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U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF PLANT INDUSTRY—BULLETIN NO. 100, PART VI.

B. T. GALLOWAY, *Chief of Bureau.*

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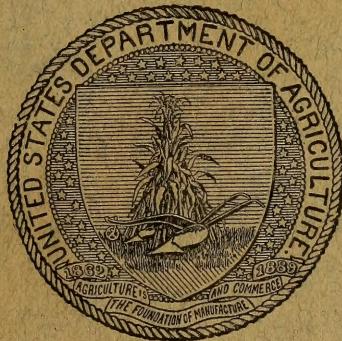
ORCHARD GRASS.

BY

R. A. OAKLEY,

ASSISTANT AGRICULTURIST, FARM MANAGEMENT
INVESTIGATIONS.

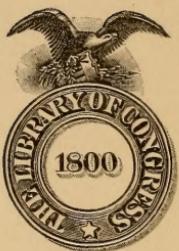
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B. T. GALLOWAY, *Chief of Bureau.*

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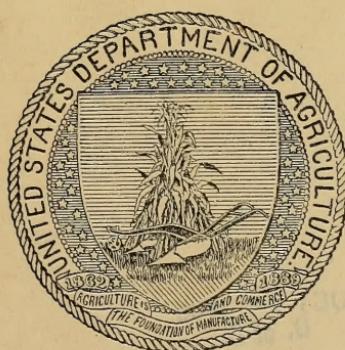
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CONTENTS.

	Page.
Introduction	5
Methods of culture	6
Seeding	6
Mixtures with red clover	7
Mixtures with other grasses	8
Life of meadows	9
Uses and value	9
Hay	9
Pasture	10
Seed	10
Harvesting the seed crop	11
Thrashing	11
Handling the aftergrowth	12
Value of the straw	12
Weeds in orchard grass seed fields	13
Other grasses in fields intended for seed	14
Summary	15

ILLUSTRATIONS.

	Page.
PLATE I. Fig. 1.—Harvesting orchard grass for seed. Fig. 2.—Method of shocking orchard grass; shocks showing bands at top-----	10
4	
100—VI	

ORCHARD GRASS.^a

INTRODUCTION.

Orchard grass (*Dactylis glomerata* L.) is a well-known standard grass which is grown to some extent in every State in the Union and quite commonly in the region east of the Mississippi River and north of the northern portions of Alabama and Georgia. It attains most importance, however, in Kentucky, southern Indiana, Tennessee, North Carolina, Virginia, West Virginia, and Maryland, and seems quite thoroughly adapted to a variety of soils in these States.

It may be said that the general opinion of farmers in regard to the value of orchard grass either for hay or pasture is quite unfavorable. This unfavorable opinion, which is due somewhat to prejudice, exists to a greater extent in the timothy region than elsewhere, and as the limits of this region are reached and crossed orchard grass is much more highly regarded. The objectionable features of the grass are in general its bunchy habit, coarseness, and the unpalatability of its hay unless cut at the proper state of maturity. These objectionable features are not alone the cause of its unpopularity or the reason why it is not grown more generally. There is no doubt that orchard grass could be grown very successfully throughout the greater portion of the timothy region, but as the demand for any hay except timothy is very limited farmers see little inducement for them to raise it. On

^a In connection with the general plan of the Farm Management work it is contemplated to take up the study of various seed crops. Much interest is now being manifested in better seeds for the farmer. This is especially true of forage-crop seeds, including both grasses and clovers. Mr. Oakley's paper, which is contributed from the Office of Farm Management, conducted under the direction of Prof. W. J. Spillman, is a valuable contribution to the methods followed in growing orchard grass for hay, for pasture, and for seed. Special attention is called to the fact that orchard grass seed as usually grown is for all practical purposes pure. The investigations of this Bureau have shown that considerable quantities of the seed of this grass found in the market contain seed of other and less desirable, cheaper grasses. That the seeds of these cheaper forms have been added for the purpose of adulteration seems evident from the fact that the grasses bearing them are not found in orchard grass fields to any extent worth mentioning.—B. T. GALLOWAY, *Chief of the Bureau of Plant Industry.*

account of its maturing well with a number of other very valuable grasses and clovers its popularity may in time increase as the advantages of such mixtures become more generally appreciated.

