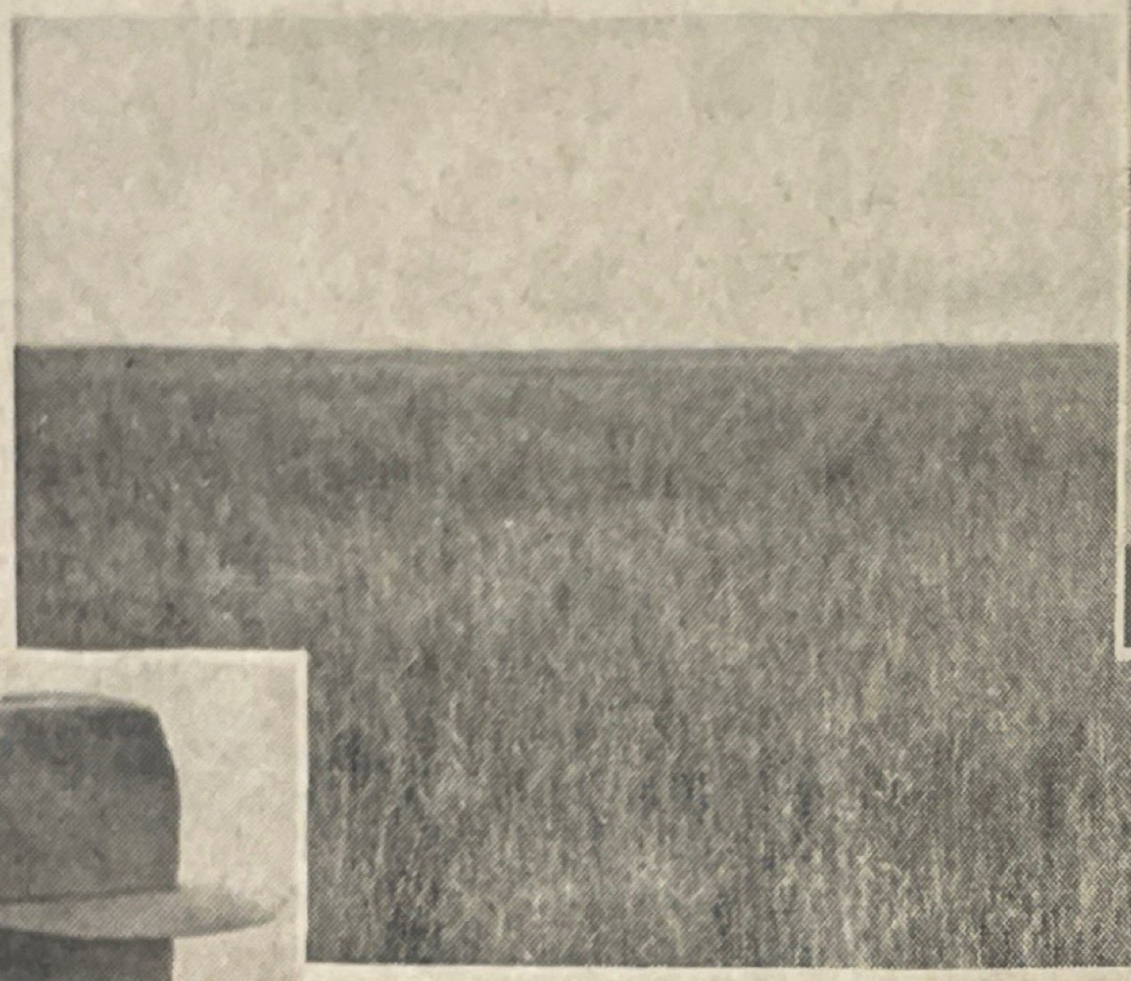
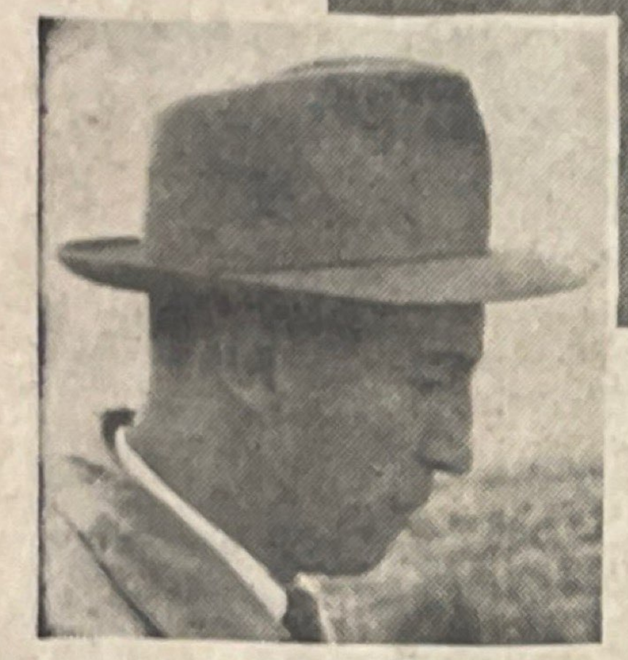
FARMING ON PEAT





