

LARGE HAY CROPS

A Record of
Experience Under Unfavorable Conditions.

BY
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ON THE FARM OF GEORGE M. CLARK.

PRINTED FOR THE AUTHOR.

HIGGANUM, CONN.

PREFACE.

As a result of many years' experiments with fertilizers, seeds and various machines for the cultivation of the soil, I have been fortunate enough to attain results in the raising of hay which have attracted considerable attention. In consequence, numerous articles regarding my plan have appeared in agricultural journals and hundreds or rather thousands of letters of inquiry have been sent to me and answered.

During that period in question my methods, while remaining essentially the same, have changed in certain particulars, and at the same time the tools employed have been gradually perfected. Now that I cannot hope to make any decided improvement in either method or machines, I propose to embody an account of my experience with the raising of hay, and my present recommendations for the securing of a large crop, in a pamphlet, which can be sent without cost, save that of postage, to any who are interested.

With some hesitation, I have appended a short sketch of my own life, partly to answer inquiries and partly in the hope that young men and others may find in it something that may encourage them to patient and prolonged effort.

In my capacity as a manufacturer I have merely had a good opportunity to devise and improve tools, the expediency of which was made clear by my experiments as a farmer. They are the tools with which I raise hay, and I believe them the best tools with which any one can raise hay, but I do not contest the right of others to hold a contrary opinion, and am quite prepared to be convinced by anyone who may have attained superior results under conditions no more favorable.

Meanwhile, I commend the plan here outlined to my brother farmers of the country, with a conviction founded on long experience, and in general conformity with what I believe to be the soundest theory.

G. M. C., Higganum, Conn.

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MY EXPERIENCE IN GRASS GROWING.

I want to tell the reader my experience in cultivating grass. The condition of my field when I commenced—and now. If I can make it plain to his mind, he will know better whether he would like to follow me or not. I wish to tell him wherein I have erred, and what my conclusions are. I think no one has attempted to redeem a poorer field or one harder to reclaim. The land was so poor or dormant that little or no value had been obtained from it in fifty years. A portion of it was swampy. The northeast corner of the 16-acre field was 12½ feet lower than the northwest corner. It rose east, south and northwest. The surface was

A Surface Half Covered With Rocks.

half covered with rocks, which had to be removed before the cultivation of grass began. At least a thousand tons of bowlders to each acre were drawn off and thrown into 7x9 feet ditches, 16 rods of which held a thousand tons. It cost \$100.00 at the rate of 10c per ton to bury a thousand tons 15 inches deep.

To do the work over again, I should not bury them, but draw them up into one large heap, for the reason that the ditches under drain the land too much, and cut off the sub-soil water, which is very essential in the cultivation of any crop. I have found that with intense cultivation and correct grading there is seldom any need of any other except surface

The Surface Soil

drainage. The surface soil of my field, when finished, was clay hard pan, clay hard pan and gravel, gravel and loam. All of the decomposed vegetable matter, when grade was finished, was swept off, so that the surface was almost entirely made of hard pan and gravel. A portion of the field was quite moist; as the land rose it became somewhat dryer, until at the northwest corner it was extremely dry. The rocks, which I moved varied in size from one pound to seventy-five tons. I used powder to reduce the largest; I should now use dynamite, since it costs less and crushes the stone much finer.

The subjugation of the field cost \$4,000. A portion of this money was obtained from the grass crop before the work was completed. With more time I could have made the grass crop pay the whole cost, but it has long since been paid by the sale of the hay together with a fair interest on the money. In the sections where I had no ditches the grass has been much heavier. In a section of $\frac{7}{8}$ of an acre, where there was no underdrainage, I have taken off 87 tons of well cured hay in 11 years, being at the rate of a little more than 9 tons to the acre each year. The second crop on this section has usually been about 3 tons per annum, so that the first crop would average about 6 tons.

To Renew the Crop Without Loss.

As my best land is too moist for a general crop, I was confronted with the question how to renew the crop of grass without loss? The grass is cut July 1, and in two months the land must be reseeded.

I find that to reseed in a single season will always be a little more expensive. The surface was lifted, twisted and turned at least twenty-five times in two months; the sod was quickly killed, but some of it at the time of seeding still remained upon the surface, and had to be removed, when with a little more time it would all have been plant food. For that reason I would advise, on all land where general crops can be grown to rest one year, cultivate more thoroughly, and kill out all vegetation.

The way to do this is as follows:

Commence July 1, stir and sunburn for two months, then sow rye or wheat, then again get July and August for sunburning, kiln drying and renewing the soil. If the land is flat it might rest till Spring and sow oats. The worst land with two seasons of this intense cultivation, will go on for years and do good work.

Worn Out Farms

What we call worn farms are simply dormant; intense cultivation with a little time and fertilizer, will make them produce the largest

kind of grass. Notice the truck gardener; he keeps his land in the air from Spring to Fall, year after year, continually increasing his product. He cultivates and feeds, keeps on cultivating, feeding and selling. He actually gets more cash from a three acre farm, than the average farmer from 180.

Intense Cultivation Half the Fight.

In this circular I wish to give everyone his due. J. H. Hale of South Glastonbury, Conn., (the Orchard King) was the first man of my acquaintance to find intense cultivation, and found it by trying to kill witch grass; he killed the grass, and made a crop of corn in a drouth. He said intense cultivation, bone, muriate of potash, and nitrate of soda would make a large grass crop. That is where I started. Intense cultivation is more than half the battle. The Heavens possess light and life; stir the earth and you will take the vitality in. The stirring kills foul germs; every time you stir the soil more weed seeds are sprouted and then killed, and thus the land is cleaned.

Keep the Land True.

