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Grass growing for profit. A short compila

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GRASS GROWING FOR PROFIT

Edited and Published by
WILLIAM S. MYERS, D.Sc., F.C.S., Director-in-Chief
Chilean Nitrate Committee
Late of New Jersey State Agricultural College
25 Madison Avenue, New York

GRASS GROWING FOR PROFIT

A Short Compilation of Experimental
Work on the Effects of Nitrate
of Soda on Hay Crops

Including Some Directions for the Preparation
of Land and Harvesting the Crop

and

Results at Highland Experimental Farms
New York

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WILLIAM S. MYERS, D.Sc., F.C.S., Director-in-Chief
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1. Product of one square foot of ground in field yielding over three tons per acre of cured timothy hay fertilized with Nitrate of Soda.

2. Product of one square foot of ground in adjoining field (not fertilized with Nitrate of Soda) yielding one ton per acre of cured hay.

Highland Experimental Farms, New York

GRASS GROWING FOR PROFIT

Approximately sixty millions of tons of timothy hay are grown every year in the United States on about forty millions of acres of meadow-land. Beginning at the seaboard and going west, the chief hay-producing states are: New York, Pennsylvania, Missouri, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa and Kansas. New York alone has nearly five millions of acres on which is produced upwards of six millions of tons of hay. These ten states, which may be said to constitute the Hay Belt of the United States, have a total of 30,000,000 acres on which were lately grown 45,000,000 tons of hay. These figures are mentioned to show the magnitude of our grass-growing industry. Of course, grass is grown more or less extensively in all of the states, but the states mentioned are the leaders and produce the great bulk of our annual crop of timothy hay.

Timothy and related grasses feed heavily on Nitrogen; they are able to transform it completely into wholesome and digestible animal food. When full rations of plant food are present a good crop of grass will remove about the equivalent of two of the active fertilizer ingredients of 150 pounds of Nitrate of Soda and 150 pounds of phosphate. These amounts are recommended to be applied per acre as top-dressing for old grass lands where grass fertilization is well understood and practiced. Grass lands get sour easily, especially when very old, and when they do, one ton of lime per acre may be harrowed in before seeding down anew. The seeding

should be done before September, and the above-mentioned ration should be used as a top-dressing the following spring, as soon as the grass begins to show growth.

If all the conditions are favorable, from three or five tons of clean barn-cured hay, free from weeds, may reasonably be expected. When grass crops are heavy and run as high as four and one-half or more tons per acre field-cured, it is safe to allow 20 per

Clearing Land for Seeding.

cent. shrinkage in weight for seasoning and drying down to a barn-cured basis. Nitrate of Soda, the chief constituent of the prescribed ration, pushes the grass early and enables it to get ahead of all weeds, and the crop then feeds profitably and fully on the other manurial constituents present in the fertilizer mentioned in the formula and present in the soil.

Nitrate can sometimes be used alone for a season or two and at very great profit, but a full grass ration is better in the long run for both the soil and crop. *Generally speaking, 100 pounds of Nitrate, if used under proper conditions, will produce an increase of from 1,000 to 1,200 pounds of barn-cured, clean timothy hay. It pays well to use Nitrate liberally on grass lands.*

A reliable, heavy Top-Dressing formula for Grass Lands per acre:

100 lbs. Nitrate of Soda alone
or preferably

150 lbs. Nitrate of Soda.

150 lbs. Acid Phosphate.

50 lbs. Sulphate of Potash every other year.

What Percentage of Water Does Hay Lose During Storage?

Hay which had been stored during the summer was removed from the mow the following February, and found to contain 12.21 per cent. of water. A careful comparison of other moisture determinations of hay leads to the conclusion that 12.21 is a fair general average of the percentage of water in the best quality of barn-cured hay. When hay is first stored it usually contains from 20 to 28 per cent. of moisture. The loss in storage may be said to be about 12 to 16 per cent.

Nitrate of Soda as Used in Clark's Grass Cultivation.

It may not be out of place here to mention the fact that Mr. Clark's success in obtaining remarkably large yields of hay for a number of years, an average of nine tons of cured hay per acre for eleven years in succession, has been

heralded throughout the United States. He attributes his success largely to the liberal dressings of Nitrate of Soda which he invariably applies to his fields early in the spring, and which start the grass off with such a vigorous growth as to shade and crowd out all noxious weeds before they get fairly

Types of Characteristic Rock Shattering (1).
Preparing Land for Seeding.

started and which result in a large crop of clean and high-priced hay.

How Careful Cultivation May Aid in the Profitable Use of Nitrate. It is also known that many who have tested his methods have met with failure chiefly because they neglected to supply the young grass plants with a sufficient amount of readily available food for their use early in the spring when it is most needed, before

the organic forms of Nitrogen, which exist in the soil only in an insoluble form which cannot be utilized by the plants as food, can be converted into soluble Nitrates by the action of bacteria in the soil. This does not occur to any great extent until the soil warms up to summer temperature when it is too late in the season to benefit the crop's early spring growth.

