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CULTIVATED GRASSES AND CLOVERS IN KANSAS:
FOURTEEN YEARS' EXPERIENCE AT
THE COLLEGE FARM

BY ORDER OF THE COUNCIL:

E. M. SHELTON, Director.

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EXPERIENCES WITH CULTIVATED GRASSES AND CLOVERS IN KANSAS.

E. M. SHELTON.

To the many thousands of farmers who, within the last two or three years, have established themselves upon Kansas farms, the question of the adaptability of their new possessions to the culture of the tame grasses is one of the very first importance. In all the newer portions of the State, local experiences with grasses and clover are not available; for there are none. Even in many of the older sections the "tame-grasses" have never been tried, or, if their cultivation has been attempted, it has been done upon the basis of Eastern experience as to kinds and methods; and persistent efforts have rarely been made to correct the errors and failures resulting.

The backwardness of many sections, even of Eastern and Central Kansas, in the use of cultivated grasses and clovers, which in Kansas, as elsewhere, are the basis of improved agriculture, is not difficult to explain. Farming in Kansas, almost from the first, has meant simply the cultivation of the great staples, corn and wheat, particularly the former, for which its soil and climate were so wonderfully well suited. Moreover, the first settlers, besides having the pick of the farm lands for cultivation, had for "range" purposes as much of the outlying lands as they wished to use. To grow eighty acres of corn, furnishing the material for fattening a herd of cattle which had cost next to nothing for summering, was but work for a single farmer. This is, indeed, agriculture in its most elementary form; but it may be doubted if more profitable farming has ever been known or practiced. Why should the settler trouble himself about the cultivation of unfamiliar grasses when the country was a vast ocean of grass of which he might use at will?

But the aspect of Kansas agriculture has changed almost miraculously within the last five years. The "range" has gone forever; thousands of Kansas farmers wish, today, that their impoverished, weedy "plow-land" could be returned to its orig-

inal condition of prairie sod. Corn is grown, thanks to improved machinery, nearly as cheaply as ever, and perhaps as good crops are raised as were ever produced; but weeds and insect pest have increased in numbers and boldness enormously. These are the facts, principally, which have driven Kansas farmers, old and new, to thoughts of better and more varied cultivation, and especially to the cultivation of grass. In all this our cultivators have but followed the universal law; for no agricultural community was ever yet, I believe, known to abandon the simpler systems of farm practice for the complex and costly, except as it was driven to it.

It will be observed that I say nothing here of what may be called the "permanent improvements" of Kansas agriculture, as, for example, improved stock, shelter, and methods of feeding, better cultivation, and the outlay of greater skill and care in managing winter feed. In these and many other ways the agriculture of the State has made a distinct advance, which is sure not to be lost in the future. It only remains for our farmers to continue this upward movement by cultivating not much, but well; by growing, in large variety, grain, root, and forage crops, and particularly grasses and clovers. The great obstacle to the introduction of the "new things of agriculture" in Kansas is the well-nigh universal disposition of Kansas farmers to stake all on some one crop. We are all more or less saturated with the "bonanza farming" idea. Cultivating grasses and roots we pronounce "small business." We can't stop to "putter" with dairying and fruit-raising and tree-planting so long as the big corn-field demands our attention. There are, however, many reasons for thinking that the day of the exclusive corn-field and great wheat-farm is past forever, in Kansas.

This bulletin has been prepared chiefly for the benefit of that large class of Kansas farmers, new and old, who are looking anxiously for the facts relating to the cultivation of the grasses and clovers in Kansas. It is firmly believed that the facts of the fourteen years' experience herein detailed are certain, with minor variations, to be repeated in the fourteen years next to come; that, in short, our experiences may, in a good degree, be taken safely as a guide and the criterion of future operations elsewhere performed. In forming a judgment of the applicability of these facts to other circumstances and conditions, it will be well to bear in mind certain well-known general facts relating to grass

culture in the State in general, and the situation and agricultural condition of the College farm.