The land should be kept true while this intense cultivation is being done. If it is thus kept, the soil will be worked to a uniform depth, that will remain uniform when finished, the surface of every part of the field will be uniformly packed, and have same sunlight and exposure, when, if the grading is left until the last, the hills will be drawn into the valleys, and where the hills were it will not be intensely cultivated.

While the land when first seeded may look to be all right, yet the crop will tell. You cannot cheat the soil. A field thus worked will not produce an even or uniform crop, it will fall far behind in a drouth. To make a large crop cultivate intensely to a uniform depth of at least six (6) inches.

Destroy All Old Sod.

It is better in taking up a grass field for any purpose to cut and destroy the old sod before turning it under. What is wanted is to quickly turn the sod into plant food. It is often turned

flat over and deep and allowed to remain there for years without decay; if it is thus treated, it will cut off the sub-soil water, causing premature drouth, almost destroying the fertility of many fields, often without the knowledge of the owner. Perfect connection with the sub-soil is of great importance.

Kinds and Amount of Grass Seed Used.

I have used nearly all the different kinds of English grasses by themselves, and also in mixtures. At one time I sowed 16 quarts of timothy and 16 quarts of uncleaned redtop, 16 quarts of orchard grass and 6 quarts of clover to the acre. Two years later the orchard grass had the field. It will not grow or mature with timothy and redtop. If one wants orchard grass or clover let him sow it by itself.

Alfafa is much used in the arid sections; the roots often descend ten feet for nitrates and water. With irrigation ten to twelve tons per acre are easily obtained. The hay is good but often kills horses with colic. Crimson Clover has friends. I bought, used and gave away 300 pounds of the seed in order to learn quickly about it. It proved a failure.

Light and Heavy Grass.

Orchard grass and clover are light weight and will do better by themselves. Alfafa can be kept going indefinitely by the use of the Cut-away harrow running over it once in three years and resetting it. I formerly used 16 quarts each of timothy and recleaned redtop with 4 to 6 quarts of clover, but with more experience have fully decided, that clover is bad, and that 14 quarts each of timothy and redtop is ample. Timothy grows faster, and forces the redtop up to mature its seed. A good stand of these two grasses will make a dense growth of three or four feet high. Every six inches in height will make a ton of hay to the acre. The redtop increases the total weight of the hay about 1½ tons to the acre, and improves the quality of both. It is not coarse grass that makes great weight. Four to five hundred spears of grass to the square foot make a good stand. When the number falls below three hundred

appears to the square foot, the land should be taken up and reseeded. A grass that will make six tons to the acre will be fine, soft, and silky, and make the most perfect feed for animals. No kind of grain or any other seed should ever be sown with timothy and redtop. These two grasses will mature a heavy crop in ten (10) months from the time of seeding, and if sown with grain will take twenty-two (22) months, to produce less than half a crop, and will con-

Seeding Very Important

tinue a small crop thereafter. The matter of getting a stand at the first sowing is important. At one time I sowed sixteen quarts each of timothy and redtop, on September 1. On the fourth there came a shower, which washed the seed into bunches. On September fifth I again sowed sixteen quarts each of timothy and redtop, and that time harrowed in the seed one and one half inches, and rolled it. Later I found that the last thirty-two quarts of seed sown produced no grass, the first seed was ahead and kept the field.

Observe that the first thirty-two quarts, sown September first, produced all the grass, and an imperfect stand. The indications are clear that the land will not use any more seed than is required, and that the grass seed must all be sown at one time. It is only safe to sow and finish, each day what you commence.

Experience vs. Theory.

I have often been told that the stand of timothy and redtop could easily be renewed by adding a little more seed at any time.

This theory has prevailed all over the country. My experiments have proved this untrue. I have tried taking up the turf and transplanting it; that was a failure. I have made bare spots as mellow as possible seven inches deep, moistened, seeded, and rolled the ground smooth; that was a failure. I have made all the experiments I could think of to improve the stand of grass, after the original seeding. Every one has failed. I once tried a section of two acres, harrowing with the Cutaway, making a good bed, seeding and rolling Sep-

tember first. Two weeks later had a fine stand. April first the grass looked fine. May first the new grass began to wane. June twentieth there was no new grass in sight. It was singular but the original bare spots were there. My several tests in turning the sod over flat and seeding were without success. This refers to timothy and redbtop; witch grass, foul meadow, and other foul grasses.

Fertilizers Used.

I have used yard and coarse manures of every kind for fifty years, besides ashes. Peruvian guano, white fish, fish pomace, and many fish compounds, bone, muriate of potash, sulphate of potash, nitrate of soda and lime.

I use all the yard and coarse manures that I can get before seeding to grass, none after. Better use coarse manures with corn, potatoes, or field crops, and leave your land clean for grass. I use ashes whenever I can get them. Peruvian Guano and all kinds of fish compounds have failed, ending in sorrel. Lime was used to kill it, but lime has been of little service on my soil. The Cutaway Harrow and Disk Plow will kill sorrel, since they mix the soil with sunshine and air.

I now depend upon commercial fertilizers, made from bone, muriate of potash, and nitrate of soda.

Fall and Spring Dressing.

A good Fall dressing is made 1,000 pounds bone, 800 pounds potash, and 200 pounds soda. A good Spring dressing is made of 1-3 each of bone, potash, and soda. A hundred variations of these kinds of material can be made, and all will be good; I have tried dozens of them. Their value depends upon quality, proportions, and demand, and ranges from 1½ to 2½c. per pound.

I use bone, muriate of potash and nitrate of soda with each crop of grass. I now use no Fall dressing except when seeding.

I have either used the Rogers & Hubbard's Grass and Grain Dresser in the Fall when seeding, and their Oat Dresser in the Spring, or the compositions above named.

