

GREELEY HORACE

WHAT I KNOW
OF FARMING;

Horace Greeley

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Horace Greeley
**What I know of farming: / a series of
brief and plain expositions of practical
agriculture as an art based upon science**

*"I know
That where the spade is deepest driven,
The best fruits grow."*

John G. Whittier.

PREFACE

Men have written wisely and usefully, in illustration and aid of Agriculture, from the platform of pure science. Acquainted with the laws of vegetable growth and life, they so expounded and elucidated those laws that farmers apprehended and profitably obeyed them. Others have written, to equally good purpose, who knew little of science, but were adepts in practical agriculture, according to the maxims and usages of those who have successfully followed and dignified the farmer's calling. I rank with neither of these honored classes. My practical knowledge of agriculture is meager, and mainly acquired in a childhood long bygone; while, of science, I have but a smattering, if even that. They are right, therefore, who urge that my qualifications for writing on agriculture are slender indeed.

I only lay claim to an invincible willingness to be made wiser to-day than I was yesterday, and a lively faith in the possibility – nay, the feasibility, the urgent necessity, the imminence – of very great improvements in our ordinary dealings with the soil. I know that a majority of those who would live by its tillage feed it too sparingly and stir it too slightly and grudgingly. I know that we do too little for it, and expect it, thereupon, to do too much for us. I know that, in other pursuits, it is only work thoroughly well done that is liberally compensated; and I see no reason why farming should prove an exception to this stern but salutary law. I may be, indeed, deficient in knowledge of what constitutes good farming, but not in faith that the very best farming is that which is morally sure of the largest and most certain reward.

I hope to be generally accorded the merit of having set forth the little I pretend to know in language that few can fail to understand. I have avoided, so far as I could, the use of terms and distinctions unfamiliar to the general ear. The little I know of oxygen, hydrogen, nitrogen, &c., I have kept to myself; since whatever I might say of them would be useless to those already acquainted with the elementary truths of Chemistry, and only perplexing to others. If there is a paragraph in the following pages which will not be readily and fully understood by an average school-boy of fifteen years, then I have failed to make that paragraph as simple and lucid as I intended.

Many farmers are dissuaded from following the suggestions of writers on agriculture by the consideration of expense. They urge that, though men of large wealth may (perhaps) profitably do what is recommended, their means are utterly inadequate: they might as well be urged to work their oxen in a silver yoke with gold bows. I have aimed to commend mainly, if not uniformly, such improvements only on our grandfathers' husbandry as a farmer worth \$1,000, or over, may adopt – not all at once, but gradually, and from year to year. I hope I shall thus convince some farmers that draining, irrigation, deep plowing, heavy fertilizing, &c., are not beyond their power, as so many have too readily presumed and pronounced them.

That I should say very little, and that little vaguely, of the breeding and raising of animals, the proper time to sow or plant, &c., &c., can need no explanation. By far the larger number of those whose days have mainly been given to farming, know more than I do of these details, and are better authority than I am with regard to them. On the other hand, I have traveled extensively, and not heedlessly, and have seen and pondered certain broader features of the earth's improvement and tillage which many stay-at-home cultivators have had little or no opportunity to study or even observe. By restricting the topics with which I deal, the probability of treating some of them to the average farmer's profit is increased.

And, whatever may be his judgment on this slight work, I *know* that, if I could have perused one of like tenor half a century ago, when I was a patient worker and an eager reader in my father's humble home, my subsequent career would have been less anxious and my labors less exhausting than they have been. Could I then have caught but a glimpse of the beneficent possibilities of a farmer's life – could I have realized that he is habitually (even though blindly) dealing with problems which require and reward the amplest knowledge of Nature's laws, the fullest command of science, the noblest

efforts of the human intellect, I should have since pursued the peaceful, unobtrusive round of an enthusiastic and devoted, even though not an eminent or fortunate, tiller of the soil. Even the little that is unfolded in the ensuing pages would have sufficed to give me a far larger, truer, nobler conception of what the farmer of moderate means might and should be, than I then attained. I needed to realize that observation and reflection, study and mental acquisition, are as essential and as serviceable in his pursuit as in others, and that no man can have acquired so much general knowledge that a farmer's exigencies will not afford scope and use for it all. I abandoned the farm, because I fancied that I had already perceived, if I had not as yet clearly comprehended, all there was in the farmer's calling; whereas, I had not really learned much more of it than a good plow-horse ought to understand. And, though great progress has been made since then, there are still thousands of boys, in this enlightened age and conceited generation, who have scarcely a more adequate and just conception of agriculture than I then had. If I could hope to reach even one in every hundred of this class, and induce him to ponder, impartially, the contents of this slight volume, I know that I shall not have written it in vain.

We need to mingle more thought with our work. Some think till their heads ache intensely; others work till their backs are crooked to the semblance of half an iron hoop; but the workers and the thinkers are apt to be distinct classes; whereas, they should be the same. Admit that it has always been thus, it by no means follows that it always should or shall be. In an age when every laborer's son may be fairly educated if he will, there should be more fruit gathered from the tree of knowledge to justify the magnificent promise of its foliage and its bloom. I rejoice in the belief that the graduates of our common schools are better ditch-diggers, when they can no otherwise employ themselves to better advantage, than though they knew not how to read; but that is not enough. If the untaught peasantry of Russia or Hungary grow more wheat per acre than the comparatively educated farmers of the United States, our education is found wanting. That is a vicious and defective if not radically false mental training which leaves its subject no better qualified for any useful calling than though he were unlettered. But I forbear to pursue this ever-fruitful theme.

I look back, on this day completing my sixtieth year, over a life, which must now be near its close, of constant effort to achieve ends whereof many seem in the long retrospect to have been transitory and unimportant, however they may have loomed upon my vision when in their immediate presence. One achievement only of our age and country – the banishment of human chattelhood from our soil – seems now to have been worth all the requisite efforts, the agony and bloody sweat, through which it was accomplished. But another reform, not so palpably demanded by justice and humanity, yet equally conducive to the well-being of our race, presses hard on its heels, and insists that we shall accord it instant and earnest consideration. It is the elevation of Labor from the plane of drudgery and servility to one of self-respect, self-guidance, and genuine independence, so as to render the human worker no mere cog in a vast, revolving wheel, whose motion he can neither modify nor arrest, but a partner in the enterprise which his toil is freely contributed to promote, a sharer in the outlay, the risk, the loss and gain, which it involves. This end can be attained through the training of the generation who are to succeed us to observe and reflect, to live for other and higher ends than those of present sensual gratification, and to feel that no achievement is beyond the reach of their wisely combined and ably self-directed efforts. To that part of the generation of farmers just coming upon the stage of responsible action, who have intelligently resolved that the future of American agriculture shall evince decided and continuous improvement on its past, this little book is respectfully commended.

H. G.

New York, Feb. 3, 1871.

I. WILL FARMING PAY?

I commence my essays with this question, because, when I urge the superior advantages of a rural life, I am often met by the objection that *Farming doesn't pay*. That, if true, is a serious matter. Let us consider:

I do not understand it to be urged that the farmer who owns a large, fertile estate, well-fenced, well-stocked, with good store of effective implements, cannot live and thrive by farming. What is meant is, that he who has little but two brown hands to depend upon cannot make money, or can make very little, by farming.

I think those who urge this point have a very inadequate conception of the difficulty encountered by every poor young man in securing a good start in life, no matter in what pursuit. I came to New-York when not quite of age, with a good constitution, a fair common-school education, good health, good habits, and a pretty fair trade – (that of printer.) I think my outfit for a campaign against adverse fortune was decidedly better than the average; yet ten long years elapsed before it was settled that I could remain here and make any decided headway. Meantime, I drank no liquors, used no tobacco, attended no balls or other expensive entertainments, worked hard and long whenever I could find work to do, lost less than a month altogether by sickness, and did very little in the way of helping others. I judge that quite as many did worse than I as did better; and that, of the young lawyers and doctors who try to establish themselves here in their professions, quite as many earn less as earn more than their bare board during the first ten years of their struggle.

John Jacob Astor, near the close of a long, diligent, prosperous career, wherein he amassed a large fortune, is said to have remarked that, if he were to begin life again, and had to choose between making his first thousand dollars with nothing to start on, or with that thousand making all that he had actually accumulated, he would deem the latter the easier task. Depend upon it, young men, it is and must be hard work to earn honestly your first thousand dollars. The burglar, the forger, the blackleg (whether he play with cards, with dice, or with stocks), may seem to have a quick and easy way of making a thousand dollars; but whoever makes that sum honestly, with nothing but his own capacities and energies as capital, does a very good five-years' work, and may deem himself fortunate if he finishes it so soon.

I *have* known men do better, even at farming. I recollect one who, with no capital but a good wife and four or five hundred dollars, bought (near Boston) a farm of two hundred mainly rough acres, for \$2,500, and paid for it out of its products within the next five years, during which he had nearly doubled its value. I lost sight of him then; but I have not a doubt that, if he lived fifteen years longer and had no very bad luck, he was worth, as the net result of twenty years' effort, at least \$100,000. But this man would rise at four o'clock of a winter morning, harness his span of horses and hitch them to his large market-wagon (loaded over night), drive ten miles into Boston, unload and load back again, be home at fair breakfast-time, and, hastily swallowing his meal, be fresh as a daisy for his day's work, in which he would lead his hired men, keeping them clear of the least danger of falling asleep. Such men are rare, but they still exist, proving scarcely anything impossible to an indomitable will. I would not advise any to work so unmercifully; I seek only to enforce the truth that great achievements are within the reach of whoever will pay their price.

An energetic farmer bought, some twenty-five years ago, a large grazing farm in Northern Vermont, consisting of some 150 acres, and costing him about \$3,000. He had a small stock of cattle, which was all his land would carry; but he resolved to increase that stock by at least ten per cent. per annum, and to so improve his land by cultivation, fertilizing, clover, &c., that it would amply carry that increase. Fifteen years later, he sold out farm and stock for \$45,000, and migrated to the West.

I did not understand that he was a specially hard worker, but only a good manager, who kept his eyes wide open, let nothing go to waste, and steadily devoted his energies and means to the improvement of his stock and his farm.