Types of Characteristic Rock Shattering (2).

It is important that we always bear in mind the fact that our only source of Nitrogen in the soil for all plants is the remnants of former crops (roots, stems, dead leaves, weeds, etc.) in different stages of decomposition, and that in the early spring there is always a scarcity of Nitrogen in the soil in an available form, for the reason that the most of that which was converted into soluble forms by the action of the soil bacteria during the warm summer months of the previous year was either utilized by

the plants occupying the ground at that time or has been washed down below the reach of the roots of the young plants by the melting snow and the heavy rains of late winter and early spring.

When we consider the fact that most plants require and take up about 75 per cent. of their total

Rock before Blasting with One Pound of Forty Per Cent. Dynamite.

Nitrate Ammoniate during the earlier stages of their growth and that Nitrogen is *the* element most largely entering into the building up of the life principle (or protoplasm) of all plants, it is plain that we cannot afford to jeopardize the chances of growing crops by having only an insufficient supply of immediately available Nitrogen when it is most needed.

Hay In the case of hay, from timothy and other grasses, the experiments that have been conducted answer the first question

—"What shall I use"—as follows: Use Nitrate of Soda, because it is a food element that is especially needed; it is soluble in water and can be immediately taken up by the plants and supplies them with that which they need at the time they need it—it can

Same Rock Shattered by the Explosion of Dynamite.

be used by them early in the spring before other forms of applied Nitrogen are usable and before other soil supplies are available. The results of experiments conducted through a period of nine years, and in different sections of the state, show that upon soils which will produce crops ranging from one to three tons per acre, a gain in yield of from 9 to 54 per cent., or an average increase of 32.7 per cent., may be expected from the use of from 100 to 150

pounds per acre, which would show an average gain in yield of 654 pounds per acre; based on the average yield of 1.25 tons per acre, the gain would be 820 pounds. This increase, at an average price of \$12 per ton, would mean about \$5 per acre, or \$2 more than the cost of the material. A very satisfactory profit, when it is remembered that it is obtained at the same cost of labor and of capital invested in land.

Grass. According to experiments in Rhode Island, soils are less exhausted when complete fertilizers are used with Nitrate than when no Nitrate is used. The soda always left behind after the Nitrate of Soda is used up aids the lime and potash, and unlocks the soil silicates and thereby frees potash, lime and magnesia. The feeding value of hay is far greater when Nitrate is used as a fertilizer in this connection.

Practical Conclusions.

The application should be in the form of a Top-Dressing, applied very early in the spring in order that the first growth may find readily available material for its support and be carried through the season with no check from partial starvation.

Top-Dressing Grass Lands. On land which shows any tendency to sourness, a ton to the acre of slaked lime should be used every five or six years. This makes the land sweet and promotes the growth of grass plants of the best kinds.

Lime should be sown upon the furrows and harrowed into the soil. *Top-dressing with lime after seeding will not answer, and, in the case of very acid soils, the omission of lime at the proper time will necessitate re-seeding to secure a good stand of grass.*

Clearing Land for Grass Growing.

Economical and Profitable Practice. All the elements of fertility are essential so that ordinarily complete fertilizers may be used, Nitrate being used as a Top-Dresser, though on some soils rich in phosphoric acid or potash, one or both of these ingredients may be used in small quantity. This is particularly true of phosphates after lime has been applied to the soil, since lime aids to

set the phosphoric acid free from its natural insoluble combinations.

Grass seems to demand less phosphoric acid than was applied in the test; but it responds with increasing profit to applications of Nitrate of Soda up to 200 pounds to the acre when potash and phosphates are present in abundant available forms.

Preparing Land after Clearing and Plowing for Grass Growing.

Clearing and Reclaiming Lands.

In recent years, dynamite has come to be generally used for the preliminary clearing and reclaiming of land, and especially for the shattering and pulverizing of rocks and the removal of stumps. Modern tools and machinery, such as the disk-harrow and

leveler and improved plows and scrapers, permit the preparation of land on the Atlantic Seaboard fully as workable, and as convenient in every way for the best improved heavy hay and harvesting machinery as is the case of lands of the Mississippi Basin. These remarks apply also to land adapted to general use as well as to farming.

A Mixing Plant with Grinding Machine for Chemical Fertilizers.

Almost every farmer should be able to clear from five to thirty acres of such land, and he may become an effective competitor of the more favored western producer to a greater extent than ever before, if he chooses.

