DRAINAGE.

Paper read before Sunnyside Farmers' Institute by H. B. Stewart.

More water in the upper ten feet of the soil than is needed for the growing of crops is, in this paper, called surplus water. The construction of ditches and drains for the purpose of allowing the surplus water in the upper portion of the soil to run off is called artificial drainage. In this region, surplus water gets into the upper three feet of the soil through the lower natural drainage of the soil being crowded by excessive seepage from the canal, lateral ditches, lagoons on the upper side of the canal, ponds allowed to stand anywhere and the excessive use of water in irrigation. Pure water alone when in excess will kill most agricultural plants. But in an irrigated country like this the water in passing through the soil dissolves out various salts and carries them along with it in its course to the ocean. These salts are known under the common name of alkali. Evaporation from the surface of the water in the canal, lagoons and ponds concentrates the alkali in these places, and it, with the water from them, soaks into the soil. Evaporation of moisture from the surface of the ground leaves the alkali there and when it reaches 3 per cent. of the upper twelve inches of the soil it kills all forms of vegetation. The carrying off of this alkali is another object to be accomplished by drainage and the scientific use of water in connection with it.

Each man's farm requires a special plan of ditches to secure best results, probably no one plan answering for two farms. The nature of the soil and the lay of the land will be the main factors in this plan. A clayey soil will require drains close together, a loam not so close, and in sand they may be quite a distance apart. For best results they should not be less than three feet deep, while five feet deep would be much better. The ditches should be run in the lowest ground and just above where the seepage water comes to the surface of the ground on a hilside. A drain must have fall to it, one sixteenth of an inch to the rod being the least that can be used, while one-half an inch to the rod is about a perfect grade, though in a ditch made on this medium grade in a sandy soil the running water would wash the ditch banks some. The farm drains could be made to empty into connecting ditches which would answer for waste ditches. The land should be drained to a depth of three feet for the common plants of agriculture, while for alfalfa and fruit trees it should be drained to a depth of ten feet. Hence where drainage is required all waste ditches should be not less than five feet in depth. The waste ditches could be put under the supervision of one man who should attend to their proper construction and maintainance. Every man using a comunity waste ditch should share in its total cost and expense from beginning to end. The ditch company, too, would be justly taxed if they were to bear their share in the expense of this work. The bottom of the drains should be a perfect grade where lumber or tiles are used. If there are any short sags in the bottom of the ditch sand will get in and finally clog the drain. If there is any difference in the fall of portions of the drain, it is best, where possible, to have the greatest fall at the lower portion of the drain and the least fall at the upper part. In running underground drains they should be run in the direction which will get the most fall in the shortest distance. Highways should be sixty feet wide where ditches are run in them so the drainage ditches may be made deep enough to drain all tributary land to a depth of three feet. Laws pertaining to drainage are something greatly to be desired, and then have a supervisor of drainage for each district.

The practical conclusions reached in this investigation are: First, only those crops that need the least water should be raised on the high land, that is, land high enough to not need drainage. These crops are alfalfa, trees and all deep rooting plants; while those needing considerably more water should be raised on the low ground, such plants are clover, timothy, redtop and all shallow rooting plants. Where timothy has been sown alone on high ground it should be cut up at once and alfalfa or trees put in its place. Second, allowing ponds of water to acumulate either above the ditch or any where below it is an extremely pernicious practice and should be prohibited by law, because the water in them is constantly soaking into the ground and filling up the basin formed by the hills and hard pan rims around us. Again, the heat of the sun is constantly evaporating water from their surfaces and consequently concentrating the alkali in them, thereby hastening its acumulation on the surface of the land. The low places where these ponds of water have accumulated, should be filled up with earth, ditched to their bottoms and the water drained off or dikes of earth thrown up to prevent it getting into them. There should be a penalty attached for violation of this law. Third: The practice of slushing the sand out of ditches and laterals by means of side gates, letting the water into low ground there to slowly soak away should be stopped. Fourth: In the matter of watering stock from ditches; allowing one hundred times the quantity of water to pass through the ditch that the stock would drink is a bad mistake and another item in the list that necessitates the less fortunate neighbor to ditch his land and it may be, force him to the wall. It would be more neighborly to water the stock from a well and by so doing lessen the need of drainage. Wells can now be had for a mere trifle. Fifth: After the seeding has been successfully accomplished, use no more water in irrigating than is actually needed by the crops being raised; and where alkali exists irrigation by flooding is best. The water should be run from the upper to the lower side of the plot as quickly as it can be without washing the soil and then turned off. If moisture is within an inch of tne top of the ground, the soil is wet enough. The ground should be graded perfectly to expedite irrigation evenly. A plot should be irrigated within twenty-four hours. Water furrows should not be more than forty rods long from head ditch to waste ditch.