Walking one day over the farm of the late Prof. Mapes, he showed me a field of rather less than ten acres, and said, "I bought that field for \$2,400, a year ago last September. There was then a light crop of corn on it, which the seller reserved and took away. I underdrained the field that Fall, plowed and sub-soiled it, fertilized it liberally, and planted it with cabbage; and, when these matured, I sold them for enough to pay for land, labor, and fertilizers, altogether." The field was now worth far more than when he bought it, and he had cleared it within fifteen months from the date of its purchase. I consider that a good operation. Another year, the crop might have been poor, or might have sold much lower, so as hardly to pay for the labor; but there are risks in other pursuits as well as in farming.

A fruit-farmer, on the Hudson above Newburg, showed me, three years since, a field of eight or ten acres which he had nicely set with Grapes, in rows ten feet apart, with beds of Strawberries between the rows, from which he assured me that his sales per acre exceeded \$700 per annum. I presume his outlay for labor, including picking, was less than \$300 per annum; but it had cost something, to make this field what it then was. Say that he had spent \$1,000 per acre in underdraining, enriching and tilling this field, to bring it to this condition, including the cost of his plants, and still there must have been a clear profit here of at least \$300 per acre.

I might multiply illustrations; but let the foregoing suffice. I readily admit that shiftless farming doesn't pay – that poor crops don't pay – that it is hard work to make money by farming without some capital – that frost, or hail, or drouth, or floods, or insects, may blast the farmer's hopes, after he has done his best to deserve and achieve success; but I insist that, as a general proposition, *Good Farming DOES pay*– that few pursuits afford as good a prospect, as full an assurance, of reward for intelligent, energetic, persistent effort, as this does.

I am not arguing that every man should be a farmer. Other vocations are useful and necessary, and many pursue them with advantage to themselves and to others. But those pursuits are apt to be modified by time, and some of them may yet be entirely dispensed with, which Farming never can be. It is the first and most essential of human pursuits; it is every one's interest that this calling should be honored and prosperous. If not adequately recompensed, I judge that is because it is not wisely and energetically followed. My aim is to show how it may be pursued with satisfaction and profit.

II. GOOD AND BAD HUSBANDRY

Necessity is the master of us all. A farmer may be as strenuous for deep plowing as I am – may firmly believe that the soil should be thoroughly broken up and pulverized to a depth of fifteen to thirty inches, according to the crop; but, if all the team he can muster is a yoke of thin, light steers, or a span of old, spavined horses, which have not even a speaking acquaintance with grain, what shall he do? So he may heartily wish he had a thousand loads of barn-yard manure, and know how to make a good use of every ounce of it; but, if he has it not, and is not able to buy it, he can't always afford to forbear sowing and planting, and so, because he cannot secure great crops, do without any crops at all. If he does the best he can, what better *can* he do?

Again: Many farmers have fields that must await the pleasure of Nature to fit them for thorough cultivation. Here is a field – sometimes a whole farm – which, if partially divested of the primitive forest, is still thickly dotted with obstinate stumps and filled with green, tenacious roots, which could only be removed at a heavy, perhaps ruinous, cost. A rich man might order them all dug out in a month, and see his order fully obeyed; but, except to clear a spot for a garden or under very peculiar circumstances, it would not pay; and a poor man cannot afford to incur a heavy expense merely for appearance's sake, or to make a theatrical display of energy. In the great majority of cases, he who farms for a living can't afford to pull green stumps, but must put his newly-cleared land into grass at the earliest day, mow the smoother, pasture the rougher portions of it, and wait for rain and drouth, heat and frost, to rot his stumps until they can easily be pulled or burned out as they stand.

So with regard to a process I detest, known as Pasturing. I do firmly believe that the time is at hand when nearly all the food of cattle will, in our Eastern and Middle States, be cut and fed to them – that we can't afford much longer, even if we can at present, to let them roam at will over hill and dale, through meadow and forest, biting off the better plants and letting the worse go to seed; often poaching up the soft, wet soil, especially in Spring, so that their hoofs destroy as much as they eat; nipping and often killing in their infancy the finest trees, such as the Sugar Maple, and leaving only such as Hemlock, Red Oak, Beech, &c., to attain maturity. Our race generally emerged from savageism and squalor into industry, comfort and thrift, through the Pastoral condition – the herding, taming, rearing and training of animals being that department of husbandry to which barbarians are most easily attracted: hence, we cling to Pasturing long after the reason for it has vanished. The radical, incurable vice of Pasturing – that of devouring the better plants and leaving the worse to ripen and diffuse seed – can never be wholly obviated; and I deem it safe to estimate that almost any farm will carry twice as much stock if their food be mainly cut and fed to them as it will if they are required to pick it up where and as it grows or grew. I am sure that the general adoption of Soiling instead of Pasturing will add immensely to the annual product, to the wealth, and to the population, of our older States. And yet, I know right well that many farms are now so rough and otherwise so unsuited to Soiling as to preclude its adoption thereon for many years to come.

Let me indicate what I mean by Good Farming, through an illustration drawn from the Great West:

All over the settled portions of the Valley of the Upper Mississippi and the Missouri, there are large and small herds of cattle that are provided with little or no shelter. The lee of a fence or stack, the partial protection of a young and leafless wood, they may chance to enjoy; but that it is a ruinous waste to leave them a prey to biting frosts and piercing north-western winds, their owners seem not to comprehend. Many farmers far above want will this Winter feed out fields of Corn and stacks of Hay to herds of cattle that will not be one pound heavier on the 1st of next May than they were on the 1st of last December – who will have required that fodder merely to preserve their vitality and

escape freezing to death. It has mainly been employed as fuel rather than as nourishment, and has served, not to put on flesh, but to keep out frost.

Now I am familiar with the excuses for this waste; but they do not satisfy me. The poorest pioneer might have built for his one cow a rude shelter of stakes, and poles, and straw or prairie-grass, if he had realized its importance, simply in the light of economy. He who has many cattle is rarely without both straw and timber, and might shelter his stock abundantly if he only would. Nay, he could not have neglected or omitted it if he had clearly understood that his beasts must somehow be supplied with heat, and that he can far cheaper warm them from without than from within.

The broad, general, unquestionable truths, on which I insist in behalf of Good Farming are these; and I do not admit that they are subject to exception:

I. It is very rarely impracticable to grow good crops, if you are willing to work for them. If your land is too poor to grow Wheat or Corn, and you are not yet able to enrich it, sow Rye or Buckwheat; if you cannot coax it to grow a good crop of anything, let it alone; and, if you cannot run away from it, work out by the day or month for your more fortunate neighbors. The time and means squandered in trying to grow crops, where only half or quarter crops can be made, constitute the heaviest item on the wrong side of our farmers' balance-sheets; taxing them more than their National, State, and local governments together do.

II. Good crops rarely fail to yield a profit to the grower. I know there are exceptions, but they are very few. Keep your eye on the farmer who almost uniformly has great Grass, good Wheat, heavy Corn, &c., and, unless he drinks, or has some other bad habit, you will find him growing rich. I am confident that white blackbirds are nearly as abundant as farmers who have become poor while usually growing good crops.

III. The fairest single test of good farming is the increasing productiveness of the soil. That farm which averaged twenty bushels of grain to the acre twenty years ago, twenty-five bushels ten years ago, and will measure up thirty bushels to the acre from this year's crop, has been and is in good hands. I know no other touchstone of Farming so unerring as that of the increase or decrease from year to year of its aggregate product. If you would convince me that X. is a good farmer, do not tell me of some great crop he has just grown, but show me that his crop has regularly increased from year to year, and I am satisfied.

— I shall have more to say on these points as I proceed. It suffices for the present if I have clearly indicated what I mean by Good and what by Bad Farming.

III. WHERE TO FARM

When my father was over sixty years old, and had lived some twenty years in Erie County, Pennsylvania, he said to me: "I have several times removed, and always toward the West; I shall never remove again; but, were I to do so, it would be toward the East. Experience has taught me that the advantages of every section are counterbalanced by disadvantages, and that, where any crop is easily produced, there it sells low, and sometimes cannot be sold at all. I shall live and die right here; but, were I to remove again, it would not be toward the West."

This is but one side of a truth, and I give it for whatever it may be worth. Had my father plunged into the primitive forest in his twenty-fifth rather than his forty-fifth year, he would doubtless have become more reconciled to pioneer life than he ever did. I would advise no one over forty years of age to undertake, with scanty means, to dig a farm out of the dense forest, where great trees must be cut down and cut up, rolled into log-heaps, and hurried to ashes where they grew. Where half the timber can be sold for enough to pay the cost of cutting, the case is different; but I know right well that digging a farm out of the high woods is, to any but a man of wealth, a slow, hard task. Making one out of naked prairie, five to ten miles from timber, is less difficult, but not much. He who can locate where he has good timber on one side and rich prairie on the other is fortunate, and may hope, if his health be spared, to surround himself with every needed comfort within ten years. Still, the pioneer's life is a rugged one, especially for women and children; and I should advise any man who is worth \$2,000 and has a family, to buy out an "improvement" (which, in most cases, badly needs improving) on the outskirts of civilization, rather than plunge into the pathless forest or push out upon the unbroken prairie. I rejoice that our Public Lands are free to actual settlers; I believe that many are thereby enabled to make for themselves homes who otherwise would have nothing to leave their children; yet I much prefer a home within the boundaries of civilization to one clearly beyond them. There is a class of drinking, hunting, frolicking, rarely working, frontiersmen, who seem to have been created on purpose to erect log cabins and break paths in advance of a different class of settlers, who regularly come in to buy them out and start them along after a few years. I should here prefer to follow rather than lead. If Co-operation shall ever be successfully applied to the improvement of wild lands, I trust it may be otherwise.

He who has a farm already, and is content with it, has no reason to ask, "Whither shall I go?" and he may rest assured that thoroughly good farming will pay as well in New England as in Kansas or in Minnesota. I advise no man who has a good farm anywhere, and is able to keep it, to sell and migrate. I know men who make money by growing food within twenty miles of this city quite as fast as they could in the West. If you have money to buy and work it, and know how to make the most of it, I believe you may find land really as cheap, all things considered, in Vermont as in Wisconsin or Arkansas.

And yet I believe in migration – believe that there are thousands in the Eastern and the Middle States who would improve their circumstances and prospects by migrating to the cheaper lands and broader opportunities of the West and South. For, in the first place, most men are by migration rendered more energetic and aspiring; thrown among strangers, they feel the necessity of exertion as they never felt it before. Needing almost everything, and obliged to rely wholly on themselves, they work in their new homes as they never did in their old; and the consequences are soon visible all around them.