Along the eastern border of the State, and especially in that part touching the Missouri River, in a belt of territory varying in width with different seasons, the grasses and clovers are, and long have been, cultivated almost precisely as they are grown in Missouri and Illinois. The "tame-grass question" here has long been settled. Quite fortunately, the College farm is located 118 miles west of the Missouri river, thus having many conditions in common with both the eastern and west-central parts of the State. The farm is "second-bench" land; it a strong clay loam, naturally of only moderate fertility, and the cultivated portions have been under plow for fifteen or more years.

The facts given below are taken largely from files of the *Industrialist*, and from my reports and private memoranda:—

1873. —Our records of this season's work are meager in the extreme. A considerable area was seeded to Kentucky blue-grass in the early fall. About three acres of this was mulched lightly with coarse stable-litter. The mulched portion alone made a sod, which remained a pasture-field until last season. In the year 1872 or '73, about four acres of the highest, poorest, and most exposed portion of the old College farm were seeded with mixed red clover and timothy. This field has given at least one crop of hay every year since; and, during several seasons, two full crops have been obtained. It is interesting to notice, in this connection, that the timothy had all disappeared before the end of the fifth year, giving place to Kentucky blue-grass, but the red clover has held its own down to the present.

1874. —This was pre-eminently a year of disaster, —caused by drouth and locusts. Ten acres—a field of growing wheat—were seeded, late in April, with clover and timothy in the usual proportions. The seed germinated perfectly; and the young grass and clover plants occupied the ground completely. In consequence of the rivalry of the wheat and lack of sunlight, however, the young grass grew "spindling," so that, within a fortnight after the removal of the wheat crop, the June suns had scorched the life out of every grass and clover plant in the field. Despite the prevailing drouth, this was not a bad year, certainly, for "tame-grass," as the sixteen acres of timothy and clover gave, per acre, an average yield of one and three-tenths tons of excellent hay. In my report for 1874 I find the following item: "The common red

clover was severely injured—more than half killed, in fact; but it is noteworthy that upon that portion of the field which had previously been manured and thoroughly tilled, the injury was scarcely perceptible. Timothy and blue-grass, on the other hand, although putting forth no green blades for nearly three months, immediately after the fall rains, started with undiminished vigor, apparently uninjured.”

1875. —This, too, was a dry year, and to the drouth was added the scourge of young grasshoppers early in the season. Timothy, seeded on seven acres of ground in September, 1874, made an excellent “catch.” Two acres of alfalfa, sowed in the spring of 1875, made a perfect growth, and for years yielded great crops of hay, to say nothing of pasturage. Red clover was greatly injured by drouth and grasshoppers. Timothy shared a like fate; but I notice in the *Industrialist* of July 15th this item: “Our crop of timothy, which was totally ruined by drouth and grasshoppers the past spring, within a week has started up a green, even sward over the entire fields.” Thirty-three varieties of grasses and clovers were sowed this spring, most of which came to naught. This was, perhaps, all things considered, the worst year for the cultivated grasses that we have known in Kansas.

1876. —This was a year of great success with grass, as with everything else grown upon the farm. Besides a variety of experimental sorts, alfalfa was grown to the extent of six acres; and of mixed orchard-grass, timothy, and Kentucky blue-grass, two acres. This was our first considerable trial of orchard-grass. Everything sown this year grew amazingly. According to the *Industrialist*, alfalfa, on May 24th, measured thirty inches tall, and blue-grass, on the same date, was reported “knee-high.” June 27th alfalfa yielded two and three-tenths tons per acre; and, on June 24th, seven acres of timothy, seeded the previous year, gave ten and a half tons of hay. The *Industrialist* of June 24th reported the College barn “well-nigh full of hay, and the genuine article, timothy and alfalfa.” It is worth noticing here, that the addition of plaster—gypsum—to growing alfalfa at the rate of 160 pounds per acre increased the yield of hay 326 pounds.

1877. —This, also, was a season of great yields of all farm products, not excepting grass. Not much grass-seed was sown, however, except in an experimental way; but all grasses and clovers came to a wonderful perfection.