Orchard grass is exceedingly variable and offers a large field for selection and breeding. Its variable characters of most importance are its coarseness, bunchiness, and time of maturing. By consistent selection with special reference to the first two characters valuable strains may in time be developed which will not possess the objectionable features of the common orchard grass now being grown.

METHODS OF CULTURE.

SEEDING.

While there are some methods that are generally employed in the culture of orchard grass, still there is a great difference of opinion even among the most successful growers in any one locality as to the best practices. In the seed-producing section of Kentucky and Indiana it is the common custom to sow the grass in February on fall wheat at the rate of from three pecks to one bushel to the acre. Since the crop in this section is almost entirely harvested for seed, it is not considered desirable to sow more than a bushel. In years past as much as two bushels to the acre were sown, but it is now the general opinion that one bushel is sufficient, and even less is often used. A bushel of orchard grass seed weighs 14 pounds. Orchard grass to give large yields of seed should be reasonably thin, as it produces more abundantly when in this condition. It is usually sown broadcast, as it does not feed out well through a press drill, either by hand or with a wheelbarrow or other type of seeder, and is covered very shallow. Good results are often obtained by not covering the seed, and it is quite a common opinion that too deep covering is the cause of many of the failures to secure a stand.

A method of seeding which is often followed in the section mentioned is to scatter the orchard grass straw from which the seed has been thrashed on ground that has been sown to wheat. This is usually done in February. The straw acts as a mulch in this case and the seed needs no covering. It is very essential that it be scattered evenly and very thin; otherwise the stand will be too thick and unsatisfactory. The greatest objection to this practice is that unless the straw is very clean the meadow is sure to be weedy, and some are of the opinion that since the seed that is left in the straw or blown over with it is mostly of poor quality a field of inferior and unequally maturing grass will be the result.

Orchard grass may be sown successfully after corn by splitting the rows with a disk harrow as soon as the crop is removed. This may be done any time during the month of October, and in February or as

soon as the weather is favorable the grass may be sown with a broadcast seeder at the ordinary rate, and the ground being uneven at this time the freezing and thawing which follow will cover the seed sufficiently. Disking seems to give much better results than plowing, since the ground if plowed will not have time to thoroughly settle before the time of seeding. Rolling would doubtless be beneficial after seeding in this manner.

In western Virginia and in Tennessee orchard grass is commonly sown the latter part of September or the first of October with wheat on the ground at the rate of a bushel and a half to two bushels to the acre, the wheat being drilled in at the rate of three to five pecks to the acre and the grass sown either broadcast by hand, with a broadcast seeder, or an attachment to the drill, and covered as shallow as possible.

Orchard grass is often sown with oats, usually in March, on ground that has been previously in wheat and which has been plowed the preceding autumn. A half seeding of oats is usually sown in this case, and gives as a result only a fair crop. The grass, however, makes more pasture the first season as a rule than when sown with a full seeding of either wheat or oats. Early fall seeding with winter oats in sections where the latter can be grown may be depended upon to give good results, but on account of the Hessian fly it is not possible to sow it with wheat much before October.

A crop of hay is not expected the first season, whether the grass is sown in the fall or spring, either alone or with a nurse crop. If sown alone a light cutting may be secured, provided the conditions are favorable, in the latter part of August or September; but in general the grass is pastured and not cut except at the time when the grain which is sown with it is harvested. The following season it makes a crop of either hay or seed, as is desired. There may be some advantage in sowing the grass alone for the extra quantity of forage produced the first year, but whether this and any other advantages that may come from seeding in this way will compensate for the profit accruing from the nurse crop is an undecided question.

MIXTURES WITH RED CLOVER.

