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Characteristics of South African peats and their potential exploitation

by

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ABSTRACT

Peat has been exploited for some time by man for use in various technological processes, power generation, agriculture and the chemical industries. In Africa this potentially important resource has remained virtually untapped and as a result also unmanaged. Currently little diversity exists in peat usage in South Africa. However, it does represent an increasingly important commodity in the daily lives of many South Africans, notably in the agricultural and horticultural fields.

This investigation of selected "type" peat deposits in South Africa had as its objectives: (1) to determine the extent and nature of peats and peatlands in South Africa; (2) to study peat sedimentology and palaeoecology; (3) to provide a basis for characterisation of peat types; (4) to classify peatlands; (5) to delineate management constraints. For these purposes in this treatise South African peats are investigated in terms of morphological, botanical, physical, chemical and petrologic attributes. Previous to these investigations, no detailed study of the characteristics of South African peats had been done.

The following are a few of the more important conclusions resulting from this study:

(1) Under favourable conditions peatlands (mires) occur in South Africa in widely different climatic systems. However, those of socio-economic consequence tend to be located in certain broad geomorphological settings in the higher rainfall, eastern half of the country. Extensive primary mires in drier sub-tropic and tropic areas are restricted to deltaic and estuarine positions, merging with coastal mangrove swamps. Where rainfall is higher, mires extend further up-river and inland into lake, interdune and other low lying enclosed areas.

(2) Cooler, more humid regions facilitate peat formation in a wider range of basin types, following the order, estuarine/deltaic, river flood plains, open lake basins, closed lake basins, valley heads and springs.

(3) The geomorphological expression of the geology of an area is extremely important to peat accumulation as it provides the primary template required for mire development.

(4) As far as vegetation is concerned, four main mire types can be distinguished, viz. sedge/reed, hardwood forest, Raphia palm and mangrove mires.

(5) South African peats are true peat in rank, ashy in grade and hemic to sapric in type with a decomposition range of 20 - 60 %. South African peats have on average an ash content of 23%; fixed carbon content of 21.8%; volatile matter of 43.7%; moisture content of 10.9% and calorific value of 14.7 MJ/kg. Sedge/reed peats tend to be perhydrous (rich in combustible hydrocarbons). It would also appear that South African peats are in most respects no different from other African peats.

(6) Peatland area is currently estimated at approximately one million ha, representing 0.8 % of the total land surface. Roughly 30 % is regarded as harvestable peatland, representing ± 5 580 x10^6 m^3 of peat.

(7) In mires some of the excess energy produced in the ecosystem is retained and accumulated as peat. Thus the entire system is gradually increasing its energy content as peat builds up. Given adequately high rainfall and/or permanent water levels, mires (notably reed/sedge mires) in southern Africa generate large volumes of plant matter annually with the potential to accrue much of this primary production in the peat layer, leading to significant recent accumulation rates of between 5 and 10 cm per year. By way of ^{14}C age calculations this translates to accumulation rates of between 0.75 mm and 108 mm per year for African peats.

(8) It is suggested that under a prudent and appropriate management schedule, South African sedge/reed peats represent a valuable renewable resource with wide application in agronomy and for rural small-scale energy supply. Sensitive utilisation of this resource may in fact alleviate the pressure on other finite natural resources in certain densely populated rural areas of southern Africa.

SAMEVATTING

Veen word reeds lank benut in verskeie tegnologiese prosesse, energie opwekking, landbou en chemiese toepassings. In Afrika het hierdie potensiëel belangrike hulpbron feitlik onaangeraak gebly. Op die oomblik is daar nie 'n groot verskeidenheid van veengebruike in Suid Afrika nie. Dit word egter 'n toenemend belangrike kommoditeit in die daaglikse lewens van baie Suid-Afrikaners, veral in die landbou- en tuinbousektore.

