TALK AND DEMONSTRATION ON FARM DRAINAGE.

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There is probably no more. profitable means of improving ths production of net country which is already equipped in ths matter of farm buildings and sub-division, than by draining it. The object of this talk and demonstration is to tell you something about the financial aspect of land drainage, to demonstrate the need and effects, to demonstrate: the use of modern machines for tile draining, and to give you some idea about the development of the College Farm itself as influenced by drainage.

The soil which comprises what is known as the Terrace portion of the College property is inclined to be clayey in character with a sub-soil sufficiently high in clay to make it very impervious when wetand to render it suitable. for mole draining.

There is much land similar to that on the. "Terrace" of the College Sheep Farm which is capable of considerable improvement. Large areas of such land are still in the original pasture sown down after the bush burn. In many cases, the "pastures" are not worthy of the name because rushes occupy a large proportion of the. ground surface, the balance being inferior pasture. Alternatively, the bush-burn pastures have been ploughed and resown in some cases but are still poor.?, Inadequate drainage- and the need for lime and phosphate. arc., in the main, responsible for their poorness.

The factors concerned in the improvement of the type. of country in question are best illustrated by a brief outline of the methods adopted at the College.

When the farm was taken over by the College in 1927, much of it had not been ploughed or drained. Some paddocks, however, had been ploughed with the fall in narrow lands having well defined feerings and finishes. The object in this case was to get surface, drainage, Such drainage as occurred proved entirely inadequate. however.

Stumps, logs, hummocks and hollows where trees had bee felled or stumps pulled out, and abundant rushes with poor ana weedy pasture between, were the main characteristics of the area.

Pending ploughing and re sowing, regular topdressing with phosphatic fertilisers (mainly superphosphate) was carried out at the.. rate or" 2 to 3 cwt. per acre per annum,

The procedure adopted in further improving this land was as follows:

Logs and stumps remaining were burnt. A preliminary and necessarily rough mole draining was carried out, the tractor being guided in some cases on a somewhat tortuous course', so as to avoid hummocks and hollows. Where. tiles were necessary to carry water from moles because of absence of suitable outfalls, they too were installed. Hummocks were ploughed, scooped or shovelled into the hollows. Ploughing with a swamp plough to' a depth of 9 inches and using a drag chain where necessary, to'bury rushes, was the next operation. This was followed by such cultivation as was required to prepare the ground for swedes (sometimes mangolds). A second forage crop, generally Chou Moellier, followed the swedes. This in turn was followed by oats for chaff, or temporary pasture. If oats were grown, the paddock was then sown in the Autumn to permanent pasture or temporary pasture.. Mole draining was carried out thoroughly (or moles plus tiles where the latter were necessary) when the pasture! was well established and provided ths preliminary drainage was not entirely satisfactory.

Liming was not resorted to as a rule until the permanent

pasture was being sown. Then, Ground Limestone. at 1 ton, plus 3 .. . of super per acre, was sown. Subsequent liming and manuring has in later years, followed a set plan as near as possible. This plan has entailed the use of lime at 5 cwt. per acre. and super or Basic Slag at 2 cwt. per acre every year after the initial 1 ton of. lime,. After 10 years of this, the soil should be tested for lime and a decision arrived at as to whether the treatment should be maintained or reduced.

Until the advent of certified grass and clover seeds and the realisation of the value of pasture topdressing, the country was laid down in what were virtually "short rotation" pastures. Browntop became. dominant and dogstail and sweet vernal were abundant in such pasture, largely because non persistent types of ryegrass and white clover, were sown. Since about 1934 nothing except certified grasses and clovers has been sown.

Prolonged cropping is difficult because of the high weed content of the soil and the tendency for it to "cake" easily when the organic matter associated with grassland farming bcomes reduced in amount consequent on cropping.