Mr. F. Van der Elst

There are hundreds of dairyfarms in this country with hardly an acre of soil in sight—the nearest soil is anywhere between one and fifty feet below the surface under a layer of peat. And peat is most definitely not soil, but rather a form of humus. Understandably, it requires specialised treatment and management, but this peat country, which not many years ago was considered hopeless for dairying, is now providing good prospects for high dairying production. This advance in potential is the result of research by officers of the Soil Research station at Rukuhia, particularly Mr I. L. Elliott, now Superintendent, in the early stages, and more recently Mr Frank Van der Elst, and of experience gained and shared by progressive dairymen over the years.

Dead flat land carrying mos and stunted rushes and fern— this is typical of the peat cou try about Hamilton which has s far not been touched. Th spongy moss which forms th top layer of peat can be see in the upper picture. It is unde composed material, largely dea moss, with roots of the plan growing on top throughout it. In this state it is useless.

by D. K. Yerex

SUMMARY—

There are about 200,000 acres of peat in New Zealand.

Some of this has been brought into production; the remainder could be turned to dairying if developed correctly.

Although peat country is usually cheap the costs of development in the early stages are high.

Correct drainage is the first essential—overdrained peat is no better than water-logged peat.

Pastures require renewing regularly to maintain the process of decomposition.

Peat bogs differ according to the stage of development of the peat—the ash-content of the peat is the best guide to its dairying potential.

Developed correctly and farmed properly, peat country has a good dairying potential.

Management techniques used on mineral soils often do not apply on peat.

THE biggest single block of peat is on the Hauraki Plains, where there are estimated to be about 60,000 acres. In the Waikato there are a number of small areas totalling approximately 25,000 acres, and there are smaller areas in Northland and, in fact, in most parts of the country, the total acreage of peat being estimated at about 200,000 acres.

Slow Build-up

PEAT is formed by the accumulation of vegetative matter in undrained areas over a long period of time. The process starts as an accumulation of organic matter in areas with poor drainage, the bottom layers often containing heavy timber from trees that died through lack of drainage. Successive layers of vegetation add to the growing bed of peat, each stage of growth being poorer than the previous one, until the final layers of peat are species that can survive in the wet, acid conditions.

Dome-like

THESE formations have usually the appearance of a large dome, which may be several miles across. The organic matter at the edges of the peat swamp is more subject to decomposition, because the micro-organisms which cause the decomposition are more active at the edges where fertility is higher, owing to the admixture of mineral matter from the adjacent mineral soil.

In the central portions of the raised bogs, natural drainage is poor. The water-table is practically at the surface all the year round and the organic matter accumulates.

This process of accumulation of organic matter can be stopped and converted into decomposition by drainage, as can happen to a silage stack once it is opened up.

Over-drainage, on the other hand, will result in direct drying out of the organic matter without giving it time to decompose. This would leave the farmer with unproductive peat, and should be avoided.

Necessary Conditions

THE aim in farming peat shou be to create conditions where slow decomposition takes pla evenly over the whole area. Th process is regulated by a numb of factors:

(a) The depth of the water-tab below the surface (should b 12 to 24 inches);
(b) The water-content of the pe (the soil should be moist, n soaking wet and not bone dry
(c) The temperature (decompos tion is greatest during summ with high soil temperatures, a this causes the micro-organism to be more active);
(d) The fertility level of the so (high fertility will promo greater activity of soil organ ism).

Slow Burning

DECOMPOSITION of peat is sim ilar to slow-burning and result

tent of the peat. To measure the ash-content of a particular peat a certain quantity, say 100 grams, is burned, and the residual ash weighed. It has been found that the percentage of ash varies widely for the different types of peat. Fibrous, undecomposed peat contains approximately 10 per cent of ash, while well decomposed peat soils, which are often classified as peaty loams or loamy peats, contain up to 50 per cent of ash.