Mixing Very Important.

My thirty years' connection with a jobbing house in New York has enabled me to get the bone, potash and soda at wholesale rates. For a few years I bought them that way, and mixed them myself, but soon found that the mixing was important, especially when only $\frac{1}{4}$ to $\frac{1}{4}$ of an ounce was to be used to the square foot. I had no mill; Rogers & Hubbard, of Middletown, Conn., had the mill and manufactured the kind of fertilizers which I use. I have bought of them since and found them to be all right. It has been said that they granted me favors, but they never have, not one: I order fertilizers of them, and pay them the same price that others do so far as I know.

When the Grass is Off Color.

If the grass is off color I use more soda, if weak I use more potash. These strong chemicals must be mixed evenly with bone or something to spread the fire. I use just enough soda to bring a dark green; too much shows a bluish tinge. To get a second crop; when the grass has grown three inches, I put 200 pounds more of the Spring dressing on. I sow all fertilizers evenly between lines when the grass is dry and just before a rain if possible. I weigh, measure, and sow the same amount of grass seed or fertilizer on each two or four rods. (See p. 13.)

For the purpose of knowing what would bring the largest crop possible on my dry land, I once used 300 pounds of Spring dressing to the acre September 15th. The theory was to start the grass with a rush, just before Winter. When Spring came I put on 400 pounds more of the Spring Dresser, in order to secure the very earliest start possible. It was marvelous to see the rush that it made, and the immense growth at the finish. That old dry barren knoll had over four tons of well cured hay to the acre. I followed it two years only, but I should have followed it further, if time had

A 1,500 lb. Gain.

permitted. I am sure that I made a gain at least of 1,500 pounds to the acre.

My 1897 grass crop figures, as published in the

Rural New Yorker and the Country Gentleman.

This crop averages about the same as it has for several years, and was as follows:

First Crop.

Total on 16 acres	155,409	lb.
Total on 10½ acres	118,804	
Total on 6 best acres	68,707	
Total on 5½ poorest acres	36,605	
Average on 10½ acres	11,314	
Average on 6 acres	11,450	
Average on 5½ poorest acres	6,656	
Average on 16 acres, whole field..	9,713	
Best ⅝ acre	9,380	
Rate per acre	15,728	
Best acre	13,270	
Second best acre	12,943	

Second Crop.

Total on 16 acres	53,020	
Total on 10½ acres	50,725	
Total on 6 best acres	35,430	
Total on 5½ poorest acres	2,345	
Average on 10½ acres	4,640	
Average on 6 acres	5,905	
Average on 5½ poorest acres	521	
Average on 16 acres	3,317	
Amount on ⅝ acre	4,763	
Rate per acre	7,616	
Best acre	7,460	
Second best acre	6,140	

Total First and Second Crop of 1897.

Total 16 acres	208,479	
Total 10½ acres	168,874	
Total 6 acres	104,137	
Total 5½ poorest acres	38,950	
Average on 10½ acres	15,964	
Total average 6 acres	17,355	
Total average 5½ poorest acres ..	7,181	
Sixteen acres	13,030	
Total best ⅝ acre	14,593	
Total per acre	23,347	
Total best acre	20,770	
Total second best acre	19,083	
Net cash cost of above 1897 crop was	\$575.87	

Below find value of product and profit at different prices per ton:

Lbs.		Per ton.				
208,479	at	\$8.50	\$896.00	\$575.87	\$320.13	\$20.00
"	"	10.00	1042.00	575.87	466.52	29.15
"	"	11.00	1148.63	575.87	570.76	35.67
"	"	12.00	1250.87	575.87	675.00	42.18
"	"	13.00	1355.11	575.87	799.24	48.70
"	"	14.00	1456.33	575.87	880.46	55.00
"	"	15.00	1533.57	575.87	987.70	61.23
"	"	16.00	1667.90	575.87	1091.83	68.23
"	"	17.00	1772.07	575.87	1195.20	73.70
"	"	18.00	1876.30	575.87	1300.43	81.27

Average Profits \$51.61.

The above figures show that money can be made at the low figures of \$8.50 per ton for hay since there is a net profit of \$20.00 per acre at that price.

Lest my figures should be questioned, let me say that I long ago bought a Fairbank's Scale, weighing up to 4 tons, and placed it centrally in my barn floor. On this I weigh every pound that goes in or out; I have no guess work about it.

To Prepare an Acre of Land, Worn or Other-Wise, for Grass.

What follows represents my present knowledge of the art. This being understood, I shall, to save space, give my views in the form of directions, as explicit as I can make them.

Begin on July first with the Double Action Cutaway Harrow (see p. 29), going over the field twice the first week in half-lap the second time at right angles to the first. The second and every subsequent week till August first go over once in half-lap, each time at right angles to the preceding. We have thus harrowed five times in July. If by this time any foul roots remain, rake them out with the grass hoe (see page 28). remove and burn. Follow in half-lap with the 8-foot smoothing harrow with leveling board (see p. 30) until the surface is true (perhaps twice). if the board grazes the surface too lightly, stand upon it. Plow with the 24 in. Torrent Cutaway Plow (see p. 27) to a depth of six or seven inches, the disk being set at a convenient but rather

True the Surface.

considerable angle. Again true the surface as

above, seeking at once to grade and smooth. Finally harrow the field with the Double Acting Harrow once a week until September first (say three times) when the land will be in condition for sowing grain, if desired. If the land is rolling sow rye or wheat, plow with the Torrent and roll in the grain; if flat, it might lie till Spring, and then be sown with oats to be cut in the milk for hay. Before sowing, the land has been stirred 43 times:

Double Action Cutaway 8 times, equal to single action Cutaway 16 times, but since worked in half lap, this stirs the soil.....32 times
Smooth Harrow 4 times, or since half lap 8 times
Torrent Plow twice2 times
Grass Hoe 1 time

The cost, at average wages for man and team, would be, as follows:

Double Action Cutaway Harrow, 16 hours at 30c per hour	\$4.80
Smoothing Harrow 5 hours	1.50
Torrent Plow 5 hours	1.50
Grass Hoe 3 hours	1.20
Total	\$9.00

No Guess Work.