1878. —During this year our grasses, if possible, came to even

greater perfection than had been attained to during either of the two years preceding. Twelve acres of mixed orchard-grass and Kentucky blue-grass were sown April 6th, and, apparently, every seed came to the condition of a mature plant. On June 8th the yield of hay was reported in the *Industrialist* one and a half tons. On June 18th a field of alfalfa gave nearly two tons of hay per acre, although it had been used as a hog-pasture until quite late in the season. From the same paper, date of September 21st, I get this item: "About six weeks ago we finished cutting the third heavy crop of alfalfa hay, taken from the same piece of land the present season; and, at this writing, there is a fourth crop—a full one and one-half tons of hay per acre—upon the same land." In fact the experience of '76, '77, and '78 had completely "settled" the grass question in my mind, so far as it relates to Kansas.

1879.— The spring opened very dry; no rains of much value falling until early summer. Nevertheless, our grasses held their own wonderfully well, as the following facts show: March 8th—"Orchard-grass has made a vigorous start already." May 3rd—"Alfalfa plants measuring two feet in length were cut today." May 31st—"A very good crop of clover hay, and an extra growth of alfalfa, were cut this week." June 28th the behavior of the different grasses and clovers was reported as follows: "Alfalfa has been seemingly indifferent to the drouth; a heavy crop was cut May 26th, and another June 28th. Orchard-grass made a vigorous and early start, and early in May gave a great crop of forage. From that time it became brown and sear. With the June rains, it started rapidly; and, on June 28th, the field was reported "a dense mass of vivid green." Red clover gave a good crop of hay May 31st, and had another ready by the middle of July. Kentucky blue-grass started early, but remained brown and dormant throughout the entire summer, giving neither hay nor pasturage worth mentioning. Timothy made a record almost identical with that of blue-grass. English blue-grass (*Festuca elatior*) has been very satisfactory. August 12th—"Another crop of alfalfa has just been cut—the third this season"; and, again, September 13th,—"The alfalfa field has just yielded its fourth crop this season—a feat it has now accomplished three years in succession."

1880.— Six acres seeded *last fall* to orchard-grass perished utterly during the winter. (By the by, we have tried fall seeding of orchard-grass upon a small scale for a number of years with

the above invariable result). This was one of the most trying seasons to the grass crop, as to all others, that I have known in Kansas, chiefly because of the absence of rain early in the season. The only spring seeding was done upon about eight acres of ground which was given to English blue-grass (*Festuca elatior*) and orchard-grass, in about equal portions. Although this way the poorest and most exposed piece of ground upon the lower farm, the grass seed developed a fair "stand," which was used as a pasture-field, until 1887. The early hay crop was very light, but in the fall, September 25th, a heavy cutting of mixed orchard-grass and red clover was obtained.

1881. —April 23rd—"Our tame grasses are now furnishing full feed of the best quality." Nine acres were, this spring, seeded mostly to orchard-grass, which made an almost perfect growth. The summer rains, however, failed; so that the hay crop was very light. Early in May, Field No. 1—a heavy sod set in 1875—was turned under for corn. Orchard-grass, red clover, and alfalfa showed no signs of injury, but made a vigorous growth as soon as the early fall rains set in. Timothy and Kentucky blue-grass, however, were injured, in many cases, past recovery. October 29th—"The cattle are subsisting upon the 'tame-grass' pastures without other feed."

1882. —April 4th—"The College herd was sent afield to shift for itself today." This is the earliest date when, in our Kansas experience, pastures furnished ample pasturage for cattle. The varieties of grass and clover have, this year, by a gradual process of selection, been whittled down to fourteen sorts, as follows: Orchard-grass, red clover, alfalfa, English blue-grass, alsike-clover, fowl meadow-grass, perennial rye-grass, Bermuda-grass, Kentucky blue-grass, white clover, tall meadow oat-grass, timothy, Johnson-grass, and red-top. Of these, only three or four are of value; while some, like Johnson-grass and Bermuda-grass, would be dangerous pests but for the fact that they kill down to the frost level every winter. May 6th—"At this date orchard-grass, clover and alfalfa are fully 'knee-high.'" May 20th—Haying begun. August 26th—"The third heavy crop of hay this season was taken from Field A. (eight acres) today." Later on, dry weather reduced the pastures to a very low condition; but, October 21st, orchard-grass and red-clover pastures were giving the herd ample sustenance.

1883. —April 21st—"The cattle were driven to pasture today.