In the preparation of both old and new lands for grass, thorough tillage is desirable, and the surface

of the ground should be well smoothed, in order that modern machinery may be operated successfully and economically. This remark applies especially to New York and Pennsylvania and to New England, where the character of the country is largely rolling and frequently rocky. Thousands of acres of virgin land remain in these states to be reclaimed for cultivation. From the standpoint of proximity to good markets, such lands should well repay the cost of clearing, if it be thoroughly done. Such a plan, with modern facilities, offers to the farmer in these states, an opportunity to increase his acreage and the productive capacity of his farm. This means an added value to every farmer's holding.

Photographs are shown in the text of the clearing of land for grass-seeding, including the removal of timber; and, secondly, the shattering of rocks by means of dynamite. Usually one pound of 40 per cent. dynamite will throw a large stump and will shatter a large rock in sufficiently small pieces to remove by wagon or stone-boat. After the land is cleared, the disk-harrow and leveler should be used to pulverize the soil and kill the weeds. Several harrowings are usually necessary for this purpose. During such harrowing, the mineral fertilizers and liming may be applied. Nitrate of Soda should not be used until the following Spring, and on new seeding 100 pounds to the acre of Nitrate of Soda as a top-dressing is all that should be used the first season. This applies, however, only to the first year of the new seeding. Afterwards, 200 pounds of Nitrate may be used, provided adequate mineral applications of phosphate and potash are made also.

When Nitrate is used alone as a top-dressing — that is, unless the minerals have been previously applied — 100 pounds per acre is enough; but it should be remembered that to make as small an application as 100 pounds per acre requires considerable care, the tendency being, unless such care is exercised, to make the application unnecessarily heavier with consequent possible loss of profit.

A Nitrate Distributor for Top-Dressing, in Use.

Nitrate can sometimes be used alone at very great profit and, especially on old meadows, frequently the production of hay can be very materially increased. In the long run a full ration of the minerals is better for both the soil and the crop. Generally speaking, in the Hay Belt of the United

States, two crops of grass can be grown at a profit every year.

Immediately after harvesting the first crop, the minerals and Nitrate should be applied, and a satis-

Whole Field, except Center, Fertilized with Fourteen Per Cent. Acid Phosphate, Six Hundred Pounds; Sulphate of Potash, Two Hundred Pounds; Nitrate of Soda, Two Hundred Pounds; yield, three tons cured hay per acre.

Square in Center of Field had Six Hundred Pounds Acid Phosphate, and Two Hundred Pounds Sulphate of Potash, but No Nitrate of Soda; yield, one ton cured hay per acre.
Highland Experimental Farms, New York.

factory formula is as follows. This applies to intensive practice:

100 lbs. Nitrate of Soda.

100 lbs. acid phosphate.

The illustrations shown in the text are intended to include the whole operation of the preparation and

seeding of grass-lands, the application of fertilizers, the cutting and harvesting and storing of hay and preparation of the same for market. The photographs are taken from actual operations in the field and are intended to give a complete outline of the whole industry of grass growing. The machinery and tools have been found to be very satisfactory and to do their work thoroughly in every respect.

The Tedders follow the Mowing Machines for rapid curing of heavy crops of hay.

HIGHLAND FARMS.

The average yields, at Highland Experimental Farms, per acre of field-cured hay on the uplands were as follows for 1905:

No Nitrate, 3,180 pounds per acre.

Where 200 pounds of Nitrate was used, 8,340 pounds per acre.

The average yields on the lowlands were as follows:

No Nitrate, 6,985 pounds per acre.

Where 200 pounds of Nitrate was used, 8,712 pounds per acre.

In the season of 1906 the average yields per acre of field-cured hay on the uplands were as follows:

No Nitrate, 3,200 pounds per acre.

168 Pounds Nitrate, 6,240 pounds per acre.

The average yields per acre of field-cured hay on the lowlands were as follows:

No Nitrate, 5,920 pounds per acre.

112 pounds Nitrate, 8,030 pounds per acre.

Comparison of Yields.

Uplands.

Season

1905. No Nitrate, 3,180 lbs.; 200 lbs. Nitrate, 8,340 lbs.

1906. No Nitrate, 3,200 lbs.; 168 lbs. Nitrate, 6,240 lbs.

Lowlands.

Season

1905. No Nitrate, 6,985 lbs.; 200 lbs. Nitrate, 8,712 lbs.

1906. No Nitrate, 5,920 lbs.; 112 lbs. Nitrate, 8,030 lbs.

Yield of original "No Nitrate" plot in four-acre field of timothy and Red Top—Season of 1906, 1,760 pounds; Season of 1905, 3,180 pounds.

Note.—Yields are much lower for 1906 than for 1905, owing to smaller applications of Nitrate and also to the fact that there was much less rainfall during the latter part of the growing season.

Seeding Full of Daisies,
not Nitrated.

Seeding of Clear Timothy,
Nitrated.