Throughout almost the entire region where orchard grass is grown it is quite a common practice to sow red clover with it. This practice is a good one, not only for the value of the red clover in maintaining the soil fertility, but also for the fact that its presence greatly improves the orchard grass either for hay or pasture. In the seed-producing sections red clover is a menace to the seed crop, especially the first and second years. As it is impossible to cut the orchard grass above the clover, the leaves and heads get mixed in with the seed and are difficult to separate from it. Although the presence of the leaves in the

orchard grass seed materially decreases its commercial value, the advantage of having the clover in the field more than compensates for this.

In sections where the grass is grown for hay and pasture, red clover is sown at the rate of one bushel to 5 or 7 acres, usually as early in the spring as the weather will permit. It is, however, sometimes sown in the autumn at the same time as the orchard grass, but the seed of the two are not mixed, as they do not feed evenly through the drill or seeder. In cases where clover is sown in the spring on orchard grass that has been sown the fall before, it is either covered lightly by means of a drag harrow or left uncovered. Less clover is sown to the acre in seed-producing sections than where the grass is intended for hay or pasture, the customary quantity being one bushel to 8 or 10 acres. In these sections the first crop is frequently cut for hay on account of its containing so much clover. The second crop usually contains very much less and is cut for seed, as are also the following crops, since the clover at the end of two years usually disappears. Pasturing the field appears to materially increase the longevity of the clover, and it is not uncommon to see meadows that are 6 or 7 years old containing almost as much clover as they did the first year.

Much trouble is now being experienced in securing a catch of red clover throughout the greater part of the region where it is grown. As a result alsike is being substituted in some sections, and where it has been tried thoroughly it is giving good results. This difficulty in growing red clover will doubtless soon become a serious proposition, especially in seed-producing sections, and unless alsike or some similar leguminous crop can be grown it will be only a few years until more barnyard manure or commercial fertilizer will have to be used. At the present time there is very little commercial fertilizer applied to orchard grass, although it is the opinion of some of the more successful growers that an application of about 200 pounds of good fertilizer in the spring, just as the grass begins to grow, would yield profitable results.

MIXTURES WITH OTHER GRASSES.

On account of the bunchy tendency of orchard grass it is often desirable to mix it with other grasses for hay or pasture, and while this has not been practiced as yet to any great extent the results obtained from such mixtures are very promising. Aside from affecting the palatability of the grass, the mixtures have a tendency to increase the yield. Orchard grass matures well with tall meadow oat-grass and meadow fescue, and in some localities in Tennessee a mixture of it with the latter is attracting considerable attention, especially for pasture. Doubtless in time orchard grass will be more generally grown for hay and pasture in mixtures with these or other grasses.

LIFE OF MEADOWS.

Orchard grass is a more hardy and permanent grass than timothy, and as a result remains productive in a meadow under most conditions much longer. In the principal sections where it is grown the average life of a meadow is from five to seven years, although it is a question whether it might not be broken up profitably at the end of four years. Throughout almost its entire region Kentucky bluegrass is its natural enemy and works in around the bunches almost to its ultimate exclusion. Redtop and Canada bluegrass also are present in many sections with the Kentucky bluegrass, and at the end of five or six years these three grasses are greatly in the majority. Pasturing seems to facilitate the growth of the bluegrass, inasmuch as it has a tendency to cause the orchard grass to become more bunched, and it is also a means of spreading the bluegrass seed. During the last year of its existence it is customary to pasture the orchard grass field, and late in the autumn or early in the winter it is broken up and is planted to corn the following spring. It is well to have the field broken up as early as possible so as to give the sod time to rot sufficiently before planting the corn.

USES AND VALUE.

HAY.

According to chemical analysis orchard grass hay should be equal, if not superior, to timothy, but in real practice it does not seem to be able to successfully compete with the latter. In large cities there is practically no demand for any hay except timothy, and the demand for orchard grass hay is only local and very limited. In the timothy region orchard grass is looked upon very unfavorably, but where timothy can not be grown so successfully its hay is used to a greater extent and is considered of very good quality.