Peat Classification

PEAT soils could be classified according to their ash-content; the lower the ash-content the quicker the soil will subside when drained. Peat with an ash-content of 10 per cent subsides at a rate of 2 to 3 inches per year, but the rate of subsidence is reduced in proportion to the increase of the ash content. Peat soils with an ash-content of 40 per cent, for example, sink only approximately ½ inch per year. This all depends, of course, on the water-table. Deep drainage gives quicker subsidence than where a high water table is maintained.

Guide To Value

THE above figures are for peat soils with the water-table at 2 feet during the major part of the year. Not only is the ash-content a guide to the rate of subsidence that can be expected, but it also indicates the possible use that can be made of such soils.

Soft, fibrous, undecomposed peats with a low ash-content of 10 per cent are not suitable to carry heavy stock and heavy machinery during the major part of the year, and have therefore to be grazed by sheep till the surface has become firm enough or sufficiently consolidated to carry heavier stock.

Soils with a high ash-content can be used for carrying dairy cows almost immediately, provided of course, the water level is kept at 2 feet.

Soils with an ash-content of 20 per cent can carry dairy cows for the major part of the year, but extra attention has to be paid to providing ample silage and hay, as winter and early spring production on such soils is often poor.

Sheep Easier

REALLY "raw" peat is usually best brought in with sheep, since they do not require maximum pasture growth as early in the spring as the dairy herd, and are not so severely hit by dry conditions in late summer. Once the peat has started to settle down, however, it can make excellent dairying country, as subsequent reference to two farms will show.

Starter

SINCE peat is undecomposed vegetable matter its conversion to soil status is achieved by giving bacteria a chance to start the decomposition process. This is impossible where the peat is waterlogged, so drainage is essential. Unfortunately, however, bacterial action will not take place if the peat is completely dry. And very dry peat can become impervious to water, so that [illegible] of the water-table can the peat. Thus, the farmer with an undrained area is no worse off than a farmer with an over-drained area. The first can put in drains and get the water out, the second can possibly put a fire through to lower his peat closer to the water table.

Sweeter Soil

GRASS growth and vigorous bacterial activity both require non-acid soil, but peat is very acid. Lime is essential. Not only that, but the pasture roots will not go down unless the lime is down there. Deep-working of the lime is therefore necessary, not only to increase the depth of bacterial activity and decomposition, but also to get deep-rooted pasture that will better withstand the dry summer conditions.

On very soft peat, however, it is not often possible to get anything to pull a plough, and the rotary hoe becomes the only possible implement—since it churns backwards it helps to push the tractor instead of holding it back.

Shrinkage

HAVING got the lime into the soil, and also the fertiliser needed to feed the pasture, decomposition will begin to take place and the top 9 inches in which the pH has been raised, to say 5, will begin to shrink. In about five years, therefore, the top 9 inches will have become about 3 inches, but the lime will be still contained only in this level. Pasture rooted in 3 inches of peat will not withstand dry spells, and it therefore becomes necessary to tear up the pasture and work lime down again to a depth of about 9 inches.

Another good reason for reworking pastures after four or five years is that the surface settles unevenly and the pasture becomes very bumpy—water runs off the hummocks so quickly that they become bare and useless. Also, as only Yorkshire fog, sorrel and a little white clover are likely to survive during the dry summer, the pasture soon reverts to poor species.

Peculiarities

THESE peculiarities of peat lead to the formulation of a general-

On the over-drained type of peat referred to in later pages preparation of a seed-bed is a major problem, and an unpleasant one as this view of a crawler lost in a dust-cloud of its own making clearly shows.

As peat tends to be water-logged for considerable periods of the year, especially in the early stages of development, rushes can be an added hazard. Mr Van der Elst, and many farmers with the same problem, have in the past relied on frequent cutting. However, even with seven cuts a year the rushes are only kept in abeyance, and frequent cutting is not popular. Now at last Mr Van der Elst has found a method which appears to be highly successful in completely eliminating rushes. Using a spot-o-matic sprayer and about double or treble the rate of 2-4-D recommended by the makers, he has achieved remarkable results, as is shown in the above photograph.

Further investigations to determine more fully the rates to be used at the different stages of growth will be carried out.

creased the cost of control, complete — or almost complete — elimination of rushes is much cheaper than spraying every year or so. Also, with the spot-o-matic equipment the amount used is much less, even at the much heavier concentration, than complete spraying of the paddock, since on most paddocks the rushes cover only about 15 per cent of the area.