During cultivation for the crops which are grown, however, a considerable amount of levelling of the surface takes place, In recent years, a special leveller has been used with the object of leaving the surface smooth enough to ensue correct and continuous falls in mole drains. This levelling of places where the gradient is small is 'a mostimportant prerequisite to satisfactory mole draining.

The adoption of the practices outlined above has resulted in the carrying capacity of the land being increased from about 1½ sheep per acre to a winter carrying of about 5sheep (ewes) without the aid of supplementary fodder.

The Nutrition experiment which you will see, has for several winters carried between 5 and 6 ewes per acre during the winter months and there was always a slight excess of growth on limed pastures,

SUMMARY OF FOREGOING:

Draining, Liming, Phosphating and sowing to good permanent species of grasses and clovers and then managing them well, are, the dominant factors in the development of theland described.

It will be seen from the above account of the development of the portion of the College property in question, that although drainage: has not been responsible entirely for the improvement brought about,, it has been of primary importance. Without drainage the proper utilisation of pasture, grasses would have been impossible; the full exploitation of the benefits to be derived from liming and phosphating could not have been achieved, and production at the level to which it has been developed could not have materialised.

In view of the importance of drainage it is pertinent to ask' why there is so much land still in need of it? The reasons are as follows:

1. The country is very youthful and land development is necessarily still going on. Because land can be farmed, although -indifferently, without draining in many cases, this operation although of primary importance:, is sometimes left as one of the last. operations in land improvement.

2. It is extremely doubtful whether farmers have: appreciated the extent to which money can be spent profitably on draining land. More will be. said about this aspect later.

3. During the last decade or thereabouts, a shortage of labour, shortage of material and shortage, of machinery, have limited the extension of farm drainage.

4. On country where tile draining is the only satisfactory means of getting rid of excess water, many farmers have lacked the practical and technical knowledge required to set out and lay such drain systems.

5. Availability of finance has in most cases been inadequate., largely because of the. lack of appreciation of the extent to which money invested in drainage. pays good dividends.

So far as the second factor is concerned, the. better realisation of the payability of drainage will be obtained if one views money spent on this operation as a long term investment. In fact, this is the only way in which it should be viewed. In the case of tile draining it should b e possible for farmers to raise money on long term table mortgage covering periods of about 25 years at least. Under some circumstances as large a sum as £16 per acre spent *on* draining, would entail repayments on principle and interest at 4½% *of* approximately 21/- per annum. If the system of drains is so intensive as to cost this amount of money it might be expected to increase the carrying capacity of a farm by some thing like a cow to 4 or 5 acres or from 10-15 cows on a 60 acre farm. Experience of one farmer in the, Manawatu who has carried out drainage; of this order, indicates that the expectation of such an increase is not out of the way.

Since in the, case of the farm which is equipped with a house, farm buildings, fences, water supply, and is providing at least a living for the farmer and his family, the fixed charges entailed are being borne. by the existing herd or flock, it is reasonable that the: expenditure which enables extra stock to be carried, will be the only item which should be charged against such extra stock, except for small incidentals. In the case of a dairy farm the net earning of an average cow, over and above the standing herd, will, on a conservative estimat e be about £17. 10. On the basis **Of** 1/5 COW per acre increase this represents 70/- or over 3 times the interest and principle charges necessary for repayment of the £16. per acre invested in the drainage system. Moreover, at the end of the selected period for financing the pro ject, the farmer is, providing he. has carried out proper maintenance, still in possession of a perfectly good and valuable drainage. system.

Let us turn now to the. sheep-farmer on countrywhich can be mole drained. Mole draining is much cheaper but syst ems may not last so long as those of tiles. IJE t us t ake 10 years as the life of a mole drainage. system and assume that it costs £3 per acre to install. This is rather an outside figure unless a lot of tiles have been used in conjunction with the. moles. The. financing of such a scheme on a 10 year table mortgage at 4½% would entail an annual repayment of interest and principle amounting to about 7/6 per annum. At present day prices it would take less than ¼ of a ewe per acre to meet this cost and the probability is that land capable of b eing mole drained and in ne ed of it would have its carrying capacity increased by about 1 to 2 sheep per acre as a result **of** mole draining.