As previously stated, orchard grass should be sown thicker when desired for hay than for seed, 2 bushels of good seed to the acre being usually required, for unless thick it becomes coarse and woody. Its value as hay is increased by the addition of red clover or alsike, and where it has been sown with other grasses, such as tall meadow oat-grass or meadow fescue, its quality seems to be improved by such mixtures. The state of maturity at which the grass makes the best hay is when it is just in bloom. Not only does the quality seem to be better at this time, but the yield is also at the maximum.

In some sections it is considered a good hay for horses, but it is of more value for cattle, and especially for fattening them for the market. As a feed for sheep it is of only fair quality. The value of the hay depends not only on the state of maturity at which it is cut, but also on the bunchiness and coarseness of the grass. These characteristics

are influenced largely by the method of culture, and it is often for the reason that farmers do not thoroughly understand growing it that they condemn it as a hay grass. Seeding evenly with the proper quantity of seed and careful pasturing are important factors in securing a good meadow.

PASTURE.

For pasture, orchard grass gives best results in mixtures with other grasses and clovers, and is of special importance from the fact that it can be grazed early and late in the season. It is quite a valuable grass if for no other reason than this. It also stands grazing fairly well. It must, however, be closely pastured; otherwise it will become too coarse and woody, and stock will not eat it. Stock do not relish the mature grass, and invariably lose flesh when turned on a field in this condition. To secure best results from pastures, they should be mowed some time during June to keep down the weeds, and again later as needed. In this way they are kept clean and more productive. Blue-grass and white clover are usually very prominent in most orchard grass pastures and are valuable additions, as they grow between the bunches of the orchard grass, thus increasing the yield. The white clover is also of value in maintaining soil fertility.

SEED.

Orchard grass seed is produced to some extent throughout the entire region in which it is grown. There is quite a quantity raised in western Virginia, but the greatest seed-producing area is in the vicinity of Louisville, including Jefferson, Oldham, and Shelby counties, Ky., Clark County, Ind., and some of the counties adjoining those in both States mentioned. Just why there is more seed produced in this section than elsewhere is not definitely known. Some are of the opinion that it is because orchard grass seeds more readily there, which may be true. However, the cultural methods employed by farmers in this section may have something to do with the success attained in raising it. In Oldham County, Ky., the average production is about 55,000 bushels, which represents practically 5,000 acres, as the yield is about 10 to 12 bushels to the acre. The growing of seed in the section referred to is a profitable industry, and there are many farmers who engage in it quite extensively with uniform success. It is said to be a more profitable crop than wheat, and when the harvest of the two conflict orchard grass is given the most attention. The average price of seed for the last ten years has been about \$1.25 a bushel. The seed alone does not represent the entire return from the field, for after it is harvested the meadows afford hay or pasture, or both, from which a considerable profit accrues. Orchard grass seed is the controlling crop in this section, and the cropping system is planned to accommodate it.



FIG. 1.—HARVESTING ORCHARD GRASS FOR SEED.



FIG. 2.—METHOD OF SHOCKING ORCHARD GRASS; SHOCKS SHOWING BANDS AT TOP.

HARVESTING THE SEED CROP.

The methods used in harvesting orchard grass seed are practically the same throughout the whole country. In general, harvest begins about June 15 and lasts about ten days, though when there is a large acreage it is often necessary to begin earlier than this, in order to finish before the seed becomes too ripe. An inferior quality results from cutting the seed before it is sufficiently mature, and this seed is quite readily detected by its light-green color. When properly matured the seed is straw colored, and not at all green. A common test to determine whether the seed is at the proper stage for cutting is to beat the heads in the palm of the hand, and if quite a quantity shatters off it is considered ready to cut. To one unfamiliar with the crop it would seem that the waste from shattering would be great.

Orchard grass is harvested with an ordinary grain binder (Pl. I, fig. 1), making as small bundles as possible, in order that they may cure readily. The bundles are placed usually three in a shock and the shocks tied at the top with two bands of straw, one about 8 inches below the other (Pl. I, fig. 2). They are bound in this way so as to make them more stable and to prevent the seed from shattering. These shocks are made small to facilitate handling at the time of thrashing, and so that they may be easily tied at the top with the straw bands. They are left standing from two to four weeks, or until they have had time to cure thoroughly, and are thrashed without stacking. On an average it takes about 5 pounds of twine for 100 bushels of seed. The crop is of such importance that the fence corners and other places that can not be reached with the binder are cut with the cradle and bound into bundles by hand.