New York Rules for Grading.

Established by the
New York Hay Exchange Association (Incorporated).

Prime Hay: Shall be pure timothy, properly cured, bright, natural color, sound and well baled.

No. 1 Hay: Shall be timothy, not more than one-eighth ($\frac{1}{8}$) mixed with other tame grasses, properly cured, bright color, sweet, sound and well baled.

No. 2 Hay: Shall include all timothy not good enough for No. 1, fair in color, proportionately mixed with other tame grasses, sweet, sound and well baled.

No. 3 Hay: Shall include all hay not good enough for other grades, not over one-third ($\frac{1}{3}$) clover, but may be natural meadow, free from wild or bog, sweet, sound and well baled.

Shipping Hay: Shall consist of hay not good enough for No. 3, sound and well baled.

Crop of Grass Grown by Nitrate Top-Dressing.

No Grade Hay: Shall include all hay badly cured, stained, threshed or in any way unsound.

No. 1 Packing Hay: Shall consist of all fine grasses, of good color, free from flag and thistles, sound and well baled.

Fancy Clover Mixed Hay: Shall be bright, green, colored timothy and clover of medium growth,

containing not over one-third ($\frac{1}{3}$) clover, sound and well baled.

No. 1 Clover Mixed Hay: Shall be timothy and clover mixed, with at least one-half ($\frac{1}{2}$) timothy, good color, sound and well baled.

Crop of Grass Grown by Nitrate Top-Dressing.

No. 2 Clover Mixed Hay: Shall be timothy and clover mixed, with at least one-third ($\frac{1}{3}$) timothy, sound and well baled.

No. 1 Clover Hay: Shall be bright, medium growth clover, sound and well baled.

No. 2 Clover Hay: Shall be clover of fair color, sound and well baled.

No. 1 Rye Straw: Shall be bright, clean, long

rye straw, pressed in bundles in large or upright pressed bales, sound and well baled.

No. 2 Rye Straw: Shall be clean, long rye straw, of fair color, pressed in bundles in large or upright pressed bales, sound and well baled.

No. 1 Tangled Rye Straw: Shall be bright, clean straw, of fair length, sound and well baled.

No. 2 Tangled Rye Straw: Shall be reasonably clean, fair color, sound and well baled.

No. 1 Oat Straw: Shall be clean, bright, oat straw, of fair length, practically free from chaff and thistles, sound and well baled.

No. 1 Wheat Straw: Shall be bright, clean straw, of fair length, sound and well baled.

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION.

Bulletin 232.

The most important result as shown, both in the growing crop and in the weights of hay was the

1. Without Nitrogen. 2. $\frac{1}{4}$ Ration of Nitrogen. 3. Full Ration of Nitrogen. All three fertilized alike with muriate of potash and phosphate.—R. I. Bul. 103.

influence of the Nitrate of Soda. In every instance where Nitrate of Soda was applied a marked increase in the vigor of growth as well as in the weight of

hay was produced. The influence of the phosphoric acid and potash was much less marked in all instances. When Nitrate of Soda was doubled without increasing the acid phosphate or the muriate of potash the apparent increase in yield was more than doubled, but when the phosphoric acid was doubled without increasing the Nitrate of Soda or the muriate of potash the yield was decreased. (See cut on preceding page.)

RHODE ISLAND EXPERIMENT STATION.

Bulletin 104.

“Some readers of this Bulletin will recall the rabid attacks upon Experiment Station chemists made a few years ago in the agricultural press by the late Andrew H. Ward, of Boston, in which he denounced the chemists for not giving the same recognition to soda as to potash as a manure, upon the ground of its alleged ability to replace potash in plant production. To such as may have known of those published criticisms, the verdict against the equality of soda in plant production returned in this experiment by the plants themselves, ought to remove any further doubt concerning the merits of the case. It can not be disputed, however, that soda is of some use in some manner with many varieties of plants, when the supply of potash is quite limited, and also with at least a few varieties of plants even in the presence of a fairly abundant supply of potash. Whether sodium salts would be rendered useless with all varieties of plants if the supply of potassium salts were greatly increased is a point which is not as yet fully proved, nor is it fully clear as yet in just what manner the sodium salt has been helpful in this particular experiment. This is a question which will be considered later in connection with the chemical analyses of the crops. It may, however, be stated here that sodium salts seem to liberate at least phosphoric acid and potash, so that under certain circumstances they may act as indirect manures. They also appear under

Two Horse Hay Tedder, ready to operate.

certain conditions to prevent plants from assimilating large amounts of potash in excess of their needs, thereby conserving the potash supply within the soil. It does not appear unlikely, when the supply of potash is limited, that sodium salts may aid in some degree in performing some function of potassium."

The After-Effect of Sodium and Potassium Salts.

