

PEATY AND PEAT SOILS OF WAIPA COUNTY.

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The **object** of this paper is to record a few observations on the **peaty** and peat soils of the Waipa County.

The -largest area of peat and peaty soils is that in the **area known** as Komakorau swamp which is about 13 miles long and **about 8 miles broad**. No detailed mapping has been attempted in this case but the writers have visited many localities on it of roughly equal area **Moana** Tua Tua and Ruhuhia swamps covering 18,000 and 17,000 acres respectively. Other swamps are those extending from **Te Rapa** west to **Te Kowhai** and that lying on both sides of the **Whatawhata-Frankton** Road. There are as well numerous small areas of 100 acres or so. The peats and peaty soils cover **flattish** areas which became badly drained during the time the **Waikato** and Waipa rivers were **changing** their courses in the Waikato lowlands. Contours **made** by the Lands and Survey Department show that in the case of Ruhuhia and **Komakorau** the old surface on which **these** organic deposits rest is not by any means flat. The old **surface** under Ruhuhia slopes to the **North** and under Komakorau to the North-west. Apparently **then**, at least, in these two **cases**, the **whole** of the area now covered with peat was not swampy **following** the blockage of drainage by the river sediments. Badly drained conditions at the northern end of Ruhuhia and Komakorau **allowed** the peaty and peat soils to develop and the peat gradually extended southward owing to drainage conditions becoming progressively worse.

Classification.

The **peaty** and peat soils are divided into four main series, :-

1. **KAIPAKI** LOAMY PEAT, SANDY PEAT, PEATY LOAM AND PEATY SAND;  
(33,000 acres).
2. **TE RAPA** PEATY SAND AND PEATY LOAM (6,000 acres).
3. **RUHUHIA** PEAT (52,000 acres).
4. **MOANA TUA TUA** PEAT.

The soils of the Kaipaki and **Te Rapa** series occur on the margin **of** the big swamps and comprise the whole of the smaller swamps. Ruhuhia peat occupies the central **portion** of Komakorau, Ruhuhia and Whatawhata Road Swamps and a large part of the **Moana** Tua Tua swamp. **Moana** Tua Tua peat occurs in only one area - the **central** part of the swamp of that name.

(1) The Kaipaki series **cover** a considerable area in the **Kaipaki** district, along with the **Te Rapa** series forming a belt about one mile and a half wide bordering Ruhuhia peats. On the margin of Ruhuhia swamp, the belt **of** Kaipaki series is in general **only** about 20 chains wide except in the wide arm east of **Ngahine-pouri** where the whole area is **occupied** by this series. **B u t** probably **the** largest area of this series occurs in the margin of Komakorau swamp.

-The Kaipaki soils in many localities supported a forest vegetation, in which Kahikatea was abundant. The profile is:-

4-9 in. loamy peat, sandy peat, peaty loam or sand.  
on peaty loam or loamy peat.

The **topsoil** to a depth of 9 inches or so, is, except in the Winter and Spring, dry and powdery, resembling **somewhat** the structure of a fine sand. Those that are loamy show also a certain amount **of** crumb structure. The topsoil is usually a **dark** grey or **dark brown**. After repeated burnings it is a pinkish or cream **sand**

or silt loam, The subsoil, brown in colour has for a depth of a foot or so a nutty structure and is poorly consolidated. Cracks which have 'opened' several inches are common, The total depth of peaty soil and subsoil lying on ordinary sands and clays is generally not more than 3 feet.

(2) The Te Rapa Soil, though peaty, is in reality a meadow soil. In the Waipa County, it occurs chiefly in the Te Rapa and Kaipaki districts, lying between the Kaipaki soils and the higher flats running in narrow strips through the Kaipaki soils. The largest area, however, occurs on the southern and eastern margin of Komakorau swamp, The vegetation on it was similar to that on the Kaipaki soils.

The profile is:-

9 ins. dark grey peaty sand or peaty loam  
on buff to light brown sands or sandy loam.

The topsoil except in winter and spring is dry and powdery.. 'Its subsoil in most localities dries out in summer, but unlike the Kaipaki subsoil remains compact.

(3) Ruhuhia peat occurs chiefly in the central-portions of the big swamp. The vegetation is mainly manuka and rushes. A profile in the Ruhuhia swamp shows:-

1 in'. grey sands,  
on fibrous brown peat.

A field examination of the peat suggests that rushes and manuka twigs are its principal constituents.

(4) Moana Tua Tua peat is formed from grey moss, The ground water level on this type is almost at the surface.

#### Moisture.

The peaty soils do not behave like ordinary soils as regards their moisture,, statue throughout the year, During the dry weather of last December, the peaty soils began to dry out, but judged by the pastures, not to the same extent as do the Hamilton clay loam and Horotiu sandy loam. At the end of, the dry spell - in early February, - these soils were dry and powdery to about 12 ins, below the surface and the pastures fairly badly wilted, but, in many cases, not so much as those in the Hamilton clay loam and Horotiu sandy loam. With the rain in February, the soils became wet only to an inch or so from the surface. This condition of the soil continued even into the month of May. Late in June, the soils were becoming moist and the pastures showing their first decided response of this year. Thus the peaty soils take a very long time to moisten and it is only in late Winter and Spring that they really contain a good supply of moisture,

A study of peaty soils leads to the conclusion that in them, as indeed on all soils, right moisture conditions are most important. The peaty lands in their natural state are saturated with moisture, some of which must be removed before pastures can be established, If, however, they are drained deeply, the peat dries into a powdery or rubbly mass which will not readily take up moisture again. Throughout the Waikato are large areas of peat which may be described as slightly over-drained. On these are found a surface skin of 4-5 ins. of consolidated peat separated from the moist peat below by a layer of dry powdery or rubbly peat 12-14 ins, thick, The pasture shows the effects of this. Rye and clover remains only in the hollows and the Fog is stunted and spindly, What has happened is that drainage has proceeded faster than consolidation. The dry powdery layer would not have been formed had

- (1) Consolidation been greater; or
- (2) Had the drying out been slower,

Enquiry needs to be made into the practical aspect of controlling drainage on peat lands so that consolidation may keep pace with it.