When the grass is sufficiently tall it is cut from 12 to 14 inches high, to avoid the low-growing weeds, such as plantain and sorrel, and also clover and bluegrass. Another advantage in high cutting is that it leaves more of the undergrowth to be utilized later for hay or pasture.

THRASHING.

The common grain separator is used for thrashing with the ordinary cylinder and concaves, but with special riddles and with nearly all the wind shut off to prevent too much of the seed from being blown over. In hauling the shocks to the machine, racks with tight beds or with tarpaulins spread over the bottom are used to catch the seed that shatters off, which is usually considerable. This is always heavy seed, and is worth saving. Since the shocks are small, a whole one may be thrown on the rack at one forkful without breaking the bands. This reduces shattering to a minimum. Unless the grass is very weedy the thrashing machine cleans the seed sufficiently for the market, but most of the larger growers have hand fanning mills, which are used when necessary. Seeds like those of redtop are easily blown out, but

it is harder to dispose of the bluegrass and some of the weed seeds, such as plantain and whitetop. From the machine the seed is put into 8-bushel bags for shipping. Thrashing costs on an average 8 cents per bushel, with the customary crew furnished.

HANDLING THE AFTERGROWTH.

In cases where orchard grass is cut for seed there is a great difference of opinion as to how the aftergrowth should be handled. It is generally considered that pasturing is not in the least detrimental and even beneficial. As to whether the aftergrowth should be cut for hay is an undecided question. It is a common practice, however, to cut it, due to the fact that it is depended upon largely for hay, since timothy and other hay grasses are not grown to any great extent. After the grass is cut for seed, especially when it is cut sufficiently high, there is always considerable green undergrowth. This continues to grow, and during the latter part of August or about the first of September is at the proper stage to cut for hay. If there is clover present in the aftergrowth it makes a very fair quality of hay and yields from one-half to one ton to the acre. The quality of this hay is not so good as that of the hay made from the first cutting.

While it is a general practice to cut the aftermath during the latter part of August or September, there are some who prefer to cut it as soon as the shocks are removed from the field, as it is believed to be better for the following seed crop if it is cut then. It is the opinion of some that the aftermath should be cut in any event, and consequently if it is not desired for hay it is cut and left on the ground. Others are of the opinion that if it is cut at all it materially injures the next year's crop, especially so if used for hay, as the two cuttings remove a large amount of plant food from the soil without much return.

Judicious pasturing, to say the least, is not detrimental to the field, and in all probability is more or less beneficial. The aftergrowth, which comes on after the seed crop is removed, furnishes grazing until it is covered with snow, and in the more southern sections where the grass is grown lasts nearly the entire winter. Sheep can be very profitably pastured on this aftergrowth and in many cases almost as much money is made from the pasture that it affords the sheep as from the seed crop, on account of the length of time which it will furnish grazing. At present prices sheep are equally as profitable as cattle, if not more so, and can be pastured on orchard grass to much better advantage.

VALUE OF THE STRAW.

There is much difference of opinion regarding the value as a feed for stock of orchard grass straw from which the seed has been thrashed. Some state that it is of almost as much value as the hay, but in general it is thought to be about equal to wheat straw. Its value depends

largely on three factors: The state of maturity at the time of cutting; the amount of aftergrowth, including red clover, contained in it, and the success with which it is cured. If the grass is cut before the seed is sufficiently mature to harvest, the straw will be of more value for feed than when it is cut at the proper stage. The undergrowth which is present probably furnishes as much feed as the straw itself, if not more, especially when it contains clover.

It is a common practice to cut the grass as high as possible to avoid the weeds and clover, but if it is short there is necessarily a great deal of undergrowth cut with it. If the grass has not received too much rain while in the shock and is stacked properly or put into a barn or shed at the time of thrashing, the straw will be of much more value than if carelessly handled. In general, there is little attention paid to the stacking of the straw, and it is commonly left in piles just as they are made by the machine. When utilized for forage it is fed to horses or cattle, usually the latter, but is of very little value for sheep. Aside from its value as a feed, straw may be used for seeding meadows, as previously described. It should never be used for this purpose, however, unless thoroughly free from weeds.