(From Rhode Island Agricultural Experiment Station Bulletin, No. 106, May, 1905.)

This experiment was a continuation of tests upon the same forty-eight plots upon which annual applications of sodium and potassium salts had been made since 1894.

In 1902, 1903, and 1904 no further applications of sodium or potassium salts were made, but each

plot continued to receive annual applications of phosphoric acid and Nitrogen. Where the large applications of potassium salts had been made previously, it was found that timothy and clover were much better able to persist than elsewhere. The influence of the previous applications of potassium salts still

A Side-delivery Rake in Operation.
Highland Experimental Farms, New York.

continued in a most striking manner even the third year, in all cases where large amounts were used at that time as was fully demonstrated by the much greater yields of hay.

Considerable evidence was afforded that the earlier applications of sodium salts were now helpful by way of increasing the crops of hay *in those cases where the previous applications of potassium salts had been large*. It seems possible that this may

have been due, in part at least, to the retention in the soil of a part of the previous applications of potassium salts, by virtue of extra soda having been taken up by the preceding crops in the place of superfluous potash, whereby the potash supply in the soil was really conserved.

Whole Field, except center, Fertilized with Fourteen Per Cent. Acid Phosphate, Six Hundred Pounds; Sulphate of Potash, Two Hundred Pounds; Nitrate of Soda, Two Hundred Pounds; yield, three tons per acre of cured hay.
Square in Center of Field had Six Hundred Pounds Acid Phosphate, and Two Hundred Pounds Sulphate of Potash, but No Nitrate of Soda; yield, one ton per acre of cured hay.
Highland Experimental Farms, New York.

Owing to the marked peculiarities of different varieties of plants, it was not expected that direct manurial benefit to the grass would necessarily result from the use of the sodium salts [other than the Nitrate] even if such a direct effect might possibly occur in the growth of radishes, beets, turnips, and certain other plants.

AMERICAN HAY JOURNAL.**Timothy and Mixed Hay.****Their Comparative Value.**

Timothy has the advantage of being more easily cured and much less subject to dust and mould than clover. It is specially adapted to driving horses and

Plot ready for Record of Weights to be Taken.

Highland Experimental Farms, New York.

those which do severe work, as it furnishes a large amount of crude fibre, a requisite necessary where horses are fed a heavy grain ration. It does not possess the laxative properties of clover, and too laxative a condition is more likely to occur in such animals than in those doing light work or at rest. Being less palatable than clover, there is less danger

from overfeeding, which often occurs on the farm where the feeding is done by hired help.

Clover must be fed in limited amounts to horses for satisfactory results; if not, a horse is likely to gorge himself with it, which will interfere with free respiration. When fed freely it also furnishes more protein than is needed, and this surplus must be excreted by the kidneys, which may overtax these

The Loader is of great service in handling hay quickly.

organs. Dusty hay, if fed for any considerable length of time, is very likely to interfere with respiration and finally causes heaves. As clover is much more subject to dust than timothy it has prejudiced many men from ever feeding it to their horses.

Mixed hay may run largely to clover or contain but a sprinkle. Pure timothy being more easily recognized and graded, it has established a prestige with city team owners and consequently they will usually buy nothing but choice timothy or upland prairie hay.

General Directions for the Use of Nitrate of Soda on Seeded Crops.

The use of Nitrate of Soda *alone* is never recommended, except, at the rate of not more than one hundred pounds to the acre. ***It may be thus safely and profitably used without other fertilizers.*** It may be applied at this rate as a Top-Dressing in the spring

717
No treatment.
2200 lbs. hay
per acre.

716
320 lbs. Acid Phosphate.
160 lbs. Nitrate of Soda.
3840 lbs. hay per acre.

715
160 lbs. Nitrate
of Soda.
3550 lbs. hay
per acre.

Fig. 18.—These plats show in a very marked way the influence of Nitrate of Soda on the yield of hay. (Cornell Univ. Bulletin No. 232.)

of the year, as soon as vegetation begins to turn green; or, in other words, as soon as the crops begin new growth. At this rate very satisfactory results are usually obtained without the use of any other fertilizer, and the Soda residual, after the nitrogenous ammoniate food of this chemical is used up by the plant, has a perceptible effect in sweetening sour land.

In most of our grass experiments where Nitrate was used alone at the rate of but one hundred pounds

per acre, not only was the aftermath, or rowen, much improved, but in the subsequent seasons, with nothing applied to the plots, a decidedly marked effect was noticed, even on old meadows. This speaks very

Hay Caps for Protecting Hay While Curing.

well indeed for Nitrate of Soda not leaching out of the soil. The readily soluble elements are the readily available elements. The natural capillarity of soils doubtless is, in most instances, a powerful factor in retaining all readily soluble elements of fertility both during and after the season of growth.