The best procedure is to cut the rushes first, let the regrowth come away to about 9 to 12 inches, and then spray.

At the normal rate of application, Mr Van der Elst believes, spraying only frightens the rushes. Another factor is that poor cultivation of peat merely chops rush roots up into hundreds of cuttings, so that they come back again much worse than before, whereas deep cultivation buries a large propor-

Two tons of lime when putting new grass down are recommended for peat. But additional dressings in subsequent years are of no apparent benefit once the pH is raised to 5. Best results are achieved by waiting until the next regrassing and then adding lime to reduce the acidity of peat brought to the surface by cultivation.

ised plan of action of bringing rough peat country to good dairying pasture.

Surface drainage must be provided to get rid of the bulk of the water in the peat without making it too dry. Lime must be worked well down into the peat to get pasture species deeply rooted, and to provide a maximum level of decomposition. Fertiliser must also be provided in adequate quantities to allow for vigorous pasture, as with any newly-developed land. Pastures must be renewed frequently during the early years to maintain the decomposition process.

The first sowing down of a peat pasture can be considered as a temporary sward as it has to be renewed after approximately 5 years. The second sowing is more permanent as the soil has become more stable and decomposes at a slower rate.

These pastures will still have a tendency to revert back to poorer species but the process can be slowed down considerably by good management. A number of trials have been laid down to investigate ways and means of maintaining productive pastures. Water control, deep liming prior to sowing down, and bringing lime down in an existing pasture, together with oversowing, are some of the systems under investigation.

Major And Minor Elements

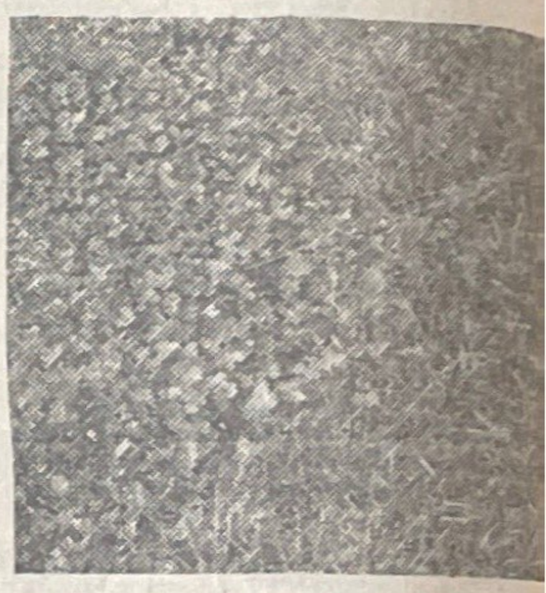
IN addition to lime, peat requires all the nutrients necessary for vigorous pasture growth—phosphate in liberal quantities and potash as appears necessary from test rea Practically all peat also requ applications of copper, in the e years, to assist in the estab ment of pastures and, as this gresses, for stock health. Two of copperised potassic super (o lb bluestone per acre) should fice as far as copper is concer

Heavy annual dressings of p phate (5 cwt per acre) are rec mended during the first years a development, till the soil phosp reserves become adequate, a which maintenance dressings o to 4 cwt are sufficient. At Ruku after 7-8 years of heavy topdres the phosphate level of a padd has been raised to a level of on soil test. This paddock has excellent production of 12,000 lb dry matter per annum, and Van der Elst believes that this be maintained with a dressing 3 cwt of phosphate annually.

Potash dressings of 1 cwt nually seem to be enough during the early stages of develo ment.

It is also advisable to apply ph phate and potash only when gro ing conditions are favourable a the pasture can make immedia use of the fertiliser applied.

Peat that has not decompose much may also require molybdenu and at Rukuhia startling resul have been achieved with molyb super dressings, especially in ter



of clover establishment which ha in turn, produced good rye pastur However, advice on the prope amounts of molybdenum is essentia as too much molybdenum ca cause more trouble than it wil cure.

Drainage Techniques

EXPERIENCE has changed Ruku hia's original recommendation on drainage, since it has been found that deep drains between 10 and 20 chains apart tend to create mounds in the pasture—the peat nearest the drains sinks more rapidly than that in the middle and, as a result, to give very uneven pasture growth. The next recommendation was shallow drains put in by a ditch plough about two to five chains apart. These had the soil banked up on either side and sheep tended to camp there, with the result many lambs were lost in the drain.