The orchard-grass furnishes ample feed,—as much might have been said a week ago.” This was a season of great abundance; and all the records testify to the fact with items numerous and pointed. We need only to give a few of those referring to the cultivated grasses. May 26th—“Orchard-grass and red clover are from twelve inches to two feet tall.” June 2nd—“The alfalfa cut this week is giving a good ton and a half of hay per acre; while the orchard-grass and red clover are doing nearly or quite as well.” “The barn fairly creaks under the overflowing bays of wheat, oats, millet, and tame hay squeezed into it. The third crop of hay that is still coming will have to colonize.” —*Industrialist*, May 18th. September 29th—“We have again accomplished the feat of cutting four crops of alfalfa hay from the same ground in one season. The fourth crop is not as heavy as the average of the first three; but the four crops will easily give six tons per acre.”

1884.—It would be quite enough to say of the growing season of 1884 that the rains were abundant and timely; so that every seed planted gave its harvest. But here are a few of the facts: April 29th nine acres were seeded to mixed orchard-grass and red clover. Of this field, the *Industrialist* of September 22nd spoke as follows: “The field is covered with the densest growth of grass and clover. The rank vegetation stands, or, rather, sprawls about, to the depth of twelve to fourteen inches.” June 7th—“We are now putting up hay which, over considerable areas, will yield one and a half tons per acre. A good deal of orchard-grass is fully three and a half feet high.” November 22nd—“ We have now an orchard-grass sod, seeded in 1875, which has been mowed two or three times each succeeding year. We have, also, a capital stand of red clover, which was seeded in 1872.” —*Industrialist*. To the above item we may add that during all this time these fields received no manure or other dressing.

1885.—The early season was well-nigh perfect for grass and all other cultivated plants. The following items from the *Industrialist* will serve to show, in a statistical way, the relative earliness of a few of the commoner grasses and clovers at the date mentioned: April 7th—“Grass is starting well. Alfalfa shows the largest and most vigorous growth, with meadow oat-grass a good second, showing blades six and seven inches long, and plenty of them. Blue-grass follows, with orchard-grass and red clover in the third or fourth place.” April 20th—“Meadow oat-grass shows

shoots nine to eleven inches high; alfalfa, eight to ten; English blue-grass, five to eight; orchard-grass, three to six; timothy, four to five; red-clover, two to five. Bermuda-grass shows no green blades above ground, although evidently alive." The late summer and fall, however, did not maintain the promise of the spring-time. About six acres seeded to orchard-grass and red clover made an almost perfect growth. The *Industrialist* of September 26th gives the facts of the season as they relate to our theme as follows: "The early growing season was nearly or quite all that could be desired by the grower of cultivated grasses; but, later, protracted dry weather put the tender sorts to a severe test. Tall meadow oat-grass, for which so much has been claimed, gave a medium crop of hay; but, since the cutting, has hardly shown a sign of life. Kentucky blue-grass has killed out in places, the fields showing many bare spots, but the late rains have put new life into the living plants; so that, without doubt, it will soon recover lost ground. Red clover has given an enormous yield of hay; and, since cutting, has afforded abundant pasturage. The same, and even more, can be said of orchard-grass and alfalfa. Our experience the present season, and the experience of many other seasons, have shown mixed red clover and orchard-grass to be the most useful of perennial forage plants." October 10th—"An exceedingly dry fall has brought pastures to a condition of more or less complete barrenness ; so that on October 8th the herd was gathered to the barn." —*Industrialist*.

1886. —The winter of 1885-6 will long be remembered because of its length and severity; resulting in the total destruction of nearly all of the alfalfa, clover, timothy, and orchard-grass (about thirty acres) then growing upon the College farm. The only exception to the general fatality was the orchard-grass, sowed the *spring immediately preceding* this severe winter. For some unaccountable reason, the six acres sowed in the spring of 1885, although the field was a very exposed one, was not damaged in the least. Elsewhere, in protected situations, the south side of board fences and buildings, no damage was done. Neither were Kentucky blue-grass nor its near relative, Texas blue-grass, injured in the least; but the destruction of all other grasses, and all clovers, except as stated above, was complete. This was, by far, the most serious set-back that we have experienced in the course of fourteen years of experimenting with cultivated grasses and clovers. That the circumstances of that winter were exceptional to

a degree, I have every reason to believe. The results of the losses of the previous winter were soon made painfully apparent in a greatly diminished pasturage and hay crop. The *Industrialist* of August 21st contains this note: "Hay is a poor half-crop; and, pasturage is the poorest we have known for years." The absence of clover, orchard-grass, and alfalfa explains this shortage in part; but only in part, for the season was a dry one, and not well calculated to bring the grasses to their best estate.