"A stern chase is a long chase," say the sailors; and he who buys a farm mainly on credit, intending to pay for it out of its proceeds, finds interest, taxes, sickness, bad seasons, hail, frost, drouth, tornadoes, floods, &c., &c., deranging his calculations and impeding his progress, until he

is often impelled to give up in despair. There are men who can surmount every obstacle and defy discouragement – these need no advice; but there are thousands who, having little means and large families, can grow into a good farm more easily and far more surely than they can pay for it; and these may wisely seek homes where population is yet sparse and land is consequently cheap. Doubtless, some migrate who might better have forborne; yet the instinct which draws our race toward sunset is nevertheless a true one. The East will not be depopulated; but the West will grow more rapidly in the course of the next twenty years than ever in the past. The Railroads which have brought Kansas and Minnesota within three days, and California within a week of us, have rendered this inevitable.

But the South also invites immigration as she never did till now. Her lands are still very cheap; she is better timbered, in the average, than the West; her climate attracts; her unopened mines and unused water-power call loudly for enterprise, labor and skill. It is absurd to insist that her soil is exhausted when not one-third of it has ever yet been plowed. I do not advise solitary migration to the South, because she needs schools, mills, roads, bridges, churches, &c., &c., which the solitary immigrant can neither provide nor well do without: and I have no assurance that he, if obliged to work out for present bread, would find those ready to employ and willing to pay him; but let a hundred Northern farmers and mechanics worth \$1,000 to \$3,000 each combine to select (through chosen agents) and buy ten or twenty thousand acres in some Southern State, embracing hill and vale, timber and tillage, water-power and minerals, and divide it equitably among themselves, after laying it out with roads, a park, a village-plat, sites for churches, schools, &c., and I am confident that they can thus make pleasant homes more cheaply and speedily there than almost anywhere else.

Good farming land, improved or unimproved, is this day cheaper in the United States, all things considered, than in any other country – cheaper than it can long remain. So many are intent on short cuts to riches that the soil is generally neglected, and may be bought amazingly cheap in parts of Connecticut as well as in Iowa or Nebraska. When I was last in Illinois, I rode for some hours beside a gray-coated farmer of some sixty years, who told me this: "I came here thirty years ago, and took up, at \$1-1/4 per acre, a good tract of land, mainly in timber. I am now selling off the timber at \$100 per acre, reserving the land." That seems to me a good operation – not so quick as a corner in the stock-market, but far safer. And, while I would advise no man to incur debt, I say most earnestly to all who have means, "Look out the place where you would prefer to live and die; take time to suit yourself thoroughly; choose it with reference to your means, your calling, your expectations, and, if you can pay for it, *buy* it. Do not imagine that land is cheap in the West or the South only; it is to be found cheap in *every* State by those who are able to own and who know how to use it."

I earnestly trust that the obvious advantages of settling in colonies are to be widely and rapidly improved by our people, nearly as follows: One thousand heads of families unite to form a colony, contribute \$100 to \$500 each to defray the cost of seeking out and securing a suitable location, and send out two or three of the most capable and trustworthy of their number to find and purchase it; and now let their lands be surveyed and divided into village or city lots at or near the center, larger allotments (for mechanics' and merchants' homes) surrounding that center, and far larger (for farms) outside of these; and let each member, on or soon after his arrival, select a village-lot, out-lot, farm, or one of each if he chooses and can pay for them. Let ample reservations of the best sites for churches, school-houses, a town hall, public park, etc., be made in laying out the village, and let each purchaser of a lot or farm be required to plant shade-trees along the highways which skirt or traverse it. If irrigation by common effort be deemed necessary, let provision be made for that. Run up a large, roomy structure for a family hotel or boarding-house; and now invite each stockholder to come on, select his land, pay for it, and get up some sort of a dwelling, leaving his family to follow when this shall have been rendered habitable; but, if they insist on coming on with him and taking their chances, so be it.

IV. PREPARING TO FARM

I write mainly for beginners – for young persons, and some not so young, who are looking to farming as the vocation to which their future years are to be given, by which their living is to be gained. In this chapter, I would counsel young men, who, not having been reared in personal contact with the daily and yearly round of a farmer's cares and duties, purpose henceforth to live by farming.

To these I would earnestly say, "No haste!" Our boys are in too great a hurry to be men. They want to be bosses before they have qualified themselves to be efficient journeymen. I have personally known several instances of young men, fresh from school or from some city vocation, buying or hiring a farm and undertaking to work it; and I cannot now recall a single instance in which the attempt has succeeded; while speedy failure has been the usual result. The assumption that farming is a rude, simple matter, requiring little intellect and less experience, has buried many a well-meaning youth under debts which the best efforts of many subsequent years will barely enable him to pay off. In my opinion, half our farmers now living would say, if questioned, that they might better have waited longer before buying or hiring a farm.

When I was ten years old, my father took a job of clearing off the mainly fallen and partially rotten timber – largely White Pine and Black Ash – from fifty acres of level and then swampy land; and he and his two boys gave most of the two ensuing years (1821-2) to the rugged task. When it was finished, I – a boy of twelve years – could have taken just such a tract of half-burned primitive forest as that was when we took hold of it, and cleared it by an expenditure of seventy to eighty per cent. of the labor we actually bestowed upon that. I had learned, in clearing this, how to economize labor in any future undertaking of the kind; and so every one learns by experience who steadily observes and reflects. He must have been a very good farmer at the start, or a very poor one afterward, who cannot grow a thousand bushels of grain much cheaper at thirty years of age than he could at twenty.

To every young man who has had no farming experience, or very little, yet who means to make farming his vocation, I say, Hire out, for the coming year, to the very best farmer who will give you anything like the value of your labor. Buy a very few choice books, (if you have them not already,) which treat of Geology, Chemistry, Botany, and the application of their truths in Practical Agriculture; give to these the close and thoughtful attention of your few leisure hours; keep your eyes wide open, and set down in a note-book or pocket-diary each night a minute of whatever has been done on the farm that day, making a note of each storm, shower, frost, hail, etc., and also of the date at which each planted crop requires tillage or is ripe enough to harvest, and ascertaining, so far as possible, what each crop produced on the farm has cost, and which of them all are produced at a profit and which at a loss. At the year's end, hire again to the same or another good farmer and pursue the same course; and so do till you shall be twenty-four or twenty-five years of age, which is young enough to marry, and quite young enough to undertake the management of a farm. By this time, if you have carefully saved and wisely invested your earnings, you will have several hundred dollars; and, if you do not choose to migrate to some region where land is very cheap, you will have found some one willing to sell you a small farm on credit, taking a long mortgage as security. Your money – assuming that you have only what you will have earned – will all be wanted to fix up your building, buy a team and cow, with the few implements needed, and supply you with provisions till you can grow some. If you can start thus experienced and full-handed, you may, by diligence, combined with good fortune, begin to make payments on your mortgage at the close of your second year.

I hate debt as profoundly as any one can, but I do not consider this really running into debt. One has more land than he needs, and does not need his pay for it forthwith; another wants land, but lacks the means of present payment. They two enter into an agreement mutually advantageous, whereby

the poorer has the present use and ultimate fee-simple of the farm in question, in consideration of the payment of certain sums as duly stipulated. Technically, the buyer becomes a debtor; practically, I do not regard him as such, until payments fall due which he is unable promptly to meet. Let him rigorously avoid all other debt, and he need not shrink from nor be ashamed of this.

I have a high regard for scientific attainments; I wish every young man were thoroughly instructed in the sciences which underlie the art of farming. But all the learning on earth, though it may powerfully help to make a good farmer, would not of itself make one. When a young man has learned all that seminaries and lectures, books and cabinets, can teach him, he still needs practice and experience to make him a good farmer.

– "But wouldn't you have a young man study in order that he may become a good farmer?"

– If he has money, Yes. I believe a youth worth four or five thousand dollars may wisely spend a tenth of his means in attending lectures, and even courses of study, at any good seminary where Natural Science is taught and applied to Agriculture. But life is short at best; and he who has no means, or very little, cannot really afford to attend even an Agricultural College. He can acquire so much of Science as is indispensable in the cheaper way I have indicated. He cannot wisely consent to spend the best years of his life in getting ready to live.

He who has already mastered the art of farming, and has adequate means, may of course buy a farm to-morrow, though he be barely or not quite of age. He has little to learn from me. Yet I think even such have often concluded, in after years, that they were too hasty in buying land – that they might profitably have waited, and deliberated, and garnered the treasures of experience, before they took the grave step of buying their future home; with regard to which I shall make some suggestions in my next chapter.

But I protest against a young man's declining or postponing the purchase of a farm merely because he is not able to buy a great one. Twenty acres of arable soil near a city or manufacturing village, forty acres in a rural district of any old State, or eighty acres in a region just beginning to be peopled by White men, is an ample area for any one who is worth less than \$2,000. If he understands his business, he will find profitable employment hereon for every working hour: if he does not understand farming, he will buy his experience dear enough on this, yet more cheaply than he would on a wider area. Until he shall have more money than he needs, let him beware of buying more land than he absolutely wants.

V. BUYING A FARM

No one need be told at this day that good land is cheaper than poor – that the former may be bought at less cost than it can be made. Yet this, like most truths, may be given undue emphasis. It should be considered in the light of the less obvious truth that *Every farmer may make advantageous use of SOME poor land*. The smallest farm should have its strip or belt of forest; the larger should have an abundance and variety of trees; and sterile, stony land grows many if not most trees thriftily: Even at the risk of arousing Western prejudice, I maintain that New-England, and all broken, hilly, rocky countries, have a decided advantage (abundantly counterbalanced, no doubt) over regions of great fertility and nearly uniform facility, in that human stupidity and mole-eyed greed can never wholly divest them of forests – that their sterile crags and steep acclivities must mainly be left to wood forever. Avarice may strip them of their covering of to-day; but, defying the plow and the spade, they cannot be so denuded that they will not be speedily reclothed with trees and foliage.

I am not a believer that "Five Acres" or "Ten Acres" suffice for a farm. I know where money is made on even fewer than five acres; but they who do it are few, and men of exceptional capacity and diligence. Their achievements are necessarily confined to the vicinage of cities or manufacturing villages. The great majority of all who live by Agriculture want room to turn upon – want to grow grass and keep stock – and, for such, no mere garden or potato-patch will answer. They want genuine farms.

Yet, go where you may in this country, you will hear a farmer saying of his neighbor, "He has too much land," even where the criticism might justly be reciprocated. We cannot all be mistaken on this head.

