## THE FORMATION OF ALLUVIAL SOILS.

The richest alluvial soils are formed by natural causes, in a manner which it is more often in our power to imitate than is commonly supposed. And in thus taking a hint from nature's great operations, we possess the advantages of studying under a tutor, whose precepts rest on the most solid of all foundations—the laws of God.

In searching for the richest soils of the old and the new worlds, we shall find these almost always situated in the bottoms of valleys, by the banks of rivers, and in other lowlying situations. When we proceed to examine the cause of this, we find, in the action of the flood or uplend stream waters, a ready explanation of this universal state of things. In these waters, at almost all seasons of the year, a mass of mechanically suspended matters are found. Finely divided earths-masses of organic matters-are thus carried along by the moving waters. It is true that the amount of them varies with the character of the countries through which these rivers pursue their course, and the rapidity of the stream; but all more or less contain a large proportion of matters, which, hurried along by the force of the current, are deposited as soon as the strength of the stream is diminished, or ceases, by the overflowing of its ordinary banks, or in the depths of the sea. By such means the rich soils of the cultivated alluvial fields of the farmer were fast formed, are still enriched, and are still, at the mouths of rivers, gradually forming or enlarging the deltas, alike proverbial for their fertility; such as those at the mouths of the Thames, the Rhine, the Nile, the Oronoco, the Mississippi, or the Ganges. It may not be unattended with some little advantage to the advancement of practical agriculture, if, in this essay, I again endeavour to keep alive a spirit of inquiry as to the practicability of profitably imitating, by artificial means, these grand natural operations of the moving waters of the earth.

It is well known, that, in certain English localities, the farmer has, by the *varping* system, formed rich alluvial land, in places where only bogs and worthless soils were before in existence. It is not merely, however, to these that I would direct my observations. I would cautiously, yet confidently, approach in many districts, and examine this question :—"How far can the adjoining muddy waters be profitably raised by artificial means; for the purposes of irrigation and warping?"

It is a very practical argument, of which, in the first instance, to remind the farmer who may be startled with such a question, that the same powerful agents that drain the great fen districts of England can as readily raise the same enormous amount of water on to the land that the great Lincolnshire steam-engines remove from it—the same amount of water, which drains so many thousands of acres of land, would irrigate, as copiously, the same extent of land. It is erident that, in those situations where water, containing a large proportion of mechanically-suspended earths and decomposing organic matters, can be employed, that there the two-fold object may be attained of feeding irrigated meads, while an alluvial soil is gradually formed by the deposit from the water. On a considerable scale this has been accomplished, in the formation of the rich meads near the city of Edinburgh, irrigated by the contents of the sewers; and, to a still greater extent, the very same process has been successfully carried on, in some of the districts surrounding the Humber, without the aid of the pump.

The rapidity with which these soils are formed is of course proportinate to the impurity of the water. In the case of the warping system, as followed on the shores of the Humber, Mr. Ralph Creyke, (Jour. R. A. S., vol. 5, p. 402), remarks, that, "in one Spring, numbering, perhaps, ten or twelve tides, as much as from ten to fifteen acres have been known to have been warped the thickness of from one to three feet." If a similar plan could be adopted in the case of the waters of the Thames, the deposit of its mud would be certainly rapid. In the instance, too, of the sewer-waters of London, a large proportion of rich insoluble substances are suspended. From a gallon of one of these (the King's Scholars' Pond Sewer), examined by Professors Brande and Cooper, (Rep. of Metro. Sew., 153), was deposited, by subsidence, 55 grains; of this-21.22 grains were combustible, and consisted of animal matter rich in nitrogen, some vegetable matter, and a quantity of fat; and 33.75 grains of matter consisting of-

•				Grains.
Phosphate of lime	•••		••	6.81
Oxide of iron	•••			2.01
Carbonate of lime	•••	•••	•••	1.75
Sulphate of Lime	•••	•••		1.53
Earthy matter and s	sand		•••	21.65

The importance of adopting this mode of forming a soil long since attracted to the attention of Arthur Young. He noted the Lincolnshire system of warping (Annals of Agri, vol. 33, p. 343), as a most singular improvement. His-account of the process employed there will serve as an instruction for those who, in other districts, may wish to accomplish similar improvements. The water of the tides, he says, that come up the Trent, Ouse, Don, and other rivers, which empty themselves into the great estuary of the Humber, is muddy to an excess; insomuch, that in summer, if a cylindrical glass, twelve or fifteen inches long, be filled with it, it will presently deposit an inch, and sometimes more, of what is called warp. The improvement is perfectly simple, and consists in nothing more than letting in the tide at high water to deposit the warp, and permitting it to run off again as the tide falls, so that, as he adds, it is not to manure the soil that is the object, but to create it. It therefore follows that it is not of much consequence what the soil is that is intend-