1887. —This was one of the most unfavorable seasons known to Kansas agriculture; or, for that matter, the agriculture of almost the entire nation. A dry spring was followed by a very dry and hot summer, which reduced the yield of all crops to the lowest point known for many years. About twelve acres of mixed orchard-grass and red clover, seeded late in April, germinated perfectly; and, for a time, its growth was all that could be desired. The dry summer, however, greatly damaged the young grass plants; for a time, indeed, the destruction of the entire crop seemed complete. The early fall rains, however, showed the loss to have been much less than was supposed. At the present time, the field shows much more than a good half-stand. By re-seeding the vacant patches we are not without hopes of getting the field thoroughly set. The early fall rains did much more than to revive the spring-seeded grass; the blue-grass started with vigor, and soon displayed a luxuriant growth that rarely has been equaled upon the College farm.

1888. —We have this spring seeded, outside of experimental plats, about twelve acres of ground. The basis of the seed mixture used has been orchard-grass, although to this have been added, in various proportions, to suit different soils and situations, red-top clover, alfalfa, and, to some extent, English blue-grass. So far all have started from the ground in a way that leaves nothing to be desired.

This, in brief, is the history of the successes and failures had with the cultivated-grasses upon the College farm, so far as there are any records. Of the failures in seeding, it ought to be said that, at least, in the case of two seasons, the loss grew out of ignorance and inexperience of Kansas soil and climatic conditions. Of course, these errors are not likely to be repeated. The facts of this history may be concisely summarized as follows: In seeding, we have, in the course of thirteen years, been completely successful in seven years, and have made more or less complete failures

in five years; and, in the same period, we have had eight years of great crops of hay, one medium crop, and four years when the hay crop was light. We have have had, in the same period, but one season (that of '85 and '86) when the destruction of grasses and clovers by winter-killing was really serious. We have never yet—at least since 1874—had experience of a season of drouth that has permanently damaged well-set orchard-grass, alfalfa, or red clover.

These facts seem to me to show, beyond any possibility of question, that the tame grasses and clovers, when cultivated with intelligence and judgment, are a profitable crop in this section of the State, and doubtless in others where they have never been tried. The experience above detailed seems a sufficient basis for certain general rules of practice which, without much further statement of reasons, are given below. It is not claimed that these rules are of the infallible cure-all sort. I know of no matter in which the farmer can safely waive judgment, or where he can delegate his thinking to another. Circumstances may make it necessary to follow an entirely different course from that which has generally proved satisfactory at the college farm. Nor have the practices here recommended *always* been satisfactory to us; they have simply given better results, all things considered, than were obtained where a different course from that recommended here was followed.

WHERE TO SOW.—THE SOIL AND ITS PREPARATION.

A strong clay loam, resting on a friable clay subsoil, is, in Kansas, as everywhere, natural grass land. The soil can hardly be too rich, naturally or artificially, for grass. Poor lands may be counted on to produce poor crops of grass as of everything else; but lands which have become impoverished from any cause may be relied on to exhibit, in the crops grown upon them, in an unusual degree, all of the unfavorable influences of the climate in general, or of a particular season. But, whatever the character of the soil, prepare it for the reception of grass seed by as thorough plowing and harrowing as is ordinarily done for oats or corn; and follow the seeding with a light harrow or roller, or both. Do not seed upon raw prairie. Except in the extreme eastern and north-eastern sections of the State, I have never known or heard of a "catch" obtained upon unbroken prairie, although I have been familiar with a considerable number of costly "experiments" made to test this matter. I would in no case attempt seeding

grass upon land that had not been cropped three years. Never consent to seed with some other crop, as wheat or oats: this is a rule with scarcely an exception.

WHEN TO SOW.

