

chess and the moon. You might as well expect a mare to bring forth a calf, or to hatch a goose from a hen's egg, as to think of getting chess from wheat.

I always apply manure several months before I plow the land. Immense quantities are wasted every year by plowing it in just before putting in the crops. On this point my friend, Joseph Harris, could not agree with me. He believes in applying manure immediately before the crops. I pile my manure in the spring, and in the fall put it on the land which I intend to plow for corn the following spring. One great object I have had in piling my manure was to destroy all weed seeds. If the manure is handled enough all seeds will be destroyed.

Barnyard manure is the standby—the sure reliance—but it would be a grand thing for our farming interests if we could apply chemical fertilizers with profit. I hope we shall find what we need. I applied some on my wheat last fall, leaving a strip without any. When I left the farm, April 1st, I could see no difference. But that land is very rich. I have some of the fertilizer left, which I shall apply next fall on land which is not so rich.

I paid for my farm largely by summer fallowing. That enabled me to raise good crops.

Larger Crops at Less Cost.

The farmer who realizes \$23.91 per acre for the year's use of his wheat land—all expenses paid—will hardly complain that farming does not pay. Will any of our subscribers give us an account of the expenses and receipts from his wheat or other crops? The following article on this subject is abridged from the *Factory and Farm*:

The want of our country is greater knowledge and better practice in agriculture; a knowledge that will enable us to produce two bushels of grain or two pounds of meat at the present cost of one; and this, no intelligent farmer will doubt, is attainable. The average return of wheat in our country is below ten bushels per acre, and as the cost of growing the crop cannot but exceed \$10, it follows that the product costs fully market value, and in a large portion of our country it does not pay for labor expended.

Now, if we can increase the yield to twenty-five bushels per acre with but little added expense, we see how great would be the increased profit. But many will say such return cannot be realized. I believe it can, under all ordinary circumstances. It is true that there is a difference in the adaptation of soils to crops, but on all natural wheat lands, such as prevail in Western New York, such yield is not extraordinary, and for a succession of years, under good cultivation. My own crop has for several years averaged fully up to that figure, except the crop of 1875, when the yield was but about seventeen bushels, owing to the extreme frost of winter. I will give the return for fifty acres in wheat, and the cost of the same last season on my farm. My practice is to follow a rotation of crops, wheat following barley. This land had grown a full crop of barley in the season of 1876, and the stubble turned under early in August, the furrow about eight inches deep. The cost of the crop of wheat harvested in 1877 was as follows:—

Plowing 50 acres at \$2 per acre.....	\$100 00
Harrowing four times, 25 cents per acre each time.....	50 00
Surface plowing twice with gang plows....	62 50
Rolling once, 25 cents per acre.....	12 50
Seed, 1½ bush. at \$1.50 per bush. per acre.....	112 50
Drilling, 50 cents per acre.....	25 00
Superphosphate, 150 lbs per acre, at \$30 a ton.....	112 50
Harvesting and drawing to barn.....	150 00
Threshing and marketing, \$35 per acre....	175 00
Picking loose stone, etc., 25c. per acre....	12 50

Total.....\$812 50

CONTRA.

Yield, 30 bush. per acre, 1,500 bush., sold at \$1.16 per bush.....	\$1890 00
Value of straw per acre \$2.....	100 00
Total.....	\$1990 00

Use of land, \$23.91 per acre.....\$1177 50

These figures are not given here as being an extraordinary crop, for many have produced larger ones. The season was unusually favorable for grain, and we do not expect like crops every year, but we may approximate to it. Certainly this gives a good return, and shows that wheat growing may be made profitable under good cultivation; but

had the yield been only an average of the State—some ten or twelve bushels per acre—it would not have paid cost of cultivation, and nothing for the use of land. It is seldom that our seasons are so bad that wheat growing does not afford reasonable encouragement to the farmer when wisely conducted. Land must be clean and fertile to make grain growing a paying business in any of the older States, which the virgin soils of the West are producing so abundantly, and at so little cost. That is we must be better farmers in the older States to enable us to compete with the many bad farmers of the West. A new country is never well farmed for when nature produces abundantly for negligent culture, we need not expect thorough cultivation, but when necessity demands a better and more thorough system we need not expect success unless we comply.

Roots in Tile Drains.

On this subject W. Chamberlain writes to the *Country Gentleman* as follows:—

Several statements and inquiries have recently come to me, or to my notice, in regard to the stoppage of tile drains by growing roots. For example, Mr. Geo. Green, of Ashtabula county, Ohio, in the *N. Y. Tribune* of April 3rd, warns against raising red clover on underdrained land. He says that he drained his land several years ago 2½ feet deep, and has since raised clover on it; that the roots entered the drains, spread out into a fine, fibrous mass, furnished lodgment for the sediment (there should be none), and gradually choked the drains, so that he had to take them up entirely, clean them out, and relay them. Now, this seems incredible, both *a priori* and in view of abundant facts to the contrary, and I certainly think Mr. Green must be mistaken—not in the fact, but in the cause of the stoppage—or that he must have a strangely mellow and rich subsoil; for in our hard clay subsoil, clover roots run down not more than 12 to 18 inches—certainly not 30. Since writing the above sentence I have carefully dug up several thrifty old roots in deep, mellow soil, and found none longer than 15 inches. They may be longer in the fall, or in a very mellow subsoil, but 30 inches seems beyond the possible maximum. Again, the fibrous roots seem near the surface, and the long tap-root seems to have few of them at its extremity. Also, except in springy soil, or during and immediately after each rain, the drains are dry, empty holes, having neither moisture nor sediment (if properly laid) to invite the entrance of roots, or to encourage them to throw out fibrous roots, in case they should chance to force an entrance.

