

## IMPROVEMENT OF LAND BY MECHANICAL MEANS.

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The art of improving land by mechanical means was known and practised by the ancients to a considerable extent; but it is only within a very recent date that its advantages have been fairly appreciated and fully realized. The progress of this department of art has been commensurate with the spirit of improvement which is so peculiarly characteristic of the present age.

By the persevering exertions, and acknowledged talents of Mr. Smith, of Deanston, the most recent and valuable improvements have been made in this department of the art of culture. But as preliminary to the subject, and before we proceed to treat of it in detail we will submit a few observations on the impediments which a superabundance of water or moisture presents to the healthy condition and growth of the crop.

A superabundance of moisture frustrates in a great measure the end which the farmer has in view in the general working of the land.

Wet lands are apt to retain the chill waters of winter till a late period in spring; and when the parching winds of March overtake a soil of this description, it is deprived in a serious degree of its productive energy. Vegetation is generally later in making its appearance in spring where water has been allowed to accumulate and stagnate, the farmer is prevented from commencing his operations till the season is far advanced, and a late harvest with a crop inferior both in quantity and weight is generally the result. To apply manures to a soil of this description is useless, for the beneficial influence which they are in other cases calculated to produce would be almost if not completely counteracted. These, among other reasons, should induce both landlord and tenant to avail themselves of every contrivance by which these impediments may be partially if not entirely removed.

Let us now consider a few of the most important mechanical means that have been devised for the improvement of the land.

**1st DRAINING.**—This is allowed on all hands to hold the first rank amongst the merely mechanical means by which the soil is rendered capable of producing valuable crops. In stiff and heavy clay lands draining is attended with the most beneficial results, and few will be inclined to dispute its efficacy in those cases where water has been found to lodge and stagnate in the surface soil. The drain not only carries away the rain water from the surface which may have a tendency to accumulate and stagnate there, but also arrests the water which may spring from beneath. As this water often holds in solution ingredients noxious to vegetation, the subsoil is thus prevented from retaining substances injurious to the plant, whilst the surface soil is, at the same time, preserved from an excess of moisture. In land which has been drained the water of the rains make its way easily through the soil, and does not sweep along the surface and carry along with it those ingredients which are beneficial to the soil, as is too frequently the case in undrained land. The rain waters too, in their passage through the surface soil to the drain leave in it those substances which they are known to contain favourable to the growth of plants. They also wash out from the surface soil, and, if the drains be deep enough, contribute to clear the subsoil of all those noxious substances which have a tendency to collect in the cold and wet bottom soils of undrained lands, and which are hurtful to the roots of those plants which

penetrate deep into the soil. This is one of those advantages which in the course of time result from the draining of land. When efficiently wrought out it constitutes a most important permanent improvement which can be fully produced by no other available means. Its permanency, however, will depend upon the manner in which the drains are kept. And if the draining be neglected, the openness of the soil will be more or less impaired till the land will again gradually return to its original condition. The constant filtering of water through the soil in making its way to the drains displaces the air that is lodged in it and keeps up a constant fresh supply which, it is well known, has a considerable effect in promoting the growth of all cultivated crops. Other good results follow the drainage of the superfluous water from the land, and which are equivalent to a change of soil. The earth becomes drier, looser, and more friable; the hard and stiff clay crumbles down and offers less resistance to the plough, so that they are more easily wrought and present fewer impediments to the operations of the farmer. Solids by this means too often change their temperature, lose their former coldness, and become better fitted for the production of vegetation. An effective drainage, in many respects and in many localities, is equivalent to a change of climate. Vegetation appears earlier in spring, and consequently the harvests are much earlier. Wet weather in autumn often prevents the sowing of winter corn in undrained lands, so that the farmer is obliged to alter his mode of cropping, and await the appearance of good weather in the spring to enable him to sow some other grain. The removal of water is followed by another important practical advantage equivalent to an actual deepening of the soil. Wet lands, when the weather is so dry as to enable the farmer to proceed with his operations, are found even in favourable seasons to retain a cold and superfluous moisture in the subsoil. This confines to the surface soil alone the roots of those plants that penetrate naturally deep into the soil in quest of food. The roots being thus confined to the surface layer tend gradually to exhaust it, but when the water has been carried off by the drains, the soil becomes dry to a greater depth, an accession of fresh air is conveyed to it, the particles become loose, and the roots descend with safety and are abundantly supplied with the nourishment which they require. From this we may draw a practical conclusion, namely, that the deeper the drains are made the better, if the water can find a speedy outlet. For then there is a greater depth of soil to nourish vegetation, and especially for those deep-rooted plants, such as lucerne, which are found so apt to fail in soils of a moderate depth. Wheat and clover, although not so deep-rooted plants as lucerne, are known to send their fibres for three or more feet in depth, in quest of nutrition, when the subsoil is dry and in a healthy condition. Deep drains are less liable to be injured by the operation of the subsoil plough, and are not so apt to be stopped up by the roots of the plants. The valuable and durable fertility of the land is thus promoted by the increase of its available depth.

But other ends not less important are attained by effective draining. When the land is dry the farmer is enabled to follow up his improvements with a greater degree of confidence, and a surer hope of success. In soils where water is allowed to stagnate the application of bones, rape dust, nitrate of soda, wood ashes, and other artificial manures, to increase its fertility, is almost useless. Even the powerful fertilising properties of lime and of little avail upon a soil where an excess of water prevails. But when the intelligent farmer has dry fields, he can bring all the know-