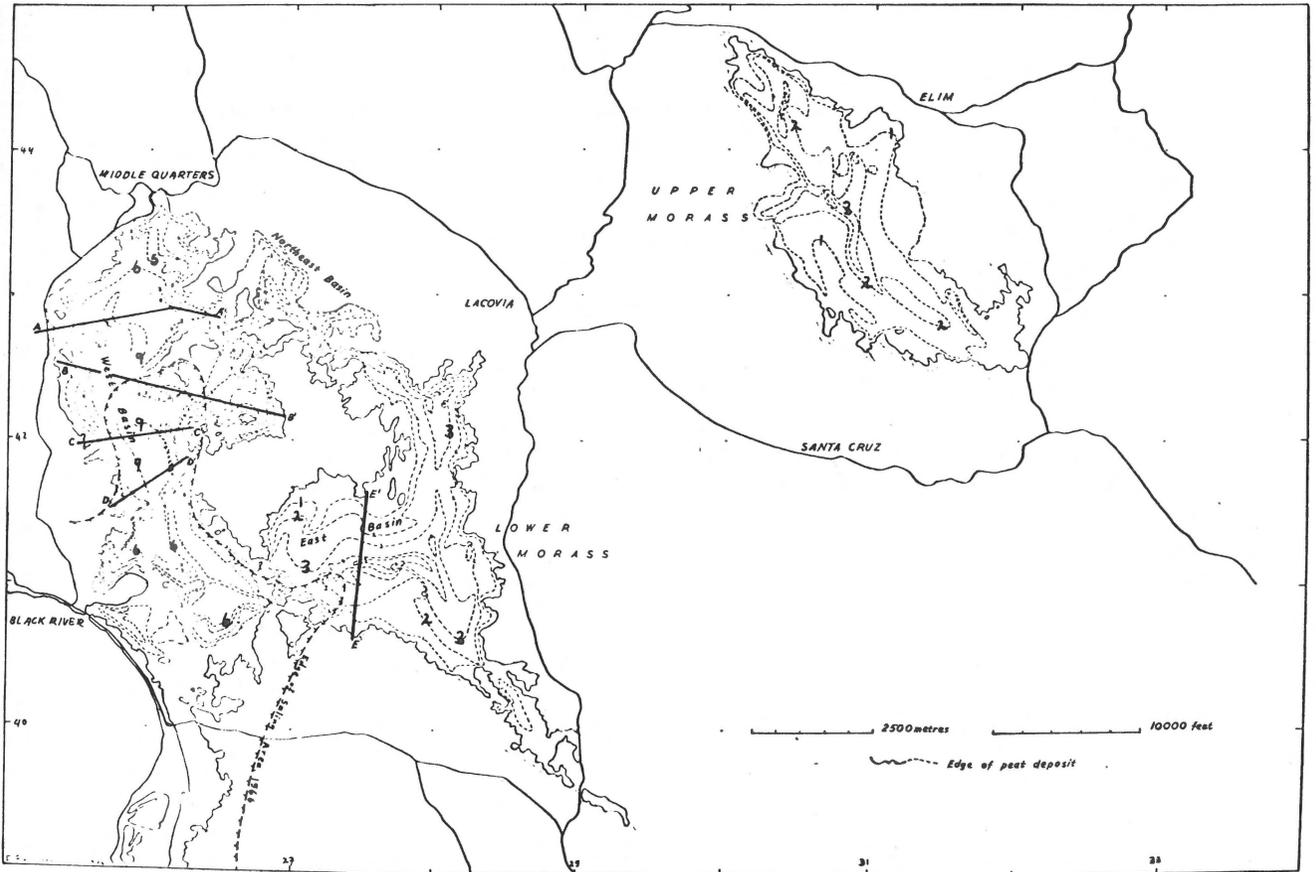


Fig. 2  
Peat deposits of the Black River basin (see Fig. 1 for location). Contours indicate thickness of peat in metres. Surface of deposits in Lower Morass is near sea level. Heavy broken line encloses saline areas.

Production of electrical power from peat on a commercial scale is well established in two countries of the north temperate zone, the Soviet Union and Ireland, and is being developed in Finland (SUONINEN, 1975; SARKAVA, 1975), but similar use of this resource does not appear to have been attempted in a tropical area. However, compared with oil, the cost of peat fuel has become more favourable. For example, in Ireland the cost of fuel peat was over twice the cost of imported oil in 1972 but fell to about two-thirds the cost of oil in 1974 (LANG, 1975). This change in the economics of peat, relative to oil, is sufficient reason for examining potential resources as they exist in Jamaica.