Moreover, the tiles, if properly laid, fit as closely on the upper side as two smooth, squarely-cut surfaces can fit, the cracks (if any are caused by slight crooks in the tiles) being always left at the bottom. The water wells up from beneath in wet weather, and enters at these seams or through the pores. It would be very hard then for the roots to find an entrance from above. They would rather glance off in their growth, as from a stone. But if the tiles are loosely joined, or the ditch dug unevenly, so that dips or low spots are left here and there, then the earth might wash through from above with the water, and the sediment gather in and gradually fill these dips, and invite the access and spreading of roots. In that case the drain would be stopped, even without the help of roots; and that, I presume, and not the clover, was the cause of Mr. Green's failure. Where the fall is very slight, it is difficult to cut the bottom groove for the tile so true that there shall be no dips. If there is moisture enough to form a small stream of water as fast as the groove is cut, that will be a perfect guide; otherwise a spirit level or a plumb line must be constantly and carefully used. The best simple apparatus for using the plumb line readily is made as follows:—Take three equal strips of one by two-inch battens, each eight feet long, and nail or screw them firmly together at the ends, so as to form an equilateral triangle; mark the middle of the base, and from the opposite angle suspend a plumb line, and the machine is done. Then, after the groove is cut for the tiles, test every doubtful portion of it by placing the base of the triangle along the groove or gutter. If the point of the plumb swings even a quarter of an inch towards the outlet, the water will of course flow that way, and there will be no dip. Now, if the tiles are properly fitted, and the subsoil tamped or packed hard, clear up to the soil, and the soil filled in so that there shall be a ridge, rather than a surface ditch, directly above the tiles, there will be no sediment, but the water will enter the tiles from beneath, and flow from the outlet as clear as spring water.

I know hundreds of acres of underdrained land, both here and in New York State, on which clover is raised whenever desired. My own house stands in a sixteen-acre field, nearly all of it drained 2½ feet deep. A part of it has been done eleven years, and clover and timothy have been raised on it most of the time. Within a stone's throw is another field of eight acres, drained three feet deep thirteen years ago, and clover and timothy have been raised on it at least eight of the thirteen years. Four acres, too, are covered with apple trees fifty years old. Three weeks ago I took up one tile of one of the four inch main drains, to form a junction for a new lateral, and found it as clean as the day it was put down, and a small stream of clear water running through it. It must keep clean, for after every heavy rain it discharges full of clear water, and I see no reason why it should not continue to do so for a hundred years.

John Johnston is sometimes called "the father of American underdraining." Last September I saw his splendid farm at Geneva, N. Y. Most of it has been drained, if I remember, more than twenty years. It has every crop on it at pleasure—clover, grain, nursery trees and orchards—and the drains do not suffer. Also the fine farm of his son-in-law, Robt. J. Swan, adjoining it, and containing about three hundred acres, all drained two and a half feet deep, except a few acres of woodland. It is clay land, like mine—the subsoil, however, being somewhat more mellow. But he raises clover at pleasure. Last September, when I was there, his farmer was cutting about seventy-five acres for seed (his usual annual crop) of as fine second-crop clover as ever need be seen. And so I might multiply examples to show that clover roots do not damage tile drains properly laid two and a half feet deep. But if in any soil or subsoil they really do, then the drains must always be laid deeper in such soil, or the joints covered with hydraulic cement or short caps like the tiles; for clovering (in rotation) must go hand in hand with tile-draining to make our clay land what it should be.

I have seen complaint that the roots of apple trees will stop the drains in about fifteen years from setting. I think they would not in hard clay subsoil, at a distance of sixteen to twenty feet; for the drains should always be half way between the rows of trees. Two years ago this fall I drained a thrifty orchard that had been planted twelve years. The trees were thirty-three feet apart, and already the roots had met and passed one another, so that we cut many of them in digging the drains. But in no case, I think, did we find roots more than twelve or fifteen inches deep, and I do not believe that they will ever go much deeper at that distance from the trees. They seemed to have got enough of the subsoil business, and to be spreading only laterally. But if facts, carefully examined and authenticated, show that tree roots actually do stop the drains a rod off to any great extent, then we must, as I said before, cement or cap the joints, or lay the drains deeper, or both. Tile-makers will, if required, furnish caps or rings for the joints, or joint the tiles like sewer pipes. We do not intend to be beaten by an apple root. We must and will drain at least our clay land for young orchards. My own experience on both sides of the question thoroughly convinces me of this. And we do not want our drains to fail in fifteen years, when they ought to last a hundred, or for that matter, a thousand. For if there is absolutely no approach towards stoppage or crumbling, in twenty or fifty years, why should there be in twenty times fifty?

A correspondent of the *Rural Home*, speaking of the benefit which birds render the farmer, says Recently while at work near a wheat field my attention was called to the fact that some of the wheat had been picked from the heads in certain parts of the field. As my neighbors seemed to think that the mischief was done by yellow birds, I obtained a gun and killed one of the supposed offenders. Although interrupted while taking his breakfast, we found in his stomach only three grains of wheat, and, by actual count three hundred and fifty weevils.

Wood ashes have long been used with very beneficial results on almost all kinds of land, and the benefit thus derived has been largely due to the potash, which in ashes is mostly in the form of the readily available carbonate, easily dissolved out by water.

Good practical farming involves a greater amount of thought than any other vocation. The conditions of success are more complex than in any other. It is least of all a business for listless, lazy men, who dread the drudgery of thinking.