We are living in a basin bounded on the north and east by the foothills of of the Rattlesnake mountains, on the south by the Miller ridge, Snipes' mountain and an irregular hard pan rim connecting them, and on the west by the Outlook Divide. This basin is now about full of water. The lowest point in its rim is at its south-east corner, a few rods east of C. H. Stanton's house. Here an outlet must be made large enough to allow most of the water turned into this basin to escape below the danger line to crops, namely, three feet below the surface of the ground. Southeast of here, in and around the Negro settlement is another basin that will become a veritable swamp on account of its nearly level position unless drainage is carried on along with the advance waters of irrigation. The outlet to that basin is just about south of here in the gap between two buttes, about half a mile west of the telephone line. About a half a mile west of the colored people's school house is a hollow place shaped somewhat like a dishpan. In the bottom of this hollow water may be pressed from the soil and a thin coat of alkali covers the ground. It made its first appearance in the summer of 1901. In a few years more our way to Mabton will be blocked by water unless a ditch is made to carry it off. South of here along the border of the lowest bottoms of the Yakima river springs will break out and turn those botttoms into a bottomless bog, while the nearby slightly higher lands will become an alkali desert. These calamities will be likely to cause civil suits for damages. Who will have to pay these damages, the company or the farmers who used the water in irrigation? But all these evils may be avoided, however, by an efficient system of drainage. Mother nature will do her utmost, regardless of consequences, to restore the equilibrium disturbed by the hand of man. Although her work will be silent and underground, it will be none the less determined and persistent. And who can doubt that the canal company is as much interested as what all the rest of us are. Why, it could be possible for the townsite of Zillah to tumble into the Yakima river owing to the softening effect upon the subsoil of the seepage water coming from irrigation and the canal back of the town.

The canal company can make these drainage ditches better, cheaper and easier than any one else. They are already equipped for doing the work. They have the teams, wagons, scrapers and engineers, and they will always have to have them. Besides, they have the wealth and are financially intersted. They will be able to sell more land with them than they can without them. And everyone using water brought here by the canal should contribute a justly proportionate share towards bearing the expense of construction. A few men's farms on the lowland will be ruined by the water that brings prosperity and opulence to his neighbor living on the highland. Would these fortunate ones stand by and see their neighbors bankrupted and not extend a helping hand —prefer self-aggrandizment to co-operation?

Referring again to the basin in which we live, by an examination of the wells along and near its southern side and the use of a levelling instrument, I find that this basin is now full and running over at Mr. C. H. Stanton's place. The conclusion follows that all the surplus water turned into this basin from now on must be carried off by drainage ditches. One main ditch from its lowest outlet should be extended to the river and done while the ground is yet dry, so horses can be worked in making it. If the work is delayed until the ground becomes boggy, owing to the presence of seepage water, nothing but a steam ditcher outside of manual labor can be used in constructing it. In this matter delays will be expensive. On the north side of Snipe's mountain, at the meeting of the waters from the south and from the north, a deep drainage ditch should be made, extended down through this town and on to the river.

When the first well was dug at this place it was about seventy feet to water, now it is about forty. The water will gradually rise in the ground until it eventually reaches the surface, unless ditches are made to prevent it. If Sunnyside would retain her beauty and prestige she should take this matter in hand at once and carry it to successful completion without delay. To be forewarned is to be forearmed, and again, a word to the wise is sufficient.

One of the experiment stations hatched 58 chickens for experimental purposes, and at the close of three weeks all but five had died. One reason for this fatality was given as follows: "I noted also that the chicks did not seem to exercise proper judgment in their selection of the food presented to them. Some ate it too coarse; others devoured coarse, fibrous roots; others seemed to have no grit in their gizzards with which to grind the grain."

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