There is no guess work about the foregoing estimate; I have just treated an acre in this way, at a cost of less than \$7.00, and the wheat has a fine stand. The additional cost of wheat and sowing was \$2.00, making \$11.00 in all.

Now to finish with the Fall Grain. On April 1, I shall sow 200 pounds of Spring Dresser (see p. 9), about July 1, the acre should yield 35 bushels of wheat, but, to be on the safe side, I will say 30. The account will then stand:

Cultivating and seeding as above.....	\$11.00
Spring Dresser, 200 pounds	5.00
Cutting and Threshing Grain	6.00
Total	\$22.00

Cr.

30 bushel wheat at 80c.....	\$24.00
1 ton straw	15.00

Total	\$39.00
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Net Profit	\$17.00
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Within a week from the following July 10, or thereabouts go over the field twice in half-

lap with the Double Action Harrow, the second time at right angles to the first. The second week plow with the Torrent, and follow with Smoothing Harrow. Beginning with the third week, harrow once a week for four weeks, with the double action harrow in half-lap. After this plow with the Torrent, going now and whenever it is possible as deep as six or seven inches. On September 1 sow by hand, if no better device can be found, 14 quarts of timothy and 14 quarts of recleaned redtop (see p. 7) between lines $8\frac{1}{4}$ feet apart, the lines being knotted or labeled every 66 feet, so that the same amount of seed may be sown on every oblong of $66 \times 8\frac{1}{4}$ feet, which of course includes just two square rods, there being eighty such oblongs to the acre. Only half of each kind of seed is to be sown in one direction, and that by itself, the other half being sown at right angles to the first in precisely the same way.

Go Over the Field 4 Times.

Consequently, it is necessary to go over the field four times in this sowing by hand. As this part has sometimes occasioned difficulty, I will state as exactly as I can, what is my own practice. I use two lines or cords about one-quarter of an inch in diameter and twenty rods (330 feet) long, each of these lines is cut and looped every four rods (66) feet. For fertilizer I lay the lines one rod ($16\frac{1}{2}$ feet) apart; for grass seed because it is so much lighter just half this distance. In the former case the oblong will contain four square rods; in the latter, two. If a cup could be made holding precisely the amount of grass seed necessary each way for one of these oblongs, it would be very serviceable; the amount is of course one-eightieth of seven quarts, since one-half the seed is sown in each direction, or seven-tenths of a gill. The object of the extreme care is, of course, to get the seed in as evenly as possible. There are machines for sowing grass seed, but I have no experience with them.

The Next Step.

The next step before harrowing is to sow 600 pounds—or more if the land is poor—of

Fall Dressing (see p. 9). Here again care is necessary that the sowing be done evenly; it is therefore better to sow half the quantity in one direction between lines, and the other half at right angles to the first in the same way. The quantity for each oblong of four square rods (see above), if all is sown at once, would be one-fortieth of 500 pounds or $12\frac{1}{2}$ pounds; if one-half is sown each way $6\frac{1}{4}$ pounds. Ten days later one can tell by the color of the grass whether the fertilizer has been evenly sown or not; if not sow more. Correctness in detail brings large results. Time and faithful work are needed to insure success. After all, work as careful as this requires but little time, comparatively.

Harrow in the Seed.

Now harrow in the seed and fertilizer together, with the Smoothing Harrow, the leveling board having first been removed. Harrow in four directions, each time in half lap. Roll the land smooth and keep everything off the field until April. When the grass has grown three or four inches, sow 500 pounds of Spring dressing (see p. 9), which contains a much higher percentage of all active chemicals, especially of nitrogen, than the Fall dressing. By July 1, one ought surely to cut four tons of hay to the acre (see p. 18).

In reviewing we find that the second season the land was stirred 32 times before sowing.

Double Action Harrow 6 times.

Single Action Cutaway 12 times, but since worked in half lap this stirs the soil 24 times.

Torrent Plow twice—2 times.

Smoothing Harrow one-half lap 2 times.

Add Smoothing Harrow four times half lap, in covering seed and fertilizer and we obtain a total of 32 and 8 which equals 40 times over the soil.

The Cost About as Follows.

Double Action Cutaway Harrow 6 times,	
12 hours at 30c. per hour	\$3.00
Torrent twice, 5 hours	1.50
Smoothing Harrow, 10 times, 6 hours...	1.80
Rolling $1\frac{1}{2}$ hours	.65

15 hours' time sowing seed and fertilizing	1.50
14 quarts timothy	1.25
14 quarts recleaned redtop.....	1.40
500 pounds of Fall Dressing	10.00
500 pounds of Spring Dressing	12.50
Sowing	.50
Getting hay	6.00

Cr.	\$40.50
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Credit from last year.....	\$17.00
4 tons of hay at \$16.....	64.00

\$81.00

Total credit	\$40.50
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Second Crop.