It has now been found that the "hump-and-hollow" system of drainage is most satisfactory. Using a

blade, or a peat ditcher such as that shown in this month's "Exporter's Enquiring Camera," the pasture is divided by shallow drains about a chain apart, so that the very gradual mounds which form can be negotiated by a tractor and mower. Also, the top of the mound – not at a great height from the water table. A very big benefit is that these drains can be put in by the farmer himself without calling in a contractor, and they are very easy to maintain.

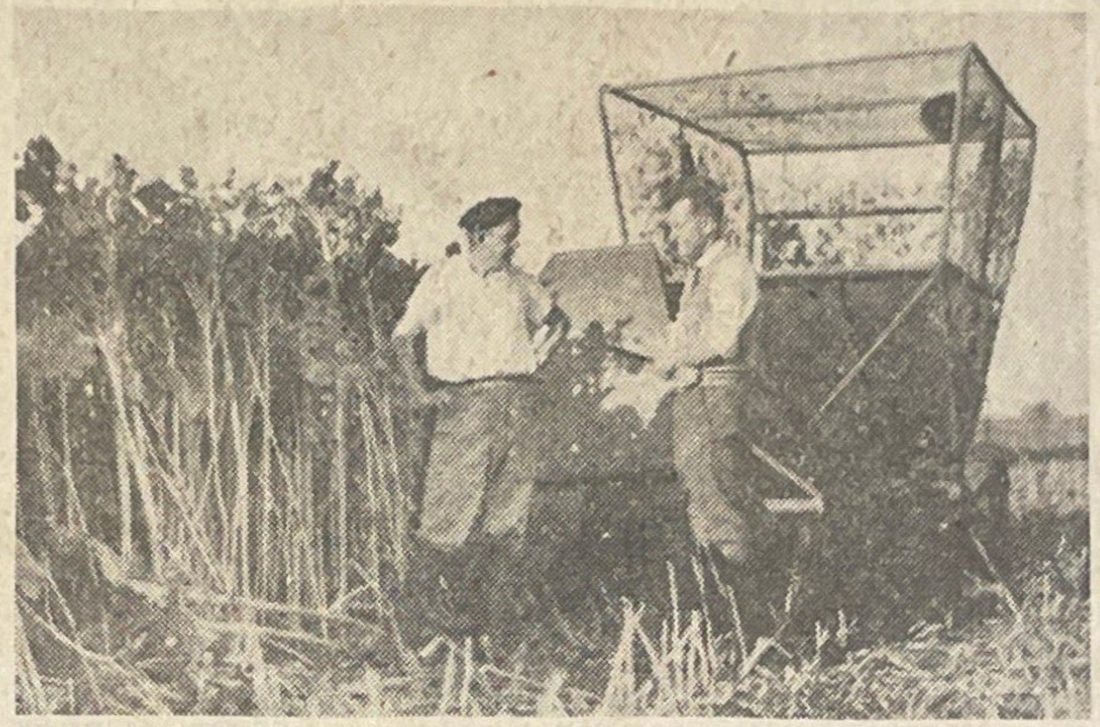
Practical Endorsement

THESE are the practical principles which Mr Van der Elst has proposed for dairyfarmers on peat, as a result of the work he has done himself at Rukuhia. Farmers on the peat country around Hamilton endorse these findings and add further details from their own success stories.

In one experiment where Mr Van der Elst lifted the sod from an area of old pasture and worked lime down two feet into the peat before replacing the turf, it was estimated that per-acre yield of the trial area was 11,000 lb Dry Matter as compared with 7,000 lb D.M. from the untouched pasture. The greatest benefit was in summer production, when the pasture over the worked-in lime outyielded the control area by two or three times as much. Deep liming will also give a longer life to a peat pasture as grasses with a deep root system can withstand dry summer condition.

Plough, & Plough Again

Mr Vaughan Jones farms 150 acres of peat on the Piako Road outside Hamilton. In his first season in 1955-56 he did 3,600 lb fat, but last season, with 115 acres in grass (4-acre paddocks) and 74 cows in milk, he reached 21,000 lb fat. The original story of his success in this venture was published in the "Exporter" (June, 1959), but his additional experience brings to light many important factors relevant to successful dairying on peat country.



Vaughan Jones has reason to be proud of this crop as he explains the value of cropping in the re-grassing rotation to C.O. Peter Hildreth.

SUMMARY

- Mr Vaughan Jones farms 150 acres of peat land.
- In six years he has lifted production from 3,600 lb fat to 21,000 lb fat.
- Pastures have been regularly renewed but maintain high production longer each time.
- The most decomposed peat area gives best winter production.
- Good cultivation methods make development work on peat much easier.