There are men who can each manage thousands of acres of tillage, just as there are those who can skillfully wield an army of a hundred thousand men. Napoleon said there were two of this class in the Europe of his day. There are others who cannot handle a hundred acres so that nothing is lost through neglect or oversight. Rules must be adapted to average capacities and circumstances. He who expects to live by cattle-rearing needs many more acres than he who is intent on grain-growing; while he who contemplates vegetable, root, and fruit culture, needs fewer acres still. As to the direction of his efforts, each one will be a law unto himself.

If I were asked, by a young man intent on farming, to indicate the proper area for him, I would say, *Buy just so large a farm as half your means will pay for*. In other words, "If you are worth \$20,000, invest half of it in land, the residue in stock, tools, etc.; and observe the same rule of proportion, whether you be worth \$1,000,000 or only \$1,000. If you are worth just nothing at all, I would invest in land the half of that, and no more. In other words, I would either wait to earn \$500 or over, or push Westward till I found land that costs practically nothing."

This, then, I take to be the gist of the popular criticism on our farmers as having unduly enlarged their borders: *They have more land than they have capital to stock and till to the best advantage*. He who has but fifty acre has too much if he lets part of his land lie idle and unproductive for lack of team or hands to till it efficiently; while he who has a thousand acres has none too much if he has the means and talents wherewith to make the best of it all.

I have said that I consider the soil of New England as cheap, all things considered, for him who is able to buy and work it, as that of Minnesota or Arkansas – that I urge migration to the West only upon those who cannot pay for farms in the old States. I doubt whether the farmers of any other section have, in the average, done better, throughout the last ten years, than the butter-makers of Vermont, the cheese-dairymen of this State. And yet there is, in the ridgy, rocky, *patchy* character of most of our Eastern farms, an insuperable barrier to the most economic, effective cultivation. If the ridges were further apart – if each rocky or gravelly knoll were not in close proximity to a strip of

bog or morass – it would be different. But the genius of our age points unmistakably to cultivation by steam or some other mechanical application of power; and this requires spacious fields, with few or no obstacles to the equable progress of the plow. I apprehend that, for this reason, the growth of bread-corn eastward of the Hudson can never more be considerably extended, so long as the boundless, fertile prairies can so easily pour their exhaustless supplies upon us. Fruits, Vegetables, Roots and Grass, we must continue to grow, probably in ever-increasing abundance; but we of the East will buy our bread-corn largely if not mainly from the West.

He, therefore, who buys land in the Eastern States should regard primarily its capacity to produce those crops in which the East can never be supplanted – Grass, Fruits, Vegetables, Timber. If a farm will also produce good Corn or Wheat, that is a recommendation; but let him place a higher value on those capacities which will be more generally required and drawn upon.

In the West, the case is different; for, though Wheat-culture still recedes before the footsteps of advancing population, and Minnesota may soon cease to grow for others, as Western New-York, Ohio, Indiana, and Northern Illinois, have already done, yet Indian Corn, being the basis of both Beef and Pork, will long hold its own in the Valley of the Ohio and in that of the Upper Mississippi. As it recedes slowly Westward, Clover and Timothy, Butter and Cheese, will press closely on its footsteps.

Good neighbors, good roads, good schools, good mechanics at hand, and a good church within reach, will always be valued and sought: few farmers are likely to disregard them. Let whoever buys a farm whereon to live, resolve to buy once for all, and let him not forget that health is not only wealth but happiness – that an eligible location and a beautiful prospect are elements of enjoyment not only for ourselves but our friends; let him not fancy that all the land will soon be gobbled up and held at exorbitant prices, but believe that money will almost always command money's worth of whatever may be needed, so that he need not embarrass himself to-day through fear that he may not be able to find sellers to-morrow, and he can hardly fail to buy judiciously, and thus escape that worst species of home-sickness – sickness of home.

VI. LAYING OFF A FARM – PASTURING

Whoever finds himself the newly installed owner and occupant of a farm, should, before doing much beyond growing a crop in the ordinary way, study well its character, determine its capacities, make himself well acquainted with its peculiarities of soil and surface, with intent to make the most of it in his future operations. I would devote at least a year to this thoughtful observation and study.

To one reared amid the rugged scenery of New-England; or on either slope of the Allegheny ridge, all prairie farms look alike, just as a European supposes this to be the case with all negroes. A better acquaintance will show the average prairie quarter-section by no means an unbroken meadow, "level as a house-floor," but diversified by water-courses, "sloughs," and gentle acclivities – sometimes by considerable ravines and "barrens" or elevated "swales," thinly covered with timber, or brush, or both. But I will contemplate more especially a Northern farm, made up of hill and vale or glade, rocky ridge and skirting bog or other low land, with a wood-lot on the rear or not far distant, and clumps or belts of timber irregularly lining brook and ravine, or lurking in the angles and sinuosities of walls and wooden fences, and a ragged, mossy orchard sheltered in some quiet nook, or sprawling over some gravelly hill-side. A brook, nearly dry in August, gurgles down the hill-side or winds through the swamp; while fields, moderately sloping here and nearly level there, interposed as they can be, have severally been devoted, for a generation or more, alternately to Grain and Grass – the latter largely preponderating. We will suppose this farm to measure from 50 to 150 acres.

Now, the young man who has bought or inherited this farm may be wholly and consciously unable to enter upon any expensive system of improvement for the next ten years – may fully realize that four or five days of each week must meantime be given to the growing or earning of present bread – yet he should none the less study well the capacities and adaptations of each acre, and mature a comprehensive plan for the ultimate bringing of each field into the best and most useful condition whereof it is susceptible, before he cuts a living tree or digs a solitary drain. He is morally certain of doing something – perhaps many things – that he will sadly wish undone, if he fails to study peculiarities and mature a plan before he begins to improve or to fit his several fields for profitable cultivation.

And the first selection to be made is that of a pasture, since I am compelled to use an old, familiar name for what should be essentially a new thing. This pasture should be as near the center of the farm as may be, and convenient to the barns and barn-yard that are to be. It should have some shade, but no very young trees; should be dry and rolling, with an abundance of the purest living water. The smaller this pasture-lot may be, the better I shall like it, provided you fence it very stoutly, connect it with the barn-yard by a lane if they are not in close proximity, and firmly resolve that, outside of this lot, this lane, this yard and the adjacent stable, your cattle shall never be seen, unless on the road to market. Very possibly, the day may come wherein you will decide to dispense with pasturing altogether; but that is, for the present, improbable. *One* pasture you will have; if you live in the broad West, and purpose to graze extensively, it will doubtless be a large one; but permitting your stock to ramble in Spring and Fall all over your own fields – (and perhaps your neighbors' also) – in quest of their needful food, biting off the tops of the finer young trees, trampling down or breaking off some that are older, rubbing the bark off of your growing fruit-trees, and doing damage that years will be required to repair, I most vehemently protest against.

The one great error that misleads and corrupts mankind is the presumption that *something may be had for nothing*. The average farmer imagines that whatever of flesh or of milk may accrue to him from the food his cattle obtain by browsing over his fields or through his woods, is so much clear gain – that they do the needful work, while he pockets the net proceeds. But the universe was framed on a

plan which requires so much for so much; and this law will not submit to defiance or evasion. Under the unnatural, exceptional conditions which environ the lone squatter on a vast prairie, something may be made by turning cattle loose and letting them shift for themselves; but this is at best transitory, and at war with the exigencies of civilization. Whoever lives within sight of a school-house, or within hearing of a church-bell, is under the dominion of a law alike inexorable and beneficent – the law that requires each to pay for all he gets, and reap only where he has sown.

You can hardly have a pasture so small that it will not afford hospitality to weeds and prove a source of multiform infestations. The plants that should mature and be diffused will be kept down to the earth; those which should be warred upon and eradicated will flourish untouched, ripen their seed, and diffuse it far and wide. Thistles, White Daisy, and every plant that impedes tillage and diminishes crops, are nourished and diffused by means of pastures.

I hold, therefore, that the good farmer will run a mowing-machine over his pasture twice each Summer – say early in June, and then late in July – or, if his lot be too rough for this, will have it clipped at least once with a scythe. Cutting all manner of worthless if not noxious plants in the blossom, will benefit the soil which their seeding would tax; it will render the eradication of weeds from your tillage a far easier task; and it will prevent your being a nuisance to your neighbors. I am confident that no one who has formed the habit of keeping down the weeds in his pasture will ever abandon it.

I think each pasture should have (though mine, as yet, has not) a rude shed or other shelter whereto the cattle may resort in case of storm or other inclemency. How much they shrink as well as suffer from one cold, pelting rain, few fully realize; but I am sure that "the merciful man" who (as the Scripture says) "is merciful to his beast," finds his humanity a good paying investment. I doubt that the rule would fail, even in Texas; but I am contemplating civilized husbandry, not the rude conditions of tropical semi-barbarism. If only by means of stakes and straw, give cattle a chance to keep dry and warm when they must otherwise shiver through a rainy, windy day and night on the cold, wet ground, and I am sure they will pay for it.

In confining a herd of cattle to such narrow limits, I do not intend that they shall be stinted to what grows there. On the contrary, I expect them to be fed on Winter Rye, on Cut Grass, on Sowed Corn, Sorghum, Stalks, Roots, etc., etc., as each shall be in season. With a good mower, it is a light hour's work before breakfast to cut and cart to a dozen or twenty head as much grass or corn as they will eat during the day. But let that point stand over for the present.

VII. TREES – WOODLAND – FORESTS

I am not at all sentimental – much less mawkish – regarding the destruction of trees. Descended from several generations of timber-cutters (for my paternal ancestors came to America in 1640), and myself engaged for three years in land-clearing, I realize that trees exist for use rather than for ornament, and have no more scruple as to cutting timber in a forest than as to cutting grass in a meadow. Utility is the reason and end of all vegetable growth – of a hickory's no less than a corn-stalk's. I have always considered "Woodman, spare that tree," just about the most mawkish bit of badly versified prose in our language, and never could guess how it should touch the sensibilities of any one. Understand, then, that I urge the planting of trees mainly because I believe it will *pay*, and the preservation, improvement, and extension, of forests, for precisely that reason.