200 pounds fertilizer	\$5.00
Sowing	.50
Gathering Hay	3.00

Cr.	\$8.50
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Second crop 1½ tons	\$24.00
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Total credit	\$15.50
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Total Profit, first crop	40.50
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Total credit for two seasons	\$56.00
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The first year the land was cut and turned 6 inches deep 35 times. The second year 26 times, besides smoothing. The acre was lifted, twisted and turned 61 times 6 inches deep in two summers, at a cost of \$11.40. The smoothing harrow 14 times cost \$3.30, and the grass hoe \$1.20. It cost \$15.90 to intensely cultivate an acre two years. These cover the facts at the present time, showing the highest state of the art, and the only method to obtain the largest kind of a crop.

The Foregoing Directions.

The foregoing directions are all right for any field on which general crops can be raised. If the land is too moist, harrow the first season three times more in half-lap with the Double Action Harrow between July 1, and September 1, and sow grass instead of grain. This, instead of stirring the land forty-three times in two months it would be fifty-five times, the work with the Smoothing Harrow and Grass Hoe remaining as before. The additional cost of cultivation would be six hours at 30c. an hour, \$1.80.

Thus we should have:

Dr.	
Labor before sowing (see p. 13).....	\$10.80
500 pounds of Fall Dressing	10.00
14 quarts timothy	1.25
14 quarts recleaned redtop	1.40
Sowing seed and fertilizers	1.50
Smoothing Harrow 10 times, 6 hours ...	1.80
Rolling 1½ hours	.45
500 pounds Spring Dressing	12.50
Gathering first crop	6.00
	<u>\$45.70</u>

Cr.	
4 tons of hay at \$16	\$64.00
Total profit first crop	\$18.00

Second Crop.	
200 pounds of Spring Dresser	\$5.00
Sowing	.50
Cutting hay	3.00
Total	<u>\$8.50</u>

Cr.	
Second crop 1½ tons, at \$16	\$24.00
Total credit	\$15.50
Profit first crop	18.30
Total profit for the first season	<u>\$33.80</u>

Second Season.	
Dr.	
800 pounds Spring Dresser	\$20.00
Sowing	1.00
Gathering first crop	6.00
Total cost	<u>\$27.00</u>

Cr.	
4 tons of hay at \$16.00	\$64.00
Total profit	\$37.00

Second Crop.	
200 pounds of Spring Dresser	\$5.00
Sowing	.50
Cutting hay	3.00
Total expense	<u>\$8.50</u>

Cr.	
Second crop 1½ tons at \$16.00....	\$24.00
Total profit	\$15.50
Cr. for first crop	37.00
Total credit for the season	<u>\$52.50</u>

MISCELLANEOUS OBSERVATIONS.

How Often Had the Land Better Be Taken Up?

Land should be taken up every five or six years, and given an intense cultivation. Sunlight and air will renew the soil, and you will get much better results from your fertilizer, for the reason that the land becomes partially dormant without cultivation. It requires a much larger amount of fertilizer, and you get smaller results.

Time Required to Produce a Crop.

It takes about forty days to produce a crop of grass, at an average growth of an inch or more a day. Under proper conditions it will grow ten inches or more in a week, yielding 500 pounds of hay per day to the acre. One may often find spots that fail to get their share of the fertilizer; such spots will be off color and look puny; give them their full share and in ten days they will often be ahead.

The Effect of a Drouth.

Many suppose that a drouth will kill out much of the grass stand. I have never had any trouble from that source, since I commenced to intensely cultivate and feed, certainly none since I commenced the use of bone, potash, and nitrate of soda with each crop. Remember that I use fertilizer with every crop, whether first or second, and have come to the conclusion that, when the land is well cared for, timothy and redtop will go through a severe drouth without injury. With intense cultivation, and perfect surface connection with the sub-soil, enough water will be drawn up to keep the grass roots alive.

Amount of Water to Carry a Grass Crop.

With intense cultivation 6 inches of water is ample to carry the first crop through. This year mine had but three and made 35 tons of

will carry the second crop. It will take double that to make a medium crop on old fields. With a dry July and August, there is no use to try for a second crop.

Time to Cut Grass.

Timothy and redtop should be cut as soon as half the heads show full blossom. In fact, all kinds of grass, to make the best hay, should be cut thus early.

To Cut and Cure Heavy Grass.

At 7:30 start the mower, and follow by turning by hand the cut grass off the standing grass, as fast as cut. At the fourth round start the hay tedder, and keep that running full time until 2:30. Turn the hay by hand at 11 and 1 o'clock, then rake and heap and nicely trim each heap as quickly as possible; the larger the

Heaping Hay.

heaps the better. If likely to rain put 1,000 to 1,500 pounds in a heap, while hot, and thus keep up the sweat. Open next morning as soon as the dew is off, tedder eight or ten times before 1 o'clock, turning twice by hand, when, if the weather is good, it will be ready for the barn. You will be surprised to see, handled in this manner, how quickly the grass will turn into well cured hay. The tedder forks, while they do not break the body of the grass, bend and open the woody crust, thus giving vent to the central steam, and allowing it to escape freely. Heaping up the hay while hot continues the sweat through the night. If it is heaped up in large masses a much larger proportion of it is kept hot, it will also resist a storm much better because of the lesser surface of the one great heap. Since the larger the heap, the more readily will the outside water be thrown off. Some use a cap to cover the heaps; they are good, but if a storm is to come, give me 1,500 pound heaps rather than a small heap capped. A rainstorm of a day or two cuts no figure with 1,500 pound heaps, and with heavy

grass one does not have to go far to find one. Always in turning by hand, shake and spread all green, wet locks upon the surface. With a quick moving horse, an acre can be teddered in twenty minutes.

DEFECTIVE MOWING OF HAY.