#### JAMAICAN PEAT DEPOSITS

In the Jamaican coastal wetlands, the peat-forming areas can be divided into two broad types. In the fresh water areas sedge swamps are dominant; nearer the coastlines, in more saline environments, forest (mainly mangrove) peats are being formed. One of the main peat constituents in the sedge

swamps is sawgrass (*Cladium jamaicense*): Thatch and cabbagepalms occur in clumps bordering the sawgrass regions, which form open plains, while in saline areas the mangrove *Rhizophora mangle* and the reed *Phragmites communis* are important floral constituents (Proctor in GRONDMIJ, 1964).

In Jamaica the largest quantities of peat occur in the Black River basin and at Negril (Fig. 1). In both regions the bedrock is Tertiary limestone, which occurs as downfaulted blocks, the faulting being of Late Tertiary or Quaternary age. On the surface of these blocks peat has accumulated, over an intervening layer of terrigenous, usually clayey material, in basins to depths exceeding 10 m in some places.

The larger of the two deposits, at Black River (Fig. 2), is subdivided into two distinct regions: the Upper Morass, where the peat is shallow, seldom exceeding 3 m thickness; and the Lower Morass where deposits are thicker and located in a series of basins. Some 1,200 boreholes, put down in the region in the early 1960's in connection with a proposed drainage scheme (GRONDMIJ, 1964) have allowed us to make a preliminary reserve assessment of some 80 million

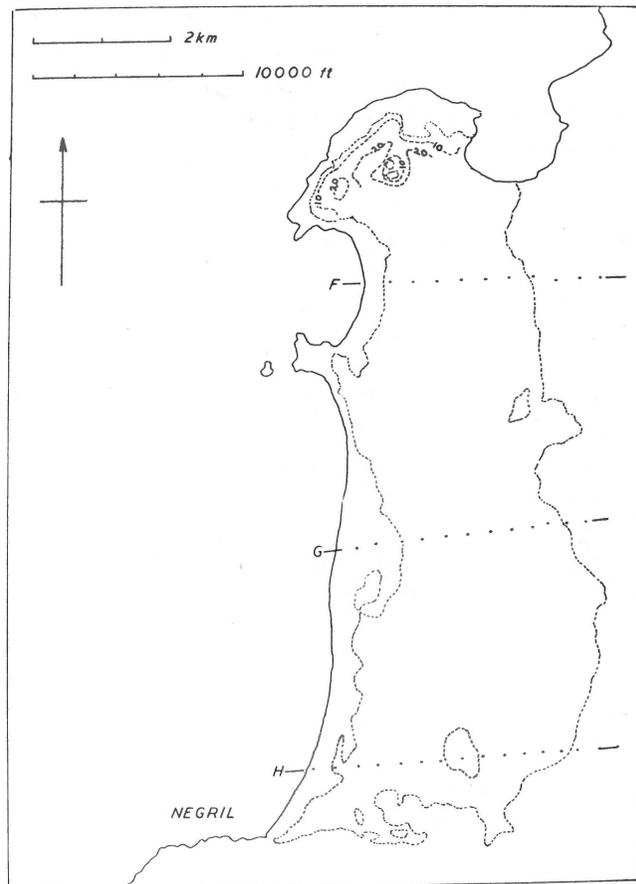


Fig. 3  
Peat deposits of Negril (see Fig. 1 for location) surface of deposits is at sea level. Spots indicate borehole control for peat depth.

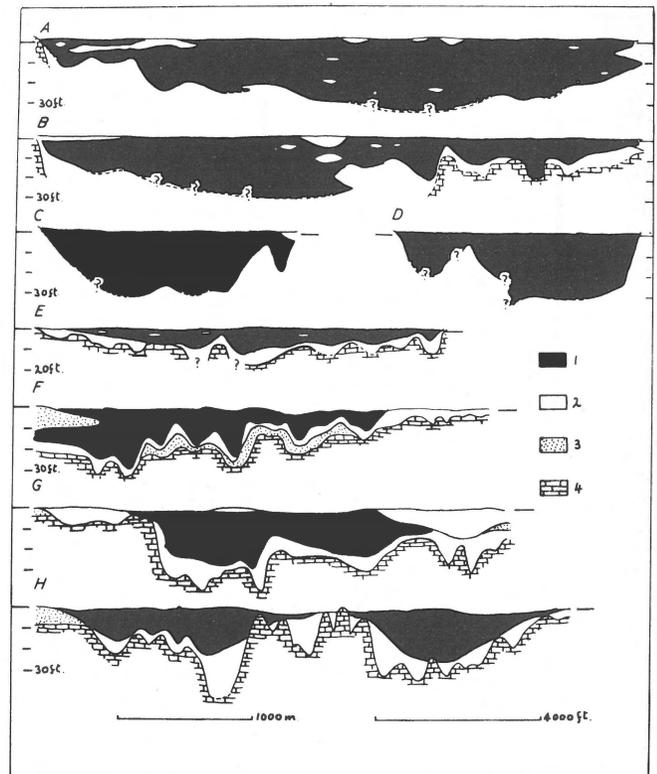


Fig. 4  
Cross sections through peat areas at Black River (A-E, Fig. 2) and Negril (F-H, Fig. 3), based on borehole data from the Grondmij (1964) and Adelatec (1969) reports. 1, peat; 2, silt, clay and marl; 3, sand and gravel; 4, limestone.

wet tons in the Lower Morass (Fig. 2).