Yet I am not insensible to the beauty and grace lent by woods, and groves, and clumps or rows of trees, to the landscape they diversify. I feel the force of Emerson's averment, that "Beauty is its own excuse for being," and know that a homestead embowered in, belted by, stately, graceful elms, maples, and evergreens, is really *worth* more, and will sell for more, than if it were naked field and meadow. I consider it one positive advantage (to balance many disadvantages) of our rocky, hilly, rugged Eastern country, that it will never, in all probability, be so denuded of forests as the rich, facile prairies and swales of the Great Valley may be. Our winds are less piercing, our tornadoes less destructive, than those of the Great West. I doubt whether there is another equal area of the earth's surface whereon so many kinds of valuable trees grow spontaneously and rapidly, defying eradication, as throughout New England and on either slope of the Alleghenies; and this profusion of timber and foliage may well atone for, or may be fairly weighed against, many deficiencies and drawbacks. The Yankee, who has been accustomed to see trees spring up spontaneously wherever they were not kept down by ax, or plow, or scythe, and to cross running water every half mile of a Summer day's journey, may well be made homesick, by two thousand miles of naked, dusty, wind-swept Plains, whereon he finds no water for fifty to a hundred miles, and knows it impossible to cut an ax-helve, much more an axle-tree, in the course of a wearying journey. No Eastern farmer ever realized the blessedness of abundant and excellent wood and water until he had wandered far from his boyhood's home.

No one may yet be able fully to explain the inter-dependence of these two blessings; but the fact remains. All over "the Plains," there is evidence that trees grew and flourished where none are now found, and that springs and streams were then frequent and abiding where none now exist. A prominent citizen of Nevada, who explored southward from Austin to the Colorado, assured me that his party traveled for days in the bed of what had once been a considerable river, but in which it was evident that no water had flowed for years. And I have heard that since the Mormons have planted trees over considerable sections of Utah, rains in Summer are no longer rare, and Salt Lake evinces, by a constant though moderate increase of her volume of waters, that the equilibrium of rain-fall with evaporation in the Great Basin has been fully restored – or rather, that the rain-fall is now taking the lead.

I have a firm faith that all the great deserts of the Temperate and Torrid Zones will yet be reclaimed by irrigation and tree-planting. The bill which Congress did not pass, nor really consider, whereby it was proposed, some years since, to give a section of the woodless Public Lands remote from settlement to every one who, in a separate township, would plant and cherish a quarter-section of choice forest-trees, ought to have been passed – with modifications, perhaps, but preserving the central idea. Had ten thousand quarter-sections, in so many different townships of the Plains, been thus planted to timber ten to twenty years ago, and protected from fire and devastation till now, the value of those Plains for settlement would have been nearly or quite doubled.

A capital mistake, it seems to me, is being made by some of the dairy farmers of our own State. One who has a hundred acres of good soil, whereof twenty or thirty are wooded, cuts off his timber entirely, calculating that the additional grass that he may grow in its stead will pay for all the coal he needs for fuel, so that he will make a net gain of the time he has hitherto devoted each Winter to cutting and hauling wood. He does not consider how much his soil will lose in Summer moisture, how his springs and runnels will be dried up, nor how the sweep of harsh winds will be intensified, by baring his hill-tops and ravines to sun and breeze so utterly. In my deliberate judgment, a farm of one hundred acres will yield *more* feed, with far greater uniformity of product from year to year, if twenty acres of its ridge-crests, ravine-sides, and rocky places, are thickly covered with timber, than if it be swept clean of trees and all devoted to grass. Hence, I insist that the farmer who sweeps off his wood and resolves to depend on coal for fuel, hoping to increase permanently the product of his dairy, makes a sad miscalculation.

Spain, Italy, and portions of France, are now suffering from the improvidence that devoured their forests, leaving the future to take care of itself. I presume the great empires of antiquity suffered from the same folly, though to a much greater extent. The remains of now extinct races who formerly peopled and tilled the central valleys of this continent, and especially the Territory of Arizona, probably bear witness to a similar recklessness, which is paralleled by our fathers' and our own extermination of the magnificent forests of White Pine which, barely a century ago, covered so large a portion of the soil of our Northern States. Vermont sold White Pine abundantly to England through Canada within my day: she is now supplying her own wants from Canada at a cost of not less than five times the price she sold for; and she will be paying still higher rates before the close of this century. I entreat our farmers not to preserve every tree, good, bad, or indifferent, that may happen to be growing on their lands – but, outside of the limited districts wherein the primitive forest must still be cut away in order that land may be obtained for cultivation, to *plant and rear at least two better trees for every one they may be impelled to cut down*. How this may, in the average, be most judiciously done, I will try to indicate in the succeeding chapter.

VIII. GROWING TIMBER – TREE-PLANTING

In my judgment, the proportion of a small farm that should be constantly devoted to trees (other than fruit) is not less than one-fourth; while, of farms exceeding one hundred acres in area, that proportion should be not less than one-third, and may often be profitably increased to one-half. I am thinking of such as are in good part superficially rugged and rocky, or sandy and sterile, such as New-England, eastern New-York, northern New-Jersey, with both slopes of the Alleghenies, as well as the western third of our continent, abound in. It may be that it is advisable to be content with a smaller proportion of timber in the Prairie States and the broad, fertile intervalles which embosom most of our great rivers for at least a part of their course; but I doubt it. And there is scarcely a farm in the whole country, outside of the great primitive forests in which openings have but recently been made, in which *some* tree-planting is not urgently required.

"Too much land," you will hear assigned on every side as a reason for poor farming and meager crops. Ask an average farmer in New-England, in Virginia, in Kentucky, or in Alabama, why the crops of his section are in the average no better, and the answer, three times in four, will be, "Our farmers have too much land" – that is, not too much absolutely, but too much relatively to their capital, stock, and general ability to till effectively. The habitual grower of poor crops will proffer this explanation quite as freely and frequently as his more thrifty neighbor. And what every one asserts must have a basis of truth.

Now, I do not mean to quarrel with the instinct which prompts my countrymen to buy and hold too much land. They feel, as I do, that land is still cheap almost anywhere in this country – cheap, if not in view of the income now derived from it, certainly in contemplation of the price it must soon command and the income it might, under better management, be made to yield. Under this conviction – or, if you please, impression – every one is intent on holding on to more land than he can profitably till, if not more than he can promptly pay for.

What I *do* object to is simply this – that thousands, who have more land than they have capital to work profitably, will persist in half-tilling many acres, instead of thoroughly farming one-half or one third so many, and getting the rest into wood so fast as may be. I am confident that two-thirds of all our farmers would improve their circumstances and increase their incomes by concentrating their efforts, their means, their fertilizers, upon half to two-thirds of the area they now skim and skin, and giving the residue back to timber-growing.

In my own hilly, rocky, often boggy, Westchester – probably within six of being the oldest Agricultural County in the Union – I am confident that ten thousand acres might to-morrow be given back to forest with profit to the owners and advantage to all its inhabitants. It is a fruit-growing, milk-producing, truck-farming county, closely adjoining the greatest city of the New World; hence, one wherein land can be cultivated as profitably as almost anywhere else – yet I am satisfied that half its surface may be more advantageously devoted to timber than to grass or tillage. Nay; I doubt that one acre in a hundred of rocky land – that is, land ribbed or dotted with rocks that the bar or the rock-hook cannot lift from their beds, and which it will not as yet pay to blast – is now tilled to profit, or ever will be until it shall be found advisable to clear them utterly of stone breaking through or rising within two feet of the surface. The time will doubtless arrive in which many fields will pay for clearing of stone that would not to-day; these, I urge, should be given up to wood now, and kept wooded until the hour shall have struck for ridding them of every impediment to the steady progress of both the surface and the subsoil plow.

Were all the rocky crests and rugged acclivities of this County bounteously wooded once more, and kept so for a generation, our floods would be less injurious, our springs unfailing, and our streams

more constant and equable; our blasts would be less bitter, and our gales less destructive to fruit; we should have vastly more birds to delight us by their melody and aid us in our not very successful war with devouring insects; we should grow peaches, cherries, and other delicate fruits, which the violent caprices of our seasons, the remorseless devastations of our visible and invisible insect enemies, have all but annihilated; and we should keep more cows and make more milk on two-thirds of the land now devoted to grass than we actually do from the whole of it. And what is true of Westchester is measurably true of every rural county in the Union.

I have said that I believe in cutting trees as well as in growing them; I have not said, and do not mean to say, that I believe in cutting everything clean as you go. That was once proper in Westchester; it is still advisable in forest-covered regions, where the sun must be let in before crops can be grown; but, in nine cases out of ten, timber should be thinned or culled out rather than cut off; and, for every tree taken away, at least two should be planted or set out.

We have pretty well outgrown the folly of letting every apple-tree bear such fruit as it will; though in the orchard of my father's little farm in Amherst, N. H., whereon I was born, no tree had ever been grafted when I bade adieu to it in 1820; and I presume none has been to this day. By this time, almost every farmer realizes that he *can't afford* to grow little, gnarly, villainously sour or detestably bitter-sweet apples, when, by duly setting a graft at a cost of two dimes, he may make that identical tree yield Greenings or Pippins at least as bounteously. I presume the cumulative experience of fifty or sixty generations of apple-growers has ripened this conclusion. Why do they not infer readily and generally that growing indifferent timber where the best and most valued would grow as rapidly, is a stupid, costly blunder? It seems to me that whoever has attained the conviction that apple-trees should be grafted ought to know that it is wasteful to grow Red Oak, Beech, White Maple, and Alder, where White Oak, Hickory, Locust, and White Pine, might be grown with equal facility, in equal luxuriance, provided the right seeds were planted, and a little pains taken to keep down, for a year or two, the shoots spontaneously sent up by the wrong ones.

North of the Potomac, and east of the Ohio, and (I presume) in limited districts elsewhere, rocky, sterile woodlands, costing \$2 to \$50 per acre according to location, etc., are to-day the cheapest property to be bought in the United States. Even though nothing were done with them but keep out fire and cattle, and let the young trees grow as they will, money can be more profitably and safely invested in lands covered by young timber than in anything else. The parent, who would invest a few thousands for the benefit of children or grandchildren still young, may buy woodlands which will be worth twenty times their present cost within the next twenty years. But better even than this would it be to buy up rocky, craggy, naked hill-sides and eminences which have been pastured to death, and, shutting out cattle inflexibly, scratch these over with plow, mattock, hoe, or pick, as circumstances shall dictate, plant them thickly with Chestnut, Walnut, Hickory, White Oak, and the seeds of Locust and White Pine. I say Locust, though not yet certain that this tree must not be started in garden or nursery-beds and transplanted when two or three years old, so puny and feeble is it at the outset, and so likely to be smothered under leaves or killed out by its more favored neighbors. I have experiments in progress not yet matured, which may shed light on this point before I finish these essays.