Whatever condition the hay is in when put in the barn, whether dry, medium dry, or otherwise, the mow will go through a sweat, and when going through should be evenly packed. When the hay is drawn up thirty or forty feet into the ridge of a barn, and dropped down, it will make a hard ridge across the mow. There may be other hard spots from some cause, and, wherever these hard places are, the hay will be more or less damaged. It does not matter in a small mow, but large mows should be filled with care. If a horse fork is used, it must be handled with extraordinary care.

The Second Crop Should Be Cut Just Before Freezing.

The grass field should be clipped as short as possible with the mower just before frost, and cleanly raked. This will prevent mouse-nests, or the falling of tall grass or any material to kill out the stand.

Pasturing Grass Fields.

Many pasture their grass fields, and allow their animals to roam over them at will nine months in the year. This is very bad, for their droppings kill the grass, and they tramp the land into road beds. The practice never, never should prevail. You cannot get large results in that way. Keep your grass field for grass only; if you must increase your pasture, plant ensilage corn or something of the sort.

Had We Better Fertilize Old Grass Fields?

Should say no. You cannot get half as good results that way, and not half the benefit of the fertilizer. For that reason I should advise taking up all old fields just as soon as con-

venient, and intensely cultivate them, as here-
inbefore described, and get them down to new
grass. That is the only way to get good results.
The old fields are generally in a very foul
condition, and strong commercial fertilizers
will be largely thrown away, if thus used.

Some Things That Ought Not to Be Done.

Never hitch a horse or any other animal on
your grass field, or let them stand, and stamp
or tear up the grass, or let them run or walk
over it except what is absolutely necessary to
remove the crop. Remove all animal droppings
or heaps of hay or other rubbish from the
field. Never drive on your field when the ground
is soft and wet, as it often is in the Fall, Win-
ter and Spring.

Never pasture your field under any circum-
stances. Avoid anything that will tend to pack
your soil. Catch, kill, or otherwise remove all
moles, woodchucks, skunks, or other animals
that will trample down or injure the stand of
grass. All kinds of poultry bite, scratch, and
do many things that are bad for the field.
The grass field should have the same care that
you give your garden or onion patch.

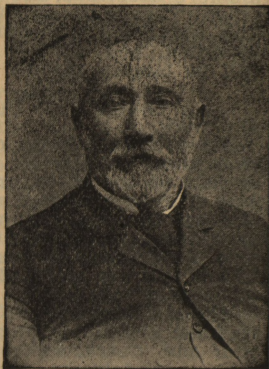
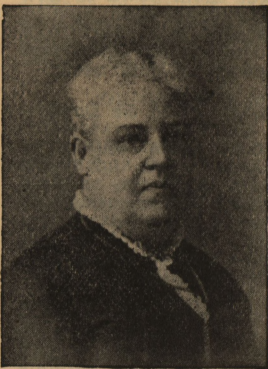
What the Average Farmer Might Do.

One thing is certain. While the average farm-
er may not be able to carry out my full scheme,
yet he can give his land more careful tillage,
use suitable seed, fertilize every crop, and give
the grass field the first chance. If he will do
this thoroughly he will most surely double his
product, and educate himself into more thor-
ough work.

Value of the Hay Crop.

The American hay crop fifty years ago was
worth two millions, is now worth annually
more than a billion. It is always worth mil-
lions more than corn, cotton, wheat, oats, and
rve combined.

Science will have to step in to keep up the
ratio.



Mr. and Mrs. George M. Clark.



Their Home.

AUTOBIOGRAPHICAL SKETCH.

Since my studies in the raising of grass, I have become more widely known, I have received numerous inquiries concerning the circumstances of my life. In response to them I annex an outline autobiography, in which I have endeavored to emphasize those points from which others may draw the most profit.

I was born on a poor farm in Haddam, Conn. My ancestors came with the Pilgrim Fathers, and were among the first to settle in the Connecticut Valley. They bore the names of Clark and Selden, and were possessed of good staying qualities. I commenced active work on the farm at nine, and have ever since been engaged in agricultural pursuits. For over fifty years have been an employer of men, the greater part of the time numbering into the hundreds. When I was twelve years of age my father died, leaving, besides myself, two sons, aged 15 and 10 years respectively, and a daughter aged one year. The sons immediately organized the firm of Clark Brothers, which continued for over thirty years. The first work done was to arrange for the support of the mother and family;

A PROFITABLE AGREEMENT.

the second was to enter into an agreement that none of the brothers should ever make, buy, sell or use any spirituous or malt liquor. This agreement has been scrupulously kept. The original farm contained thirty-nine acres, not more than five could possibly be tilled, the rest was broken or granite ledge. There was fine Connecticut River bottom land adjoining, and better land in the rear. The brothers kept adding to the farm until it contained over 400 acres. The old house was removed and two new ones were erected, together with barn space for 75 cattle, and hay space for 200 tons or more. That is a part of my farm record, the rest, is on the other side of the Connecticut River, where my sixteen acre grass field is.

Studied the Best of Books.

Immediately after the death of my father, I began to buy and study the best works upon mechanical art, spending three to five hours

each evening upon them. In addition to scientific books, such instruments as could be of service were bought and used, so that at the age of seventeen the science of ship building, civil engineering, and general construction was fairly well in hand—enough to warrant my entering the field as a contractor for, and builder of ships, mills, factories, subjugation of water powers, dams, bridges, dwellings, in fact almost anything in the line of general construction.

A Contractor at 18 Years of Age.