Our best stands have been had from spring seeding. It is difficult speak accurately here; but I would in no case be tempted to sow grass seed until the ground was thoroughly wet from the spring rains. We have rarely found it advisable to sow earlier than April 15th. The following excerpt, an argument for spring seeding, is taken from my report of 1885: "I am aware that by many the view is held that, inasmuch as the plant casts its seed in the fall season, this is Nature's own time for the sowing of seed, and that, in this respect as in so many others, art can do no better than to copy nature. To this, answer may be made that Nature, in her seeding operations, is wasteful in the extreme, sowing a thousand seeds that come to nothing for every one that develops a plant. Moreover, this argument for fall seeding applies equally in the case of corn, oats, and other similar 'spring' grains, which, in a state of nature, are equally with grass seeds sown in the fall. Fall seeding may be said to be better than seeding in the spring in the case of all plants which make a growth in the fall sufficiently strong to withstand the rigors of winter. This, corn and oats and most grasses will not do." Timothy and Kentucky blue-grass may be sowed late in August or early in September with fair prospect of success; but even these have done better with us when the seeding has been delayed until spring.

WHAT TO SOW.

Many sorts of grass and clover are, doubtless, valuable to the agriculture of the State; and it is equally certain that varieties useful in one section or situation are of little value in others. The practical man, however, never finds it to his interest to attempt the cultivation of many sorts. Usually, two or three varieties complete the list of grasses cultivated in any section; and very often a single species like alfalfa, as grown in Southwestern Kansas, satisfies fully the requirements of a large section of country. For this reason, I refer to but few sorts here; others might, beyond question, for other localities, be substituted to advantage for those commended here.

Mixed orchard-grass and red clover have proved, for the general purposes of the farm, superior to any single sort or combination that we have yet tried. A bushel and a half of orchard-grass, or,

better still, two bushels, with three quarts of red-clover seed per acre is a very satisfactory mixture. English blue-grass (*Festuca elatior*) has often been very valuable, although it has not the staying qualities so characteristic of orchard-grass. When sown alone, two bushels of seed per acre should be used, and, if to this two or three quarts of red-clover seed are added, the product of the field will be improved both in quality and quantity.

There are few Kansas farmers who might not grow alfalfa to advantage. In the ability to resist drouth, and in its yield of hay or pasturage, it has no equal among the common grasses and clovers. About twenty pounds of seed should be used to each acre of ground, which must in every case, be well prepared by plowing and harrowing. Of the above mentioned sorts, and, indeed, of every variety of grass that we have tried, it may be said that ultimately it will give place to Kentucky blue-grass. Red clover will hold its own longer than any other grass or clover against the encroachments of this conqueror of grasses; but the blue-grass is sure, sooner or later, to dispute with it the possession of the land. Except the lawn, I would on no account advise seeding to Kentucky blue-grass. For the reason that it gives no hay crop worth mentioning, and almost no pasturage, except during about five weeks of early spring, it has, in this section, at least, but trifling agricultural value. Its near relative, Texas blue-grass (*Poa arachnifera*), seems to us a much more useful sort, and, not unlikely, one of our very best grasses. A wider experience is needed before a statement of the agricultural value of this grass can be made.

IN TIMES OF DROUTH,

There is no drouth-proof fodder plant; although some deep-feeding plants like alfalfa are but slightly affected by the ordinary "dry spell." But grass is like every other crop in that it fails when from any cause it is deprived of its proper supply of moisture. To look for heavy crops from the meadow in dry seasons is as unreasonable as to expect large crops of grain when the rains fail us. We are not warranted in demanding much more of any grass than that it shall pass the time of lengthened drouth uninjured. The grass or clover that may be relied upon to do this (as will most of the sorts commended above), rallying promptly on the recurrence of rain, is a very valuable sort, accomplishing nearly all that may reasonably be expected of agricultural plants.

In conclusion, I wish to express my obligations to my assistant,

Mr. H. M. Cottrell, for much pains-taking work in compiling the facts of this bulletin.

The Bulletins and Annual Reports of the Station will be sent free to residents of the State on application to DIRECTOR OF EXPERIMENT STATION, MANHATTAN, KANSAS.