Plant thickly, and of diverse kinds, so as to cover the ground promptly and choke out weeds and shrubs, with full purpose to thin and prune as circumstances shall dictate.

Many farmers are averse to planting timber, because (they think) nothing can be realized therefrom for the next twenty or thirty years, which is as long as they expect to live. But this is a grave miscalculation. Let us suppose a rocky, hilly pasture-lot of ten or twenty acres rudely scratched over as I have suggested, and thickly seeded with hickory nuts and white oak acorns only: within five years, it will yield abundantly of hoop poles, though the better, more promising half be left to mature, as they should be; two years later, another and larger crop of hoop-poles may be cut, still sparing the best; and thenceforth a valuable crop of timber may be taken from that land; for, if cut at the proper season, at least two thrifty sprouts will start from every stump; and so that wood will yield a clear

income each year while its best trees are steadily growing and maturing. I do not advise restriction to those two species of timber; but I insist that a young plantation of forest-trees may and should yield a clear income in every year after its fourth.

As to the Far West – the Plains, the Parks, and the Great Basin – there is more money to be made by dotting them with groves of choice timber than by working the richest veins of the adjacent mountains. Whoever will promptly start, near a present or prospective railroad, forty acres of choice trees – Hickory, White Oak, Locust, Chestnut, and White Pine – within a circuit of three hundred miles from Denver, on land which he has made or is making provision to irrigate – may begin to sell trees therefrom two years hence, and persist in selling annually henceforth for a century – at first, for transplanting; very soon, for a variety of uses in addition to that.

– But this paper grows too long, and I must postpone to the next my more especial suggestions to young farmers with regard to tree-planting.

IX.

PLANTING AND GROWING TREES

Whoever has recently bought, inherited, or otherwise become the owner of a farm, has usually found some part or parts of it devoted to wood; and this, if not in excess, he will mainly preserve, while he studies and plans with a view to the ultimate devotion to timber of just those portions of his land that are best adapted to that use. In locating that timber, I would have him consider these suggestions:

I. Land wisely planted with trees, and fenced so far as need be to keep out cattle, costs nothing. Whatever else you grow involves labor and expenditure; trees grow of their own accord. You may neglect them utterly – may wander over the earth and be absent for ten or twenty years, while your fences decay and your fields are overcropped to exhaustion; even your meadows may be run out by late mowing and close feeding at both ends of the season, till a dozen acres will hardly subsist a span of horses and a cow; but your woods need only to be let alone to insure that their value shall have decidedly increased during your absence. They will richly reward labor and care in thinning, trimming, and transplanting – you may profitably employ in them any time that you can spare them – but they will do very well if simply let alone. And, unlike any other product with which I am acquainted, you may take crop after crop of wood from the same lot, and the soil will be richer and more productive after the last than it was before the first. Whether wholly because their roots permeate and break up the soil during their life and enrich it in their decay, or for diverse reasons, it is certainly true that land – and especially *poor* land – is enriched by growing upon it a crop of almost any timber, the evergreens possibly excepted. So, should you ever have land that you cannot till to profit, whether because it is too poor, or because you have a sufficiency that is better, you should at once devote it to wood.

II. Your springs and streams will be rendered more equable and enduring by increasing the area and the luxuriance of your timber. They may have become scanty and capricious under a policy of reckless, wholesale destruction of trees; they will be reënforced and reinvigorated by doubling the area of your woods, while quadrupling the number, and increasing the average size, of your trees.

III. All ravines and steep hill-sides should be devoted to trees. Every acre too rocky to be thoroughly cleared of stone and plowed should be set apart for tree-growing. Wherever the soil will be gullied or washed away by violent rains if under tillage, it should be excluded from cultivation and given up to trees. Men often doubt the profit of heavy manuring; and well they may, if three-fourths of the fertilizers applied are soaked out and swept away by flooding rains or sudden thaws and floated off to some distant sea or bay; but let all that is applied to the soil only remain there till it is carted away in crops, and it will hardly be possible to manure too highly for profit.

IV. Trees, especially evergreens, may be so disposed as to modify agreeably the average temperature of your farm, or at least of the most important parts of it. When I bought my place – or rather the first installment of it – the best spot I could select for a garden lay at the foot of a hill which half surrounded it on the south and east, leaving it exposed to the full sweep of north and north-west winds; so that, though the soil was gravelly and warm, my garden was likely to be cold and backward. To remedy this, I planted four rows of evergreens (Balsam Fir, Pine, Red Cedar, and Hemlock), along a low ridge bounding it on the north, following an inward curve of the ridge at its west end; and those evergreens have in sixteen years grown into very considerable trees, forming a shady, cleanly, inviting bower, or sylvan retreat, daintily carpeted with the fallen leaves of the overhanging firs. I judge that the average temperature of the soil for some yards southward of this wind-break is at least five degrees higher, throughout the growing season, than it formerly was or would now be if these evergreens were swept away; while the aspect of the place is agreeably diversified, and even

beautified, by their appearance. I believe it would sell for some hundreds of dollars more with than without that thrifty, growing clump of evergreens.

V. I have already urged, though not strongly enough, that crops, as well as springs, will be improved by keeping the crests of ridges thickly wooded, thus depositing moisture in Winter and Spring, to be slowly yielded to the adjacent slopes during the heat and drouth of Summer. I firmly believe that the slopes of a hill whose crest is heavily wooded will yield larger average crops than slope and crest together would do if both were bare of trees.

VI. The banks of considerable streams, ponds, etc., may often be so planted with trees that these will shade more water than land, to the comfort and satisfaction of the fish, and the protection of those banks from abrasion by floods and rapid currents. Sycamore, Elm, and Willow, do well here; if choice Grape-Vines are set beside and allowed to run over some of them, the effect is good, and the grapes acceptable to man and bird.

VII. Never forget that a good tree grows as thriftily and surely as a poor one. Many a farmer has to-day ten to forty acres of indifferent cord-wood where he might, at a very slight cost, have had instead an equal quantity of choice timber, worth ten times as much. Hickory, Chestnut, and Walnut, while they yield nuts that can be eaten or sold, are worth far more as timber than an equal bulk of Beech, Birch, Hemlock, or Red Oak. Chestnut has more than doubled in value within the last few years, mainly because it has been found excellent for the inside wood-work of dwellings. Locust also seems to be increasing in value. Ten acres of large, thrifty Locust near this City would now buy a pretty good farm; as I presume it would, if located near any of our great cities.

VIII. Where several good varieties of Timber are grown together, some insect or atmospheric trouble may blast one of them, yet leave the residue alive and hearty. And, if all continue thrifty, some may be cut out and sold, leaving others more room to grow and rapidly attain a vigorous maturity.

IX. Wherever timber has become scarce and valuable, a wood-lot should be thinned out, nevermore cleared off, unless it is to be devoted to a different use. It seems to me that destroying a forest because we want timber is like smothering a hive of bees because we want honey.

X. Timber should be cut with intelligent reference to the future. Locust and other valuable trees that it is desirable should throw up shoots from the stump, and rapidly reproduce their kind, should be cut in March or April; while trees that you want to exterminate should be cut in August, so that they may *not* sprout. There may be exceptions to this rule; but I do not happen to recollect any. Evergreens do not sprout; and I think these should be cut in Winter – at all events, not in Spring, when full of sap and thus prone to rapid decay.

XI. Your plantation will furnish pleasant and profitable employment at almost any season. I doubt that any one in this country has ever yet bestowed so much labor and care on a young forest as it will amply reward. Sow your seeds thickly; begin to thin the young trees when they are a foot high, and to trim them so soon as they are three feet, and you may have thousands thriving on a fertile acre, and pushing their growth upward with a rapidity and to an altitude outrunning all preconception.

XII. Springs and streams will soon appear where none have appeared and endured for generations, when we shall have re clothed the nakedness of the Plains with adequate forests. Rains will become moderately frequent where they are now rare, and confined to the season when they are of least use to the husbandman.

I may have more to say of trees by-and-by, but rest here for the present. The importance of the topic can hardly be overrated.

X. DRAINING – MY OWN

My farm is in the township of Newcastle, Westchester County, N. Y., 35 miles from our City Hall, and a little eastward of the hamlet known as Chappaqua, called into existence by a station on the Harlem Railroad. It embraces the south-easterly half of the marsh which the railroad here traverses from south to north – my part measuring some fifteen acres, with five acres more of slightly elevated dry land between it and the foot of the rather rugged hill which rises thence on the east and on the south, and of which I now own some fifty acres, lying wholly eastward of my low land, and in good part covered with forest. Of this, I bought more than half in 1853, and the residue in bits from time to time as I could afford it. The average cost was between \$130 and \$140 per acre: one small and poor old cottage being the only building I found on the tract, which consisted of the ragged edges of two adjacent farms, between the western portions of which mine is now interposed, while they still adjoin each other beyond the north and south road, half a mile from the railroad, on which their buildings are located and which forms my eastern boundary. My stony, gravelly upland mainly slopes to the west; but two acres on my east line incline toward the road which bounds me in that direction, while two more on my south-east corner descend to the little brook which, entering at that corner, keeps irregularly near my south line, until it emerges, swelled by a smaller runnel that enters my lowland from the north and traverses it to meet and pass off with the larger brooklet aforesaid. I have done some draining, to no great purpose, on the more level portions of my upland; but my lowland has challenged my best efforts in this line, and I shall here explain them, for the encouragement and possible guidance of novices in draining. Let me speak first of

My Difficulties.— This marsh or bog consisted, when I first grappled with it, of some thirty acres, whereof I then owned less than a third. To drain it to advantage, one person should own it all, or the different owners should coöperate; but I had to go it alone, with no other aid than a freely accorded privilege of straightening as well as deepening the brook which wound its way through the dryer meadow just below me, forming here the boundary of two adjacent farms. I spent \$100 on this job, which is still imperfect; but the first decided fall in the stream occurs nearly a mile below me; and you tire easily of doing at your own cost work which benefits several others as much as yourself. My drainage will never be perfect till this brook, with that far larger one in which it is merged sixty rods below me, shall have been sunk three or four feet, at a further expense of at least \$500.