PEAT, states Mr Jones, cannot be treated like mineral soils. The farmer going on to a peat block—and probably getting the land cheaply in comparison with other land—must be prepared to tear up his pastures fairly frequently and to take a good deal of trouble with sowing crops and subsequent new grass.

The object of the exercise is to get undecomposed peat from the lower layers up to the surface and to work the lime down. This not only gives new pastures a chance to root deeply, but also maintains the process of decomposition. If left, the old pastures will revert to poor species and suffer severely from dry spells. After four to seven years, depending on thoroughness of cultivation and management, pastures put in on "raw" peat will be due for renewal. Subsequent pastures last longer.

Old Peat For Winter

A PORTION of Mr Jones' farm that was put into grass about 15 years ago, and regrassed by him, now gives good winter production, so that he is in a position to advance calving in the coming season. Mr Jones has been cropping and regrassing 12 acres each year and has also grassed 20 acres of raw peat so that with the increased area in grass—only 30 of the 150 acres remains to be brought in—he will now put this up to 16 acres a year to maintain the "cycle".

Topdressing

NEW grass gets two tons of lime to the acre, but no more is [illegible] the pasture is re-worked. New pasture also receives 5 cwt per acre of 30 per cent potassic super in the autumn when sown, and another 5 cwt in early spring.

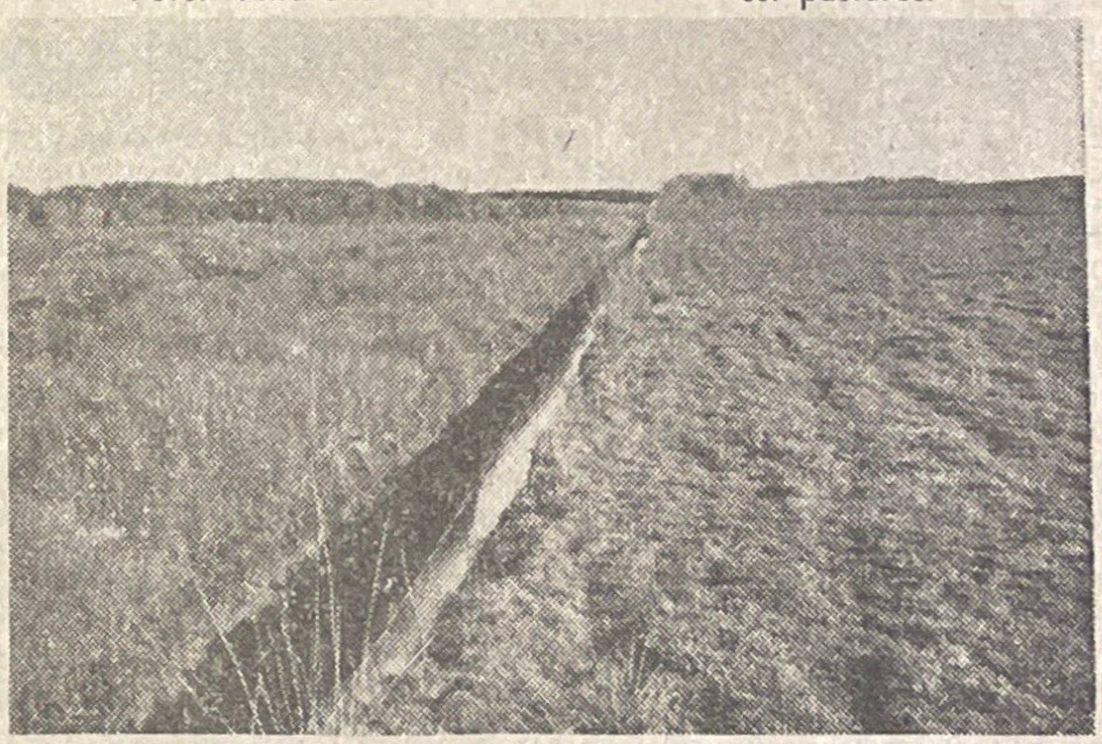
Any new grass in which the rye grass starts to go yellow may get a quick boost in the form of 1½ cwt of nitrogenous fertiliser applied in June and again in August if necessary. It then grows so well that the heavy stocking which becomes necessary builds up fertility quickly and helps establish a good pasture.

This has been so effective that Mr Jones considers it worth the additional cost. First trials with 1 cwt of nitrogen were not successful but the additional half cwt made all the difference. New grass on "raw" peat is quite remarkable—it contains a good balance of rye—and would look excellent on the most fertile soils.