If this were not so, all the fertility of the world in our humid regions would, in a season or two, run into the ocean, and be permanently lost.

This is mentioned on account of certain critics having taken the trouble to object to the use of Nitrate on the grounds that it would leach away.

A case is yet to be seen where the after-effects of Nitrate are not distinguishable, and, in certain cases, such effects have been most marked.

TABLE SHOWING PRICES OF NITRATE OF SODA ON THE AMMONIATE BASIS

Figured on basis 380 lbs. Ammonia in one ton of
Nitrate of Soda

Price per Cwt. of Nitrate	Price per Ton of Nitrate	Price Ammonia per lb. as Nitrate	Equivalent Price Ammonia per ton Unit	Equivalent Cost of Nitrogen per lb.
\$1.80	\$36.00	0.095	\$1.90	\$0.115
1.85	37.00	0.097	1.94	0.118
1.90	38.00	0.100	2.00	0.122
1.95	39.00	0.103	2.06	0.125
2.00	40.00	0.105	2.10	0.128
2.05	41.00	0.108	2.16	0.131
2.10	42.00	0.111	2.22	0.134
2.15	43.00	0.113	2.26	0.137
2.20	44.00	0.116	2.32	0.140
2.25	45.00	0.118	2.36	0.144
2.30	46.00	0.121	2.42	0.147
2.35	47.00	0.124	2.48	0.150
2.40	48.00	0.126	2.52	0.153
2.45	49.00	0.129	2.58	0.156
2.50	50.00	0.132	2.64	0.159
2.55	51.00	0.134	2.68	0.162
2.60	52.00	0.137	2.74	0.165
2.65	53.00	0.140	2.80	0.168
2.70	54.00	0.143	2.86	0.173
2.75	55.00	0.145	2.90	0.174
2.80	56.00	0.147	2.94	0.177
2.85	57.00	0.150	3.00	0.180
2.90	58.00	0.152	3.04	0.183
2.95	59.00	0.155	3.10	0.186
3.00	60.00	0.157	3.14	0.189
3.15	63.00	0.165	3.30	0.198
3.20	64.00	0.168	3.36	0.201
3.25	65.00	0.171	3.42	0.204
3.30	66.00	0.173	3.46	0.207
3.35	67.00	0.176	3.52	0.210
3.40	68.00	0.178	3.56	0.214
3.45	69.00	0.181	3.62	0.216
3.50	70.00	0.184	3.68	0.219
3.55	71.00	0.186	3.72	0.222

This table enables one to compare commercial quotations with accuracy. The figures themselves are not quotations in any sense of the word, and all the figures of the table refer to only one grade of Nitrate of Soda, namely: that containing 15.65 per cent. of Nitrogen.

THE COST OF NITRATE OF SODA, ITS USE MORE PROFITABLE THAN EVER

The steady upward movement in prices of Nitrate of Soda has been attracting widespread attention, and the uninterrupted gradual rise in prices is warranted, based on solid facts which govern the industry. Labor troubles and the extra cost of production, together with the steady increase in the consumption, have been and are factors in the situation. The increase in the consumption in this country has been heavy.

The consumption all over the world for agricultural purposes has expanded at a very great rate lately, and perhaps more particularly in this country in the cotton belt than anywhere else. Production is likely to expand so as to fully meet the fresh demand as rapidly as the supply of labor can be provided for on the west coast of Chile.

Many observers of the ammoniate market for the past years have asserted that there are not enough ammoniates annually produced to meet the consumptive requirements, and the tendency on the part of some fertilizer manufacturers is to make lower grade goods as to Nitrogen; a policy which seem to have an invariably disastrous effect on those who follow it.

It is proper to observe also that all the nitrogen in Nitrate of Soda is available. In the other ammoniates generally quoted the nitrogen is, of course, not completely available from an agricultural standpoint even though some may be soluble in water.

Process of Stacking Hay.

Nitrate always pays handsomely on hay, and one hundred pounds per acre alone is a very effective application. Even at the present prices for Nitrate, one hundred pounds without the use of any other fertilizer, will produce an increased yield of more than half a ton of barn-cured hay. The use of Nitrate on this crop promises to be very remunerative.

Stack Cover or Barrack for Hay. In use in New Jersey.

Whilst the price of Nitrate of Soda per ton may seem relatively high, its value should be judged by the 100 per cent availability of its Nitrogen — that is to say, all the Nitrogen in Nitrate of Soda is usable. All other forms must first be nitrated.

This may be illustrated by comparing gold ores of the same percentages derived from different sources — one gold ore containing ten ounces to the

ton might be worth a great deal of money per ton — that is to say, if the ore were extractable with ease and without undue expense — whereas another ten-ounce ore might contain its gold in such form as to be extracted only with great difficulty and at great

Hay Pressing in Operation.

expense. The plant food of Nitrate of Soda is all usable by the plant. It is already cooked. It needs no further preparation for the plant's use, as do all nitrogens which are *raw* compared to Nitrate of Soda.