The advisability- of sowing pastures on peaty soils in the Spring should, also be considered, In Spring, the peats are warming and are slowly parting with their moisture.. In Autumn, however, the soils are in the process of re-wetting and are cooling down. In many localities, there seems better chance of a pasture being successfully established in Spring than in the Autumn, though it must be said that there are some difficulties, notably the growth of sorrel.

#### Pastures.

The pastures on the peaty soils are generally poor when compared with those growing on the other soils of the County. They show a fairly close relation to the percentage of mineral matter in the soil, the better pastures being found on the Te Rapa and Kaipaki peaty loams. Poorer pastures are found on the Kaipaki loamy peats and still poorer ones on the Ruhuh'ia peats. To obtain some exact data on the pastures, field analyses were made - 25 point and 43 estimated analyses. Most of the pastures on Te Rapa soils contain only a low proportion of rye-grass and all examined are low in white clover, Paspalum, Yorkshire Fog and Brown top form a large proportion of the sward on most fields. During the dry summer spell the clover content was very low, and there was little sign of its recovery with the autumn rains. The main increase in autumn growth on many of the pastures was in the fog and brown top. Farmers state that the pastures do not quickly show the signs of dry weather, but once they are affected they are slow to recover.

The pastures of the Kaipaki soils resemble those of the Te Rapa series; but they vary greatly with the actual soil life and with field conditions - notably drainage. Some good long established pastures of rye and white clover and paspalum are to be seen on the Kaipaki peaty loams but on the loamy peats, although good rye-clover pastures can be sown down, few last longer than two years under present methods of treatment.. After a few years on most fields the rye and clover disappears from all but the lowest hollows, the fog becomes tufted and spindly and brown top takes charge. The average composition of some fairly good pastures in this type is shown on Table 1. Table 11 shows the seasonal change in pasture composition on a fairly good field situated on Kaipaki loamy peat. This is typical of the change that goes on in the Kaipaki and Te Rapa peaty soils. Clover is reduced very much in the dry weather and when the rains come in February the bare spaces are filled up with weeds.

T A B L E 1 .

AVERAGE OF 7 POINT ANALYSES-OF FAIRLY GOOD PASTURES ON KAIPAKI SOILS IN EARLY SUMMER.

RYE GRASS	16.2 per cent.,
PASPALUM	10 .5 " "
YORKSHIRE FOG	14.5 " "
BROWN TOP	17 .4 " "
SWEET VERNAL	5.4 " "
WHITE CLOVER	12.6 " "
LOTUS MAJOR ETC.	6 .3 " "
WEEDS	14 .0 " "

TABLE 11.

SEASONAL CHANGE IN PASTURE COMPOSITION ON A FAIRLY GOOD  
FIELD ON KAPAKI LOAMY PEAT.

	<u>5th DECEMBER:</u>	<u>13th FEBRUARY;</u>	<u>27th APRIL.</u>
RYE GRASS	16 per cent	9	17
FOG	22	23	22
WHITE CLOVER	10	1	5
WEEDS	24	56	39

All observations on the peaty soils go to show that clover suffers much more than the grasses when there is a shortage of moisture in the soil. It was noticed also that on the dry hummocks, the clover, besides making up only a small percentage of the pasture, has small leaves, whereas that on similar soil in the damp hollows forms a greater percentage of the pasture and has much bigger leaves.

Plant Food.

The Kaipaki and Te Rapa Soils are well supplied with available phosphoric acid, the amounts being unusually well above those in the mineral soils which have had similar manuring. In the case of a Kaipaki soil at Ohaupo manured with 4 cwt. of super for several years, the figure is outstandingly high 0.133%. A pinkish ash which had very little top-dressing has 0.072 per cent. The lowest figure obtained was 0.026 per cent on a paddock put into pasture 8 years ago and topdressed each year with 2 cwt. of super.

Even in this soil the phosphate is perhaps not on the low side. This evidence suggests that high phosphate dressings are not required on the Kaipaki and Te Rapa soils but the actual position can only be determined by field trials. The peaty soils are not markedly acid; they are in general somewhat more acid than the mineral soils, but the pH is in some instances above that of individual mineral soils.

Need for further research.

Peats and peaty soils occupy somewhat less than half of the Waikato lowland, large areas lying close to the towns and the railways. After several attempts to farm them, many areas of these soils have been abandoned. Other areas are still being farmed but, on the whole, the results are unsatisfactory. Further attempts to develop the peats are continually being made and much money and human effort is thus spent. This primitive and uneconomical way of gaining knowledge should be replaced by organised enquiry which could speedily add much to our knowledge, regarding the control of the moisture and the methods of fertilising on these soils. Sufficient evidence has been given to show the importance of these questions.

Were the possibilities and limitations of the various peaty soils definitely known, great benefit would be conferred on the Waikato district.

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