Mr Van der Elst is of the opinion that topdressing in early spring is less effective on very wet peat soils as leaching and fixation can occur under these conditions, and the pasture plants are less capable of making direct use of the fertilisers. In his opinion it would be better to wait until late October when spring growth has started and when the sward can make immediate use of the fertiliser applied.

Mr Jones is concerned to get growth at the right time of the year for feeding a dairy herd, rather than total volume of grass, and has found that early spring dressings are beneficial, especially on new grass.

As winter growth is the limiting factor on peat, he topdresses the whole farm in the autumn.



A county drain divides "raw' peat from Vaughan Jones' newest pastures.

Working Up Peat

IN Mr Jones' view a rotary hoe is essential to farming on peat. A plough is required to get down into the undecomposed peat—say 15 inches at least—but the rotary hoe is necessary for breaking up the turf and later breaking up the peat brought up from the lower levels, as well as for thoroughly mixing in the lime.

The first area Mr Jones brought in was done with a mole board plough which got down about eight inches. Then a disc plough was used which got about 13 inches into the peat. But now, with a chisel plough, he can bring "raw" peat up from a depth of about 20 inches. It aerates the peat, has a levelling effect, and eliminates the problem of having one wheel in the soft furrow.

No crops are grown on raw, undeveloped peat, but only on peat that has been in pasture for at least three years.

To prepare an area for grass from raw peat in scrub, Mr Jones first of all runs over it with the

rotary hoe to chop up the surface about 18 months prior to sowing. The surface material is then burned, with appropriate precautions, and 12 months before sowing the area gets another cut over with the rotary hoe.

When the area is dry in the summer prior to sowing, two tons of lime are applied to the acre, and the area ploughed with the chisel plough—about three diagonal runs being made. The area is then rotary hoed again, this time as deep as possible, and finally run over with the leveller and rollers until a good seed bed is established.

Grass is sown in the autumn at about 20 lb to the acre with 7 cwt of 30 per cent potassic super.

To prepare an area for crop, 2 tons of lime per acre are applied one month before sowing, followed by a hoeing, 3 chisel ploughings, and a deep hoeing. The area is then levelled and rolled two or three times before sowing.

The same procedure is followed in regrassing the crop area, except that no more lime is used.

Drainage

DRAINAGE is a problem. On Mr Jones' farm a deep drainage board drain bisects the farm and paddocks close to this are over-drained and liable to bare-out in the summer. The "hump-and-hollow" system of drainage is effective in removing surface water without reducing the water-table, and to achieve this Mr Jones took time out from his farming duties to invent a machine capable of doing the job quickly and efficiently. This machine is described in our "Exporters Enquiring Camera" feature in this issue.

Mr Jones suggested that if the main drains in peat areas were made wider, instead of deeper, to take flood waters, overdraining would not occur so frequently.

Management

IN the coming season Mr Jones expects to have about 90 cows in milk, and, if the season is normal, will undoubtedly reach close on 27,000 lb fat. To feed a herd of this size Mr Jones has evolved a system of balancing feed requirements with pasture development needs.

By boosting his rye grass along in new pasture he gets good winter growth which he can graze to augment winter crop, and good spring and autumn growth which he can conserve. He has a small area of clay hill which pugs (consolidated peat does not) and the stock are wintered mainly on the peat paddock next to be cropped. The problem of the summer dry spell is overcome by the use of the crop which, in turn, is essential for the renewal of a large area of grass each year. Since he has plenty of crop to feed the a reasonable cov and this ensures away quickly wit rains.

Adaptations to through shed wil with a "Produ which will make to handle the inc out much difficul

PEAT—

Big Problems And A Big Potential

Mr John Badger, as a partner in J. S. Badger & Sons, took on 270 acres of peat near Newstead, Hamilton, in mid-1956. In the intervening years Mr Badger has brought in 130 acres not in grass when he took over, and renewed about 100 of the 130 acres in grass at that time. In the first year a sharemilker on the farm pushed production from 9000 to 17,000 lb fat, and in succeeding years Mr Badger took it up to 18,500 lb, 27,000 lb, 36,000 lb and finally, last season, 40,000 lb fat from their 127-cow herd.