The price per ton of a fertilizer is not, by itself, a sufficient guide for accurately judging its value for crops.

What Nitrate Has Done For Crops. Agricultural authorities have established by careful experimentation that 100 pounds of Nitrate of Soda when applied to the following crops has produced under proper conditions increased yields as tabulated:

Apples.....	50-75 bushels
Apricots.....	96 lbs.
Asparagus.....	100 bunches
Bananas.....	1,167 lbs.
Barley.....	400 lbs. of grain
Beans (white).....	225 lbs.
Beets.....	4,900 lbs. tubers
Cabbages.....	6,100 lbs.
Carrots.....	7,800 lbs.
Castor Beans.....	50 lbs.
Celery.....	30 per cent.
Corn.....	280 lbs. of grain
Cotton.....	500 lbs. seed cotton
Ensilage Corn.....	1.18 tons
Grape Fruit.....	29 boxes
Hay, upwards of.....	1,000 lbs. barn cured
Hops.....	100 lbs.
Mangels.....	123.7 bushels
Oats.....	400 lbs. of grain
Onions.....	1,800 lbs.
Oranges.....	22 boxes
Peaches (dried).....	56 lbs.
Pecans.....	37 lbs.
Potatoes.....	3,600 lbs. tubers
Prunes.....	975 lbs. (dried)
Raisin Grapes.....	347 lbs.
Rye.....	300 lbs. grain
Strawberries.....	200 quarts
Sugar Beets.....	1,330 lbs.
Sugar Cane.....	2.40 tons of cane (Tropics)
“ “.....	1.17 tons of cane (Louisiana)
Sugar (from Sugar Cane).....	322 lbs. (Tropics)
“ “ “ “.....	224 lbs. (Louisiana)
Sugar Mangels.....	1.6 tons
Sweet Potatoes.....	3,900 lbs. tubers
Tobacco.....	75 lbs.
Tomatoes.....	100 baskets
Turnips.....	37 per cent.
Walnuts.....	106 lbs.

INCREASED YIELD BY THE USE OF NITRATE OF SODA.

The increased yields of crops resulting from a top-dressing with Nitrate of Soda are most striking. In an article recently published by Dr. E. J. Russell, Director of the Rothamsted Experimental Station, the following figures are given. On an ordinary farm where the land, while in fairly good heart, has not been over well done, a farmer may reasonably expect the following increases from a top-dressing of 1 cwt. of Nitrate of Soda:

	Per 1 cwt. nitrate of soda	Per 1 cwt. super- phosphate or high grade basic slag
Wheat, grain.....	4½ bushels.....	0 to 1½ bushels
Wheat, straw.....	5 cwt.....	½ to 5 cwt.
Barley, grain.....	6½ bushels.....	2 to 3 bushels
Barley, straw.....	6¼ cwt.....	0 to 2 cwt.
Oats, grain.....	7 bushels.....	1 to 3½ bushels
Oats, straw.....	6 cwt.....	0 to 2 cwt.
Hay.....	8 to 10 cwt.....	
Mangolds.....	32 cwt.....	20 cwt.
Swedes.....	20 cwt.....	20 to 40 cwt.
Potatoes.....	20 cwt.....	10 cwt.

For purposes of comparison the effect of phosphates is shown also.

It should be remembered that plants take up most of their Nitrogen during the early period of their growth.

Nitrate cannot take the place of intelligent soil management which includes proper cultivation.

Chilean Nitrate never leaves the soils in an acid condition and there is no harsh and unwholesome

mineral acid residue left in soils after the use of Nitrate.

It is now known that there is not as much danger of it being leached out of the soil by the rains during the growing season as has been generally believed, since the rains seldom reach lower than the bottom of the furrow, and the movement of the soil moisture is vertical and not horizontal. However, soil moisture is strongly held by good soils by capillary attraction.

Pressing Hay. Process Interrupted.

Nitrate of Soda looks somewhat like common dairy salt, and horses, cows and sheep, if they can get to it, may eat it to an injurious extent.

The emptied bags, especially in damp weather, have more or less Nitrate adhering to them. After

emptying, it is a good plan to soak in water, which will make an excellent liquid manure, say one empty bag to a barrel of water.

If lumpy, the Nitrate should be broken up fine, which is easily done by pounding it on the barn floor with the back of a spade or shovel, or by a hand grinding machine made especially for farm mixing.

Nitrate of Soda, unlike sulphate of ammonia, dried blood and complete mixed fertilizers, can be mixed with lime or ashes without loss of Nitrogen.

PROOF POSITIVE.