Obviously, therefore., failure to drain, providing finance can be arranged, is no excuse for neglecting to do it.

The objections that tiles cannot be procured readily or that labour is not available to lay them, are at the present time, perfectly valid ones. There i s , however, an easy remedy, and t h a t is to import modern equipment in the way of tile trench digging machines and if clay tiles cannot be turned out sufficiently rapidly, to import also concrete tile making machines to augment the supply of clay tilss.

A modern type of tile. trench digging machine known as the 'Roteho' will be demonstrated today, This machine was introduced from England about 13 months ago, and has dug trenches in which some 150,000 tiles or roughly **28** miles have been laid during the int ervening time. In order to assist farmers the College has put this machine at their disposal on a contract basis in conj unct ion with its Drainage Advisory Service, The demand for the machine

has been such as to indicate quite clearly that more such machines are necessary in this one district alone.

Although the machine is capable of-digging a trench up to 33" in depth at from 7 to 14 chains per hour, a good day's work including the setting up of boning rods to enable trenches to be dug to grade, is about 40 chains per day and on the average much less than this is done:, Nevertheless, the output of work is probably 7-8 times that which would result from the same energy put into hand digging.

A note of warning is necessary. After our experience with this machine it is obvious that its successful use is dependent upon the supervision, planning and setting out of grades by a skilled operator. Unless such skilled preparation of work is available, I am afraid that the. machine, might well get into disrepute, especial& as it is capable of digging trenches most satisfactorily during the drier portion of the year. On flattish country this would lead to difficulty so far as the average agricultural contractor or farmer, who uses water moving in the trench to give him his grades:, is concerned. Not only must the machine work to predetermined grade lines but the work must be checked over afterwards with the level to make sure that the operator has not made mistakes.

Reference was made to the lack of practical and technical knowledge of the. farmer as one reason why drainage was sometimes neglected. Many areas occur where it is impossible to judge by eye just where drains should go and the. grades which they would follow* In such cases the, only satisfactory way of dealing with the situation is to use a level, and preferably a dumpy level. A detailed study of the information revealed by taking levels in conjunction with a study of the soil profile and the cause of wetness, whether from a rising water-table: or from a perched water-table, have. to be taken in consideration in planning drainage systems. It is in this connection that knowledge, somewhat more detailed than that ordinarily possessed by the farmer, is desirable.. Recognising the need for such guidance as is necessary in such cases, the College. has set up a Drainage Advisory Service which is at the disposal of the farmer, but for which a fee has to be charged. This fee is necessary to meet the salaries and expenses entailed in discharging all the. duties connected with the service. It is kept at as low a level as possible because it is not the object of the College to make this a money making concern, but rather one to help the farmer at the minimum of cost to himself, The demand for advice, provided always the farmer can get the work done as is the case where a follow-up with a trench digging machine takes place:;, is sufficient evidence of the justification for this service.

Ability to finance drainage schemes is another factor which as mentioned earlier, limits their installation. The increased production which would result from the. better draining of much of our country, such for instance as the Kairanga, is a pointer to the desirability of lending'institutions such as the State Advances Corporation and others, giving serious consideration to making, money available on very attractive terms for this form of land improvement. I would go so far as to say that interest free money would return handsome dividends to the Country in the form of increased revenue from the taxation of the increased production. In England during the. war years drainage was regarded as of such importance that it was subsidised to the extent of 50% of its cost, with a limit of £7.10. subsidy in the case of tile draining, 30/- subsidy in the case. of moles and no limit in the case' of open ditches. As a rssult 3 million acres of land in Great Britain were improved by drainage under this scheme, during a time when Britain was fighting for her survival and for ours as well.