Hierdie ondersoek van gesellekteerde "tipe" veenafsettings in Suid-Afrika het as oogmerk gedhad: (1) om die omvang en voorkoms te bepaal van veen en veenlande in Suid-Afrika; (2) om die sedimentologie en palaeo-ekologie van veen te bestudeer; (3) om 'n basis te skep vir die karakterisering van veen tipes; (4) om veenlande te klassifiseer; (5) om sekere bestuursaspekte te bepaal. Vir hierdie doeleindes word gepoog in hierdie dissertasie om veen in Suid-Afrika te ondersoek en te karakteriseer in terme van geomorfologiese, botaniese, fisiese, chemiese en petrologiese eienskappe. Voor hierdie ondersoek is geen diepte studie van Suid-Afrikaanse veen nog onderneem nie.

Die volgende is enkele van die meer belangrike resultate wat gevloei het uit hierdie studie:

(1) Onder gunstige omstandighede kom veenlande in Suid-Afrika in 'n wye verskeidenheid van klimaattipes voor. Veenlande van sosio-ekonomiese belang neig egter om in sekere breë geomorfologiese omgewings in die oostelike hoër reënvalstreke van die land voor te kom. Uitgestrekte laagland, primêre veenlande in droër sub-tropiese en tropiese gebiede is beperk tot deltaïese en estuariene posisies wat vermeng met manglietmoerasse naby die kus. Waar reënval hoër is reik veenlande verder stroom-op en binnelands in mere, tussen duine en ander laagliggende komme.

(2) Koeler, vogtiger streke bevorder veenvorming in 'n wyer reeks van komtipes, in die volgorde, estuarien/deltaïes, rivier vloedvlakte, oop mere, geslote mere, valeihoofde en fonteine.

(3) Die geomorfologiese uiting van die geologie van 'n omgewing is uiters belangrik vir veenakumulasie aangesien dit primêr verantwoordelik is vir die ontstaan van veenlande.

(4) In terme van tipiese plantegroei word vier hoof-groepe onderskei, naamlik riet/biesie, moeras-bos, Raphia palm en manglietmoeras.

(5) Suid-Afrikaanse veen is in rang egte veen, asryk in graad en humies tot sapries in tipe met 'n ontbindingsgraad van 20 - 60 %. Suid-Afrikaanse veen het 'n gemiddelde as-inhoud van 23%; vastekoolstofinhoud van 21.8%; flugstofinhoud van 43.7%; voginhoud van 10.9% en hittewaarde van 14.7 MJ/kg. Riet/biesieveen neig om perhydries (ryk aan ontbrandbare koolwaterstowwe) te wees. Dit blyk dat Suid-Afrikaanse veen in meeste aspekte nie verskil van dié elders in Afrika nie.

(6) Veenland opervlakte word tans geskat op ongeveer een miljoen hektaar, wat 0.8 % van die totale landsoppervlakte verteenwoordig. Hiervan word 30 % (± 5 580 x 10^6 m^3 veen) gereken as oesbare veenland.

(7) In veenlande word 'n gedeelte van die oortollige energie wat in die ekosisteem geproduseer word geakumuleer as veen. Die hele sisteem verhoog dus gaandeweg sy energie-inhoud soos wat veen opbou. Gegewe genoegsame hoë reënval en/of permanente watervlakke, sal veenlande (veral riet/biesie vleilande) in suidelike Afrika jaarliks groot volumes plantmateriaal genereer met die potensiaal om 'n groot hoeveelheid van hierdie primêre produksie in die veenlaag te versamel, wat lei tot 'n beduidende resente akumulasie tempo wat wissel tussen 5 en 10 cm per jaar. Deur middel van ^{14}C ouderdom berekeninge lewer dit akkumulasie tempos van tussen 0.75 mm and 108 mm per jaar vir Afrika veen.

(8) Dit word voorgestel dat onder 'n oordeelkundige en toepaslike bestuurstelsel Suid-Afrikaanse riet/biesie-veen 'n waardevolle hernieubare hulpbron verteenwoordig met wye toepassing in agronomie en vir landelike klein-skaal energiebehoeftes. Sensitiewe benutting van hierdie hulpbron kan inderwaarheid die druk op ander beperkte natuurlike hulpbronne in sekere digbevolkte landelike gebiede van suidelike Afrika help verlig.