Before I was eighteen I had contracted for and built three steam saw mills in Georgia. The first thing a poor boy must do is to establish confidence; that is hard without friends; simple things often turn the tide. When first in Savannah, Georgia, with no friend within a thousand miles, and with no money, I worked as a common hand with the darkies in a saw mill. The main shaft broke, and the mill must be idle for weeks, since no one there was competent to repair it. I had been a blacksmith and quickly welded the large broken shaft. This was the means of giving me a start and the contract for three large steam saw mills, which five months later were sawing over 400,000 feet of yellow pine daily. Later in life the improvement of agricultural implements has had attention. To perfect them it has been necessary to test them in the field. In doing that, I have traveled over 600,000 miles upon this continent with my wife. My wife's eyes and ears are active and very reliable; have learned that a woman can be of service almost anywhere, if she is blessed with common sense.

In the House and Senate.

For many years the writer represented his town and district in the House and Senate, and in the capacity of chairman of important committees, was often offered large rewards to further or kill some private or public act. I will here recite one: A stranger and a poor man wanted a charter for a horse railroad; a rich man and a bosom friend did not want it, but preferred that everything should go his way. He hired a large lobby of lawyers to crush

the poor man, whose cause was just. The lawyers set upon me as I was chairman. At last one became desperate, and said he should lose \$500 if I did not help him. I told him no; he should not lose a cent by me; I would work and earn the money and pay him in full; my honor was worth more to me than \$500. I never shall forget the look he gave me. He jumped up two feet, and when he came down, he said: "Clark, you are right; the charter should be granted. I will make the rich man pay me; you shall not." The poor man got his charter, the road was soon completed, and was a great blessing. This is only one of hundreds of similar cases. In 1885 I introduced fourteen bills to reform the Fire Insurance Companies, doing business in the state. During the contest I was on the stand seventeen days, standing up against hundreds of millions. Thousands were offered me to let up, but I wanted no money. The theory was that an Insurance Company should pay the full amount for which the property was insured, and those are still my sentiments.

There is One Suggestion That I Feel Bound to Make as a Result of My Observation.

I have crossed the continent over and back on every railroad, and up and down on nearly every one, and I have also traveled thousands of miles among the farms. There is nearly one-third of the country that is a barren waste, there are over a million square miles that are almost a desert, except where a few small rivers run, that can be used for irrigation. The good land is all taken up.

I feel it my duty to tell the young men and women east of the Mississippi River that they had better go very slow in selling their homes to go to the far West; I have found hundreds of them in the arid sections, who had traded their eastern homes for a 7x9 hut. They started West to find fortune, and found a desert. I have frequently seen man, wife and children with not a dollar left, eking out a miserable existence. They had swapped a nice home, school, church, and every comfort of life for a hut, and found, when too late, that

they had better have done as I have, and stayed upon their old home with happiness. If we were satisfied with well enough it would save us a great deal of trouble. Many think the golden germ is just ahead, when, in fact, it is lying dormant right at their door.

TOOLS USED BY GEORGE M. CLARK FOR LARGE HAY CROPS.



CLARK'S NO. 6 CUTAWAY HARROW.

There are more than one hundred thousand in use. It is accordingly the most generally known of all the Cutaway tools.

1. It will cut up 15 acres, or double cut $7\frac{1}{2}$ acres in a day. It should always be run in half-lap, so that the latter figure is the one to be retained in mind.

2. When set at the greatest angle, it cuts 6 inches deep. Its track is 6 feet wide.

3. Used in place of a plow, it will quickly reduce strong sod land to pulp, though it is generally used as a regular harrow.

4. It may be used for preparing all kinds of stubble land for any crop.

5. For cutting in all coarse manures, and for all stirring and mixing of the soil, this harrow, in common with the other Cutaway machines, is unapproached.

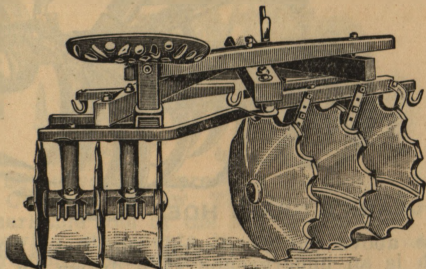
6. It has a double lever, and the gangs are reversible, that is may be made to throw the soil either inward or outward.

7. When so ordered it is made with an extension head to work far out under the low limbs in an orchard. By its means the earth

can be drawn to or from the trees, at will, thus keeping the land true.

I always use this harrow or the Double Action Harrow to subdue my grass fields.

CLARK'S TORRENT CUTAWAY PLOW.



The above cut represents the 24-inch Torrent or Right Lap Plow, a class of machines made by the Cutaway Harrow Co. in seven sizes, to cut furrows from two to six feet wide. The following remarks apply to the smallest size, which I use in my grass work.

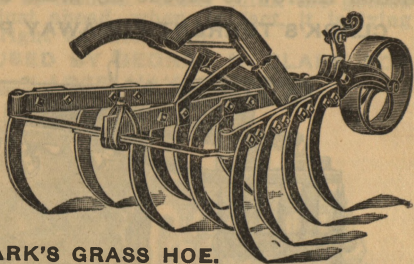
1. The 24-inch Torrent, requiring two horses, will plow five acres per day.

2. It does not form a plow crust, as is the case with all drag plows.

3. With its disks, 22 inches or more in diameter, it rolls along lifting the earth from the sub-soil without any pressure downward, thereby establishing a perfect connection between the sub-soil and the earth above. All scientific farmers know, that it is most important that the sub-soil water shall not be cut off from the surface soil, as otherwise the productivity of a field may be almost destroyed.

4. In grass work the Torrent should be preceded by the Cutaway Harrow (see p. 26), which will finally cut the sod into small pieces, a process more readily performed when the sod is held by the original earth. By following the harrow with the Torrent Plow the earth is turned over, thus drying out all surplus water, killing the grass roots, and hastening the de-

composition of all vegetable matter. By this method, neither sod or crust is left at the bottom of the furrow.