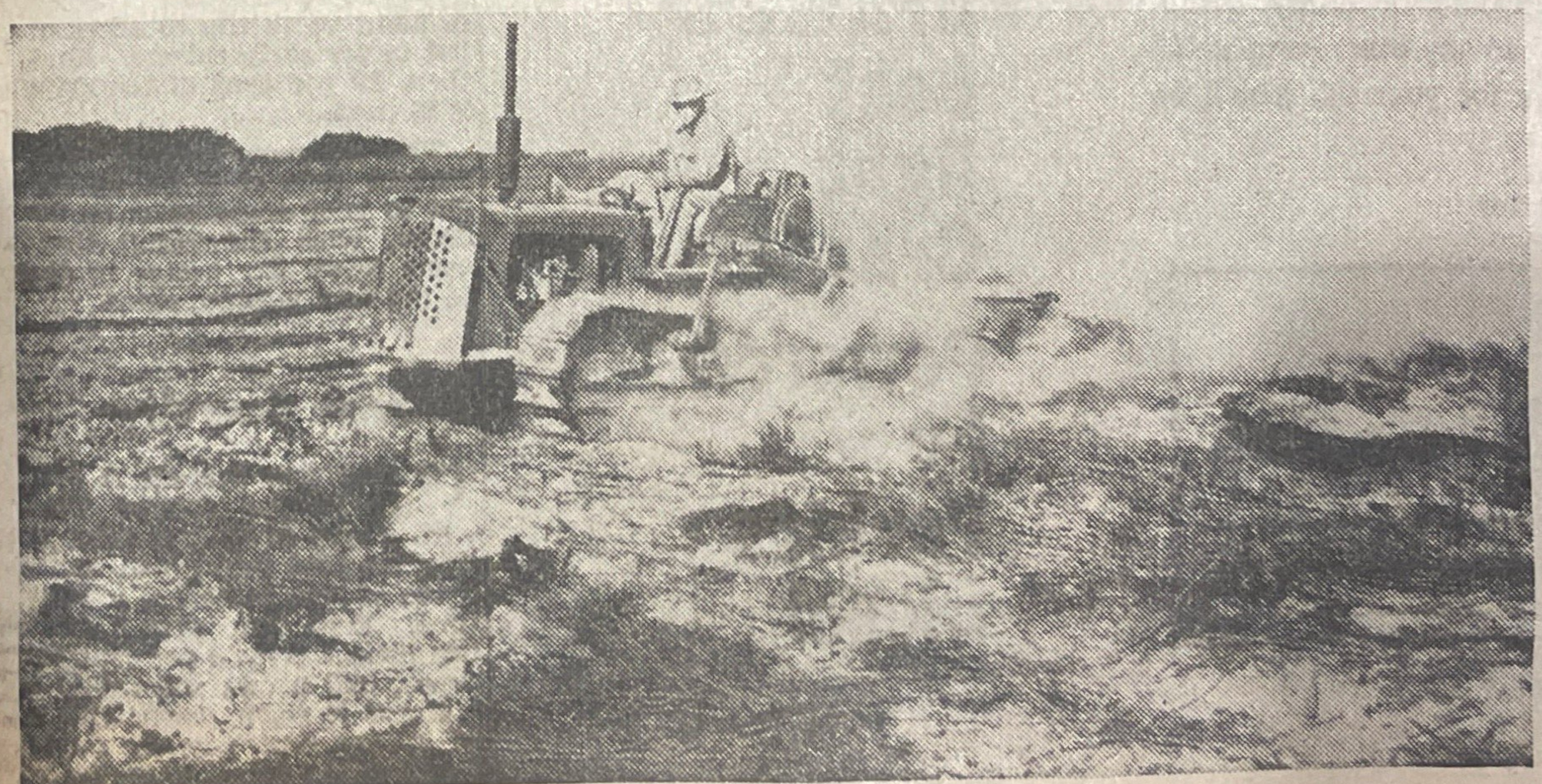
SUMMARY—

Mr John Badger's 270-acre peat farm has reached 40,000 lb fat output in five years.

Overdraining has created major problems on this farm.

Cropping is of great importance.

Development costs have been high but are beginning to pay off.



THE point phasises in dis
efforts is that t
on a block of
develop to a hi
production mus
capital into th
property. The
cheaper but wh
cost of the farr
able for the so
velopment work

The proper equ and liberal appli manure must b his first autumr Badger put in 45 most of it jus mixture, since he pasture as mere development of not expect it to well, but he doe most effective w ditions that will ture.

There are fou on this farm wh but not very pa from new grass

Cheap But

PEAT such a costs about which compares ably with any land. But lan only; top-dress bill, and consi

John Badger, a spaceman a dust-bowl o ing over-drie ing dust ma impossible ar to