In a twenty year test to determine the value of various sources of Nitrogen, the New Jersey Experiment Station found "that crop yields and the percentage of Nitrogen *recovered in the crop* were greater when Nitrates were used."

The official figures are —

"If we assign to Nitrate Nitrogen a value of 100, then the relative availability of the four materials stands as follows":

Nitrate of Soda.....	100.0
Ammonium Sulfate	76.1
Dried Blood	62.0
Manure	52.4

This research entitled "Twenty Years' Work on the Availability of Nitrogen in Nitrate of Soda, Ammonium Sulfate, Dried Blood and Farm Manures," was published in "Soil Science," April, 1918, by J. G. Lipman and A. W. Blair.

SOME NOTES ABOUT SOIL EXHAUSTION

In reference to the belief held by some farmers as to exhaustion of lands by the use of fertilizers, continuous use of Nitrate of Soda, acid phosphate and potash for twenty-five years in England by Sir J. B. Lawes on land showed no signs of exhaustion whatever. Crops at the end of the period were as big as at the beginning.

As a matter of fact the use of fertilizers does not exhaust soils since a crop grown with fertilizer takes a less amount of vitality out of the soil than does a crop without fertilizer. What exhausts a soil most is the attempt to grow crops without fertilizers. It is without doubt better and more economical to feed the plant than the soil.

Lawes concluded many years since that Nitrate was better for potatoes than salts of ammonia.

According to Stutzer, Nitrate renders mineral plant foods more valuable. Nitrate without doubt promotes the best utilization of acid phosphate, and the presence of nitrate favors nitrification. The organic matter of the soil is utilized more readily when Nitrate is present. All the mineral and nitrogenous substances required by crops must be present in a soil in order that a succession of crops may be grown at a profit. Nitrate of Soda really changes the raw material of the soil into a crop with the greatest amount of profit. Nitrate is also a means of preventing the growth of parasites and pests. Crops grown with it resist attacks of parasites better than without it. The soluble carbo-hydrate and the albuminoids are also increased in crops by the use of

Nitrate of Soda. The amount of green matter and starch grains in the leaves of the crops grown by the aid of Nitrate of Soda are increased over those grown with any other nitrogenous fertilizer. When Nitrate of Soda is used early the harvest of all the crops is fully two weeks earlier than when grown with other forms of nitrogenous fertilizers. Potassium nitrate is a good fertilizer for tobacco, increasing the growth of the leaf and its burning properties. It is cheaper to use sodium nitrate than potassium nitrate for potatoes and equally good. With sodium nitrate plants do well during their entire period of growth when it is put on at the right time, preferably before planting or seeding and not later than in the early stages of growth.

SUGGESTIONS FOR PROSPECTIVE USERS OF CHILEAN NITRATE.

The Chilean Nitrate Committee is not engaged in the sale of Nitrate of Soda. Addresses of dealers are enclosed herewith. This office has no agencies.

Please mention this office when writing to dealers. Be sure to ask for genuine Chilean Nitrate of Soda.

Prices of Nitrate of Soda. When asking dealers for prices, please state the amount of Nitrate you wish quoted. The price depends, to an extent, upon the quantity purchased — the price of a ton being lower in proportion than the price of smaller lots.

Nitrate should be kept in a dry place. Glass and dynamite manufacturers usually have Nitrate on hand. It is not a substitute for common salt for any

purpose. It is not to be fed to cattle or sheep or horses any more than acid phosphate or potash salts.

The crystals of Nitrate of Soda vary somewhat in color, from brown to white, or gray.

Order as early in the season as possible, and apply it early for best results.

Nitrate is not to be put on wet foliage, and it is to be applied evenly. Both these precautions will enable you to avoid all danger of burning or destroying vegetation.

Your farmer or your gardener may be accustomed to use barn yard manure at the rate of a pound to a square foot. No commercial fertilizer should be put on any crop in such a quantity, since at such an extravagant rate its first effect would be to destroy or to badly burn any vegetation with which it came in direct contact. Direct contact of commercial fertilizers with seeds or vegetation is not generally advisable and direct contact is always to be avoided with wet foliage. All commercial fertilizers are best applied when the soil and foliage is dry.

If you have any reason to suspect adulteration of the Nitrate you may buy, send several pounds of it to your Experiment Station for analysis, giving date of purchase, full name and address of agent, and of the Company which the seller represents.

If you have any difficulty in obtaining Nitrate, either by reason of prohibitive prices or undue delays or on account of inability of dealers to supply you promptly, let us know at once, and the difficulty will be investigated immediately.

Correspondence concerning excessive freight charges is invited. Nitrate is sometimes discriminated against by the Transportation Companies by charging a chemical rate instead of a fertilizer rate. In such cases please secure and forward all the facts, including Freight Receipts.