Preliminary estimates at Negril (Fig. 3) based on three lines of auger holes made in 1953 and other information (ADELATEC, 1969), indicate quantities in excess of 70 million wet tons. Figure 4 presents cross-sections through the peat deposits.

At Black River the peat has developed on the floodplain of the river and its tributaries. The ash and mineral matter are very variable in their distribution both geographically and stratigraphically (Fig. 5). High ash peats and peaty clays are associated with the main course of the Black River and those tributaries entering the basin from outside. Lower ash peats are associated with tributaries which originate as karst springs at the swamp edges. It appears, from the limited data available, that ash contents tend to increase upwards in the deposits.

At Negril ash contents are considerably lower (Fig. 5). Here a downfaulted limestone block was enclosed by barrier beach deposits, the beach material being composed of debris from the offshore reef system.

Other smaller peat deposits have not been investigated, but

they total some 8000 hectares and might provide additional exploitable reserves.

#### CHARACTERISTICS OF JAMAICAN PEAT

The Jamaican peats are generally similar to those of southern Florida (DAVIS, 1946; SPACKMAN ET AL., 1969), being similarly developed over a limestone bedrock. They are generally reported to be neutral (pH 6-7). The ash contents are higher than those which are currently used for commercial electricity generation.

Heating values so far measured range between 2200 and 5000 cal/g for peats with ash content less than 30%, within a range acceptable for normal combustion in power plant furnaces. On the assumption that the average calorific value of Jamaican peat, dried to 35% moisture and containing 12-25% ash, would be around 3500 cal/g and that the conversion efficiency of such a fuel would be about 1.5 kw/hr/kg the quantities available in the two deposits studied may be enough to supply as much as 100 megawatts of electrical generating capacity for about 30 years.

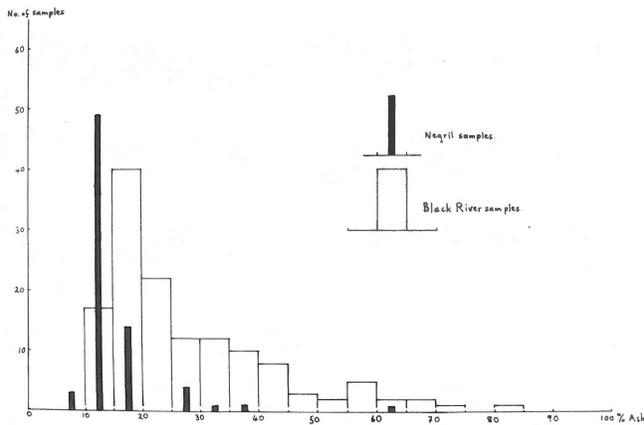


Fig. 5  
Histogram showing ash contents (dry basis) of peat samples from Black River (open boxes) and Negril (shaded boxes).

## PEAT EXTRACTION

In its natural state peat has a moisture content approaching 90%, which may be lowered to about 88% if drainage is possible. This is reduced, usually by drying in the open air, to 40-55% (milled peat) and 20-50% (sod peat) for burning.

In Jamaica where the peat deposits are coastal and at, or even below sealevel, drainage would be expensive, requiring construction of polders, enclosed by dykes. For this reason some variation on the hydropeat system of extraction, using jets of water or a dredge to dislodge the peat and a slurry pipeline to carry it to a suitable drying area, appears attractive. Some of its advantages are:

- (1) it could be used in mangrove areas containing roots and tree stumps, difficult to deal with using mechanical excavation;
- (2) high peat recovery factors may be expected, even from deposits of complex shape, an important consideration if total peat reserves are limited;
- (3) drainage is not required and the operations can be carried out from barges, using a dredge;
- (4) it is possible to pump the slurry, by pipeline, to those neighbouring areas most suited for effective drying, i.e. with good drainage and, ideally, low rainfall. Areas with both characteristics occur near to the Black River deposits in Jamaica.

## CONCLUSIONS

A preliminary examination of the problem of using the peat deposits in Jamaica as a source of fuel suggests that exploita-

tion is technologically feasible. Much further work remains to be done to assess the geological characteristics in detail and evaluate the range in quality from the point of view of fuel utilisation. The economics of the situation also require evaluation. There are definite attractions in having a domestic source of fossil fuel to act as a buffer against the vagaries of supply and prices from foreign agencies, to provide local employment and to conserve foreign exchange.

## ACKNOWLEDGEMENTS

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