This bog or swamp, when I first bought into it, was mainly dedicated to the use of frogs, muskrats and snapping-turtles. A few small water-elms and soft maples grew upon it, with swamp alder partly fringing the western base of the hill east of it, where the rocks which had, through thousands of years, rolled from the hill, thickly covered the surface, with springs bubbling up around and among them. Decaying stumps and imbedded fragments of trees argued that timber formerly covered this marsh as well as the encircling hills. A tall, dense growth of blackberry briars, thoroughwort, and all manner of marsh-weeds and grasses, covered the center of the swamp each Summer; but my original portion of it, being too wet for these, was mainly addicted to hassocks or tussocks of wiry, worthless grass; their matted roots rising in hard bunches a few inches above the soft, bare, encircling mud. The bog ranged in depth from a few inches to five or six feet, and was composed of black, peaty, vegetable mold, diversified by occasional streaks of clay or sand, all resting on a substratum of hard, coarse gravel, out of which two or three springs bubbled up, in addition to the half a dozen which poured in from the east, and a tiny rivulet which (except in a very dry, hot time) added the tribute of three or four more, which sprang from the base of a higher shelf of the hill near the middle of what is now my farm. Add to these that the brook which brawled and foamed down my hill-side near my south line as aforesaid, had brought along an immensity of pebbles

and gravel of which it had mainly formed my five acres of dryer lowland, had thus built up a pretty swale, whereon it had the bad habit of filling up one channel, and then cutting another, more devious and eccentric, if possible, than any of its predecessors – and you have some idea of the obstacles I encountered and resolved to overcome. One of my first substantial improvements was the cutting of a straight channel for this current and, by walling it with large stones, compelling the brook to respect necessary limitations. It was not my fault that some of those stones were set nearly upright, so as to veneer the brook rather than thoroughly constrain it: hence, some of the stones, undermined by strong currents, were pitched forward into the brook by high Spring freshets, so as to require resetting more carefully. This was a mistake, but, not one of

My Blunders.— These, the natural results of inexperience and haste, were very grave. Not only had I had no real experience in draining when I began, but I could hire no foreman who knew much more of it than I did. I ought to have begun by securing an ample and sure fall where the water left my land, and next cut down the brooklet or open ditch into which I intended to drain to the lowest practicable point – so low, at least, that no drain running into it should ever be troubled with back-water. Nothing can be more useless than a drain in which water stagnates, choking it with mud. Then I should have bought hundreds of Hemlock or other cheap boards, slit them to a width of four or five inches, and, having opened the needed drains, laid these in the bottom and the tile thereupon, taking care to *break joint*, by covering the meeting ends of two boards with the middle of a tile. Laying tile in the soft mud of a bog, with nothing beneath to prevent their sinking, is simply throwing away labor and money. I cannot wonder that tile-draining seems to many a humbug, seeing that so many tile are laid so that they can never do any good.

Having, by successive purchases, become owner of fully half of this swamp, and by repeated blunders discovered that making stone drains in a bog, while it is a capital mode of getting rid of the stone, is no way at all to dry the soil, I closed my series of experiments two years since by carefully relaying my generally useless tile on good strips of board, sinking them just as deep as I could persuade the water to run off freely, and, instead of allowing them to discharge into a brooklet or open ditch, connecting each with a covered main of four to six-inch tile; these mains discharging into the running brook which drains all my farm and three or four of those above it just where it runs swiftly off from my land. If a thaw or heavy rain swells the brook (as it sometimes will) so that it rises above my outlet aforesaid, the strong current formed by the concentration of the clear contents of so many drains will not allow the muddy water of the brook to back into it so many as three feet at most; and any mud or sediment that may be deposited there will be swept out clean whenever the brook shall have fallen to the drainage level. For this and similar excellent devices, I am indebted to the capital engineering and thorough execution of Messrs. Chickering & Gall, whose work on my place has seldom required mending, and never called for reconstruction.

My Success.— I judge that there are not many tracts more difficult to drain than mine was, considering all the circumstances, except those which are frequently flowed by tides or the waters of some lake, or river. Had I owned the entire swamp, or had there been a fall in the brook just below me, had I had any prior experience in draining, or had others equally interested coöperated in the good work, my task would have been comparatively light. As it was, I made mistakes which increased the cost and postponed the success of my efforts; but this is at length complete. I had seven acres of Indian Corn, one of Corn Fodder, two of Oats, and seven or eight acres of Grass, on my lowland in 1869; and, though the Spring months were quite rainy, and the latter part of Summer rather dry, my crops were all good. I did not see better in Westchester County; and I shall be quite content with as good hereafter. Of my seven hundred bushels of Corn (ears,) I judge that two-thirds would be accounted fit for seed anywhere; my Grass was cut twice, and yielded one large crop and another heavier than the average first crop throughout our State. My drainage will require some care henceforth; but the fifteen acres I have reclaimed from utter uselessness and obstructions are decidedly the best part of my farm, Uplands may be exhausted; these never can be.

The experience of another season (1870) of protracted drouth has fully justified my most sanguine expectations. I had this year four acres of Corn, and as many of Oats, on my swamp, with the residue in Grass; and they were all good. I estimate my first Hay-crop at over two and a half tuns per acre, while the rowen or aftermath barely exceeded half a tun per acre, because of the severity of the drouth, which began in July and lasted till October. My Oats were good, but not remarkably so; and I had 810 bushels of ears of sound, ripe Corn from four acres of drained swamp and two and a half of upland. I estimate my upland Corn at seventy (shelled) bushels, and my lowland at fifty-five (shelled) bushels per acre. Others, doubtless, had more, despite the unpropitious season; but my crop was a fair one, and I am content with it. My upland Corn was heavily manured; my lowland but moderately. There are many to tell you how much I lose by my farming; I only say that, as yet, no one else has lost a farthing by it, and I do not complain.

XI. DRAINING GENERALLY

Having narrated my own experience in draining with entire unreserve, I here submit the general conclusions to which it has led me:

I. While I doubt that there is *any* land above water that would not be improved by a good system of underdrains, I am sure that there is a great deal that could not at present be drained to profit. Forests, hill-side pastures, and most dry gravelly or sandy tracts, I place in this category. Perhaps one-third of New-England, half of the Middle States, and three-fourths of the Mississippi Valley, may ultimately be drained with profit.

II. *All* swamp lands without exception, nearly all clay soils, and a majority of the flat or gently rolling lands of this country, must eventually be drained, if they are to be tilled with the best results. I doubt that there is a garden on earth that would not be (unless it already had been) improved by thorough underdraining.

III. The uses of underdrains are many and diverse. To carry off surplus water, though the most obvious, stands by no means alone. 1. Underdrained land may be plowed and sowed considerably earlier in Spring than undrained soil of like quality. 2. Drained fields lose far less than others of their fertility by washing. 3. They are not so liable to be gullied by sudden thaws or flooding rains. 4. Where a field has been deeply subsoiled, I am confident that it will remain mellow and permeable by roots longer than if undrained. 5. Less water being evaporated from drained than from undrained land, the soil will be warmer throughout the growing season; hence, the crop will be heavier, and will mature earlier. 6. Being more porous and less compact, I think the soil of a drained field retains more moisture in a season of drouth, and its growing plants suffer less therefrom, than if it were undrained. In short, I thoroughly believe in underdraining.

IV. Yet I advise no man to run into debt for draining, as I can imagine a mortgage on a farm so heavy and pressing as to be even a greater nuisance than stagnant water in its soil. Labor and tile are dear with us; I do not expect that either will ever be so cheap here as in England or Belgium. What I *would* have each farmer in moderate circumstances do is to *drain his wettest field* next Fall – that is, after finishing his haying and before cutting up his corn – taking care to secure abundant fall to carry off the water in time of flood, and doing his work thoroughly. Having done this, let him subsoil deeply, fertilize amply, till carefully, and watch the result. I think it will soon satisfy him that such draining pays.

V. I do not insist on tile as making the only good drain; but I have had no success with any other. The use of stone, in my opinion, is only justified where the field to be drained abounds in them and no other use can be made of them. To make a good drain with ordinary boulders or cobble-stones requires twice the excavation and involves twice the labor necessarily expended on tile-draining; and it is neither so effective nor so durable. Earth will be carried by water into a stone drain; rats and other vermin will burrow in it and dig (or enlarge) holes thence to the surface; in short, it is not the thing. Better drain with stone where they are a nuisance than not at all; but I predict that you will dig them up after giving them a fair trial and replace them with tile. In a wooded country, where tile were scarce and dear, I should try draining with slabs or cheap boards dressed to a uniform width of six or eight inches, and laid in a ditch dug with banks inclined or sloped to the bottom, so as to form a sort of V; the lower edge of the two side-slabs coming together at the bottom, and a third being laid widely across their upper edges, so as to form a perfect cap or cover. In firm, hard soil, this would prove an efficient drain, and, if well made, would last twenty years. Uniformity of temperature and of moisture would keep the slabs tolerably sound for at least so long; and, if the top of this drain were two feet below the surface, no plowing or trampling over it would harm it.

VI. As to draining by what is called a Mole Plow, which simply makes a waterway through the subsoil at a depth of three feet or thereabout, I have no acquaintance with it but by hearsay. It seems to me morally impossible that drains so made should not be lower at some points than at others, so as to retain their fill of water instead of carrying it rapidly off; and I am sure that plowing, or even carting heavy loads over them, must gradually choke and destroy them. Yet this kind of draining is comparatively so cheap, and may, with a strong team, be effected so rapidly, that I can account for its popularity, especially in prairie regions. Where the subsoil is rocky, it is impracticable; where it is hard-pan, it must be very difficult; where it is loose sand, it cannot endure; but in clays or heavy loams, it may, for a few years, render excellent service. I wish the heavy clays of Vermont, more especially of the Champlain basin, were well furrowed or pierced by even such drains; for I am confident that they would temporarily improve both soil and crop; and, if they soon gave out, they would probably be replaced by others more durable.

– I shall not attempt to give instructions in drain-making; but I urge every novice in the art to procure Waring's or some other work on the subject and study it carefully: then, if he can obtain at a fair price the services of an experienced drainer, hire him to supervise the work. One point only do I insist on – that is, draining into a main rather than an open ditch or brook; for it is difficult in this or any harsher climate to prevent the crumbling of your outlet tile by frost. Below the Potomac or the Arkansas, this may not be apprehended; and there it may be best to have your drains separately discharge from a road-side bank or into an open ditch, as they will thus inhale more air, and so help (in Summer) to warm and moisten the soil above them; but in our climate I believe it better to let your drains discharge into a covered main or mains as aforesaid, than into an open ditch or brook.