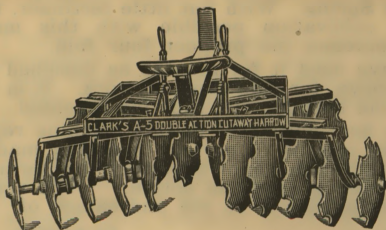
CLARK'S GRASS HOE.

The above cut represents the Grass Hoe, which is an underground rake drawn by one horse. It has ten long crooked teeth, which are so placed that they draw down into the earth eight or nine inches. This machine cuts two feet wide in the line of draft, or a tooth to every $2\frac{1}{2}$ inches. When it is drawn forward as soon as it is filled with roots or foul material it is lifted out of the ground without stopping the team; the trash drops off, and it is immediately pushed down into the ground, and fills again with trash, when it is again raised as before. When the end of the field is reached, the horse is turned around and goes back in the same track. The section of the field, which was not clean, is then raked, and thus all the roots are brought to the surface. The horse-rake is then used, the trash is carted off and burned. If the field is not sufficiently cleaned, the Grass Hoe is then drawn in the opposite direction in the same manner, and thus the field can soon be cleaned of all foul roots or rubbish.

This Grass Hoe is an excellent tool for pulling up briars and foul roots near fences or trees. In a drouth I use it between potato rows to intensely cultivate, and loosen the soil deep. In this way I made 100 bushels of potatoes this year extra to the acre. My neighbors all around failed, because they did not cultivate deeply

DOUBLE ACTION CUTAWAY

CLARK'S



HARROW.

The above cut represents the Double Action A-5 Cutaway Harrow. This is perhaps the most remarkable tool of the set here noticed. The following statements in regard to it can be thoroughly demonstrated:

1. It will cut up from 28 to 30 acres, or double cut 15 acres in a day.

2. Drawn by two heavy or three light horses, it will move 15,000 tons of earth one foot in a day.

3. It can be so set as to move the earth but little, or at so great an angle, as to move all the earth one foot.

4. It keeps the surface true, and the machine runs true in line of draft. This cannot be said of any other disk harrow.

5. When set at a smaller angle, it can be easily drawn by one horse, two horses being required when at the greater angle.

6. The work necessary with this harrow to prepare an acre of land for seeding can be done in three days.

7. It can be extended to any desired length, thus fitting it for orchard work, where it is necessary to reach out under the low limbs.

8. In many cases it will take the place of both plow and harrow; in fact it will do all that any other harrow can, and many things impossible for any other harrow to do.

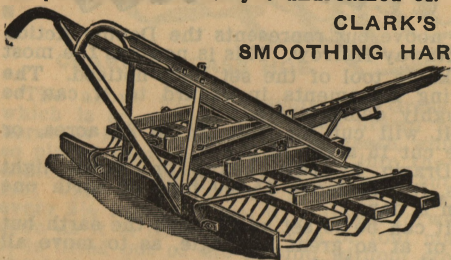
9. It will enable anyone to take up an old hidebound pasture on July 1, destroy the old sod, seed between September 1 and 15 to clover, orchard grass, or any other kind desired for

pasture, and have an excellent pasture from it the next season, only give time for a good start in the Spring. With but little fertilizer, the intense cultivation possible with this machine will increase the product four fold.

I have used it for months as described under (7), above, for this class of work. It is by all odds the best harrow thus far invented.

The first purchaser of this machine reported it, after use, as "a perfect threshing machine." It might, with equal propriety, be termed an "Archimedes Screw in action." The range of its possibilities is as yet undreamed of.

CLARK'S SMOOTHING HARROW.



This cut represents the Smoothing Harrow. It cuts a track eight feet wide. The teeth slant back. They are so arranged as to have a tooth every inch and a quarter. In the rear there is a hinged leveling board, controlled by hand lever and spring. With it any part of a yard of earth can be moved to any part of the field. A true grade can be made with this machine, and with a pair of horses one man can do more than twenty can by hand. With it the land is made perfectly true and smooth.

When seeding, the land is first made true with this machine, then the leveling board is removed and the harrow is used to rake in the seed. It is drawn across the field in half-lap in four directions, which makes the seed much more even, and the surface true. When a field is thus prepared, it is much less likely to wash, as the falling water will stand evenly on the surface.

THERE ARE SEVEN POINTS MORE.

1. I have attended personally to every detail and performed more of the actual labor of every kind upon my field than any other person. When one performs with his own hand, he will know better what is done.

2. In any figures where time, either by hand or with team and machine, to perform the labor is given, at least 20 per cent. more time has been allowed than actually expended to perform the work.

3. Where figures are given which relate to the value of fertilizer, the amount used is correct, but the prices given are from 5 to 10 per cent. higher than they have cost.

4. While I have paid as high a price as others for fertilizers, it does not matter whether I paid anything or not, so long as I have given the correct amount used, and figures as high as they would cost, which I have done.

5. As to the condition of hay, weight, etc. When taken into the barn, the best care possible has been given it, and the hay before carting into the barn has been as dry as any farmer blessed with common sense would make it, and when it goes in, it is weighed on a Fairbanks Scale and an accurate account is kept.

6. The expense of seeding does not occur but once in five or more years, hence should be divided among the other years.

7. The average profit per acre as shown by figuring the 1897 crop (page 11) at ten different prices given therein, from \$8.50 to \$18.00 per ton, is \$51.61 per acre. With these facts in hand, with proper care I believe it is perfectly safe to figure for a continuous annual profit of \$40.00 for each acre per year.

**CUTTING
A
LARGE HAY CROP**

Over Six Tons of Hay Raised on an Acre.



**ON
THE FARM OF
GEORGE M. CLARK,
HIGGANUM, CONN.
U. S. A.**