Tile and labor are dear with us; I presume labor will remain so. But, in our old States, there are often laborers lacking employment in November and the Winter months; and it is the wisest and truest charity to proffer them pay for work. Some will reject it unless the price be exorbitant; but there are scores of the deserving poor in almost every rural county, who would rather earn a dollar per day than hang around the grog-shops waiting for Spring. Get your tiles when you can, or do not get them at all, but let it be widely known that you have work for those who will do it for the wages you can afford, and you will soon have somebody to earn your money. Having staked out your drains, set these to work at digging them, even though you should not be able to tile them for a year. Cut your outlet deep, and your land will profit by a year of open drains.

XII. IRRIGATION – MEANS AND ENDS

While few can have failed to realize the important part played by Water in the economy of vegetation, I judge that the question – "How can I secure to my growing plants a sufficiency of moisture at all times?" – has not always presented itself to the farmer's mind as demanding of him a practical solution. To rid his soil and keep it free of superfluous, but especially of stagnant water, he may or may not accept as a necessity; but that, having provided for draining away whatever is excessive, he should turn a short corner and begin at once to provide that water shall be supplied to his fields and plants whenever they may need it, he is often slow to apprehend. Yet this provision is but the counterpart and complement of the other.

I had sped across Europe to Venice, and noted with interest the admirable, effective irrigation of the great plain of Lombardy, before I could call any land my own. I saw there a region perhaps thirty miles wide by one hundred and fifty along the east bank of the Po, rising very gently thence to the foot of the Austrian Alps, which Providence seems to have specially adapted to be improved by irrigation. The torrents of melted snow which in Spring leap and foam adown the southern face of the Alps, bringing with them the finer particles of soil, are suddenly arrested and form lakes (Garda, Maggiore, Como, etc.) just as they emerge upon the plain. These lakes, slowly rising, often overflow their banks, with those of the small rivers that bear their waters westward to the Po; and this overflow was a natural source of abiding fertility. To dam these outlets, and thus control their currents, was a very simple and obvious device of long ago, and was probably begun by a very few individuals (if by more than one), whose success incited emulation, until the present extensive and costly system of irrigating dams and canals was gradually developed. When I traversed Lombardy in July, 1851, the beds of streams naturally as large as the Pemigewasset, Battenkill, Canada Creek, or Humboldt, were utterly dry; the water which would naturally have flowed therein being wholly transferred to an irrigating canal (or to canals) often two or three miles distant. The reservoirs thus created were filled in Spring, when the streams were fullest and their water richest, and gradually drawn upon throughout the later growing season to cover the carefully leveled and graded fields on either side to the depth of an inch or two at a time. If any failed to be soon absorbed by the soil, it was drawn off as here superfluous, and added to the current employed to moisten and fertilize the field next below it; and so field after field was refreshed and enriched, to the husbandman's satisfaction and profit. It may be that the rich glades of English Lancashire bear heavier average crops; but those of Lombardy are rarely excelled on the globe.

Why should not our Atlantic slope have its Lombardy? Utah, Nevada, and California, exhibit raw, crude suggestions of such a system; but why should the irrigation of the New World be confined to regions where it is indispensable, when that of the Old is not? I know no good reason whatever for leaving an American field unirrigated where water to flow it at will can be had at a moderate cost.

When I first bought land (in 1853) I fully purposed to provide for irrigating my nearly level acres at will, and I constructed two dams across my upland stream with that view; but they were so badly planned that they went off in the flood caused by a tremendous rain the next Spring; and, though I rebuilt one of them, I submitted to a miscalculation which provided for taking the water, by means of a syphon, out of the pond at the top and over the bank that rose fifteen or twenty feet above the surface of the water. Of course, air would work into the pipe after it had carried a stream unexceptionably for two or three days, and then the water would run no longer. Had I taken it from the bottom of the pond through my dam, it would have run forever, (or so long as there was water covering its inlet in the pond;) but bad engineering flung me; and I have never since had the heart (or the means) to revise and correct its errors.

My next attempt was on a much humbler scale, and I engineered it myself. Toward the north end of my farm, the hill-side which rises east of my lowland is broken by a swale or terrace, which gives me three or four acres of tolerably level upland, along the upper edge of which five or six springs, which never wholly fail, burst from the rocks above and unite to form a petty runnel, which dries up in very hot or dry weather, but which usually preserved a tiny stream to be lost in the swamp below. North of the gully cut down the lower hill-side by this streamlet, the hill-side of some three acres is quite steep, still partially wooded, and wholly devoted to pasturage. Making a petty dam across this runnel at the top of the lower acclivity, I turned the stream aside, so that it should henceforth run along the crest of this lower hill, falling off gradually so as to secure a free current, and losing its contents at intervals through variable depressions in its lower bank. Dam and artificial water-course together cost me \$90, which was about twice what it should have been. That rude and petty contrivance has now been ten years in operation, and may have cost \$5 per annum for oversight and repairs. Its effect has been to double the grass grown on the two acres it constantly irrigates, for which I paid \$280, or more than thrice the cost of my irrigation. But more: my hill-side, while it was well grassed in Spring, always gave out directly after the first dry, or hot week; so that, when I most needed feed, it afforded none; its herbage being parched up and dead, and thus remaining till refreshed by generous rains. I judge, therefore, that my irrigation has *more* than doubled the product of those two acres, and that these are likely to lose nothing in yield or value so long as that petty irrigating ditch shall be maintained.

I know this is small business. But suppose each of the hundred thousand New-England farms, whereof five to ten acres might be thus irrigated at a cost not exceeding \$100 per farm, had been similarly prepared to flow those acres last Spring and early Summer, with an average increase therefrom of barely one tun of Hay (or its equivalent in pasturage) per acre. The 500,000 tuns of Hay thus realized would have saved 200,000 head of cattle from being sent to the butcher while too thin for good beef, while every one of them was required for further use, and will have to be replaced at a heavy cost. Shall not these things be considered? Shall not all who can do so at moderate cost resolve to test on their own farms the advantages and benefits that may be secured by Irrigation?

XIII. THE POSSIBILITIES OF IRRIGATION

I have given an account of my poor, little experiment in Irrigation, because it is one which almost every farmer can imitate and improve upon, however narrow his domain and slender his fortune. I presume there are Half a Million homesteads in the United States which have natural facilities for Irrigation at least equal to mine; many of them far greater. Along either slope of the Alleghenies, throughout a district at least a thousand miles long by three hundred wide, nearly every farm might be at least partially irrigated by means of a dam costing from twenty-five to one hundred dollars; so might at least half the farms in New-England and our own State. On the prairies, the plans must be different, and the expense probably greater, but the results obtained would bounteously reward the outlay. I shall not see the day, but there are those now living who *will* see it, when Artesian wells will be dug at points where many acres may be flowed from a gentle swell in the midst of a vast plain, or at the head of a fertile valley, expressly, or at least mainly, that its waters may be led across that plain, adown that valley, in irrigating streams and ditches, until they have been wholly drank up by the soil. I have seen single wells in California that might be made to irrigate sufficiently hundreds of acres, by the aid of a reservoir into which their waters could be discharged when the soil did not require them, and there retained until the thirsty earth demanded them.

An old and successful farmer in my neighborhood affirms that Water is the cheapest and best fertilizer ever applied to the soil. If this were understood to mean that no other is needed or can be profitably applied, it would be erroneous. Still, I think it clearly true that the annual product of most farms can be increased, and the danger of failure averted, more cheaply by the skillful application of water than by that of any other fertilizer whatever, Plaster (Gypsum) possibly excepted.

I took a run through Virginia last Summer, not far from the 1st of August. That State was then suffering intensely from drouth, as she continued to do for some weeks thereafter. I am quite sure that I saw on her thirsty plains and hillsides not less than three hundred thousand acres planted with Indian Corn, whereof the average product could not exceed ten bushels per acre, while most of it would fall far below that yield, and there were thousands of acres that would not produce one sound ear! Every one deplored the failure, correctly attributing it to the prevailing drouth. And yet, I passed hundreds if not thousands of places where a very moderate outlay would have sufficed to dam a stream or brooklet issuing from between two spurs of the Blue Ridge, or the Alleghenies, so that a refreshing current of the copious and fertilizing floods of Winter and Spring, warmed by the fervid suns of June and July, could have been led over broad fields lying below, so as to vanquish drouth and insure generous harvests. Nay; I feel confident that I could in many places have constructed rude works in a week, after that drouth began to be felt, that would have saved and made the Corn on at least a portion of the planted acres through which the now shrunken brooks danced and laughed idly down to the larger streams in the wider and equally thirsty valleys. Of course, I know that this would have been imperfect irrigation – a mere stop-gap – that the cold spring-water of a parched Summer cannot fertilize as the hill-wash of Winter and Spring, if thriftily garnered and warmed through and through for sultry weeks, would do; yet I believe that very many farmers might, even then, have secured partial crops by such irrigation as was still possible, had they, even at the eleventh hour, done their best to retrieve the errors of the past.

For the present, I would only counsel every farmer to give his land a careful scrutiny with a view to irrigation in the future. No one is obliged to do any faster than his means will justify; and yet it may be well to have a clear comprehension of all that may ultimately be done to profit, even though much of it must long remain unattempted. In many cases, a stream may be dammed for the power which it will afford for two or three months of each year, if it shall appear that this use is quite

consistent with its employment to irrigation, when the former alone would not justify the requisite outlay. It is by thus making one expense subserve two quite independent but not inconsistent purposes that success is attained in other pursuits; and so it may be in farming.

As yet, each farmer must study his own resources with intent to make the most of them. If a manageable stream crosses or issues from his land, he must measure its fall thereon, study the lay of the land, and determine whether he can or cannot, at a tolerable cost, make that stream available in the irrigation of at least a portion of his growing crops when they shall need water and the skies decline to supply it. On many, I think on most, farms situated among hills, or upon the slopes of mountains, something may be done in this way – done at once, and with immediate profit. But this is rudimentary, partial, fragmentary, when compared with the irrigation which yet shall be. I am confident that there are points on the Carson, the Humboldt, the Weber, the South Platte, the Cache-le-Poudre, and many less noted streams which thrird the central plateau of our continent, where an expenditure of \$10,000 to \$50,000 may be judiciously made in a dam, locks and canals, for the purposes of irrigation and milling combined, with a moral certainty of realizing fifty per cent. annually on the outlay, with a steady increase in the value of the property. If my eye did not deceive me, there is one point on the Carson where a dam that need not cost \$50,000 would irrigate one hundred square miles of rich plain which, when I saw it eleven years ago, grew nought but the worthless shrubs of the desert, simply because nothing else could endure the intense, abiding drouth of each Nevada Summer. Such palpable invitations to thrift cannot remain forever unimproved.

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