WEEDS IN ORCHARD GRASS SEED FIELDS.

The weeds which are most troublesome in orchard grass fields, especially in sections where seed is produced, are whitetop (*Erigeron annuus*), red sorrel (*Rumex acetosella*), oxeye daisy (*Chrysanthemum leucanthemum*), milfoil (*Achillea millefolium*), and the plantains (*Plantago lanceolata* and *P. aristata*). Most growers pay much attention to keeping these weeds out of their fields and go to considerable expense for labor to mow them or cut them out with a hoe just before harvest. A method which is now quite commonly used and which is most effective and practicable is to pasture the fields with sheep. This is an excellent practice and it is comparatively easy to distinguish at harvest time between fields that have been pastured in this way and those that have not by the absence of weeds in the former. Such good results have been obtained by pasturing sheep on the grass to keep down the weeds that farmers are raising more sheep than formerly and are growing cleaner seed. It is a common practice to turn the sheep on in the spring as soon as the grass begins to grow and allow them to remain until the early part of May. As the grass advances toward maturity the sheep eat very little of it, but graze mostly upon the weeds and undergrowth, and especially on the whitetop, which is one of the worst weeds present, if not the worst. They do little damage to the field when it is dry and in wet weather they are kept off, as they drag down too much of the grass. Although it is the custom to turn the sheep out of the fields in the early part of May, some of the most successful growers leave them in until nearly harvest time. It is

not uncommon to see sheep in fields that are ready to harvest. When it is possible to do so the fields should be pastured late, as this practice is more effective in keeping down the weeds, since it takes them but a short time to make sufficient growth to interfere with the cleaning of the seed. Cattle are sometimes pastured on fields that are intended for seed, but they tramp down too much of the grass and are not as satisfactory for this purpose as sheep.

OTHER GRASSES IN FIELDS INTENDED FOR SEED.

Much has recently been said regarding the presence of seeds of other grasses in orchard grass seed. Those which appear to be the most common are meadow fescue (*Festuca pratensis*) and the rye-grasses (*Lolium perenne* and *Lolium italicum*). The seed of these grasses is much heavier, but it resembles orchard grass seed to such an extent that its presence is not readily detected. Meadow fescue and rye-grass have very much the same appearance, but there is no difficulty in distinguishing them from orchard grass, as their seed habits and general habits of growth are different. If these grasses were present in considerable quantities in the orchard grass fields in Kentucky, Indiana, and western Virginia, where practically our entire supply of seed is produced, the presence of their seed in orchard grass seed could be readily accounted for. The orchard grass fields in these sections, however, are almost entirely free from other grasses, and only in a very few cases are there any others present, with the exception of some Kentucky bluegrass (*Poa pratensis*) and Canada bluegrass (*Poa compressa*) and a little cheat (*Bromus secalinus*) and redtop (*Agrostis alba*). Bluegrass and redtop, especially the former, come in naturally in the older fields, and cheat is present practically only the first year, due to its having been in the wheat which just preceded the grass crop. The quantity of meadow fescue and rye-grasses in these fields is insignificant, and there are only a very few cases where these grasses are present at all. The total percentage of other grasses in orchard grass throughout the whole seed-producing section is so small as to be hardly worthy of consideration, and statements made to the effect that the presence of their seed in orchard grass seed is due to the fact that they are grown with the orchard grass and can not be separated from it are entirely without foundation. Farmers in general are extremely careful to keep their orchard grass fields free from other grasses, for the reason that their seeds are readily detected by buyers and as a consequence the seed invariably sells at a lower price. It is a comparatively easy matter for seed growers to have pure seed for their own sowing, and there would be absolutely no advantage to them in growing meadow fescue, rye-grasses, and other grasses with orchard grass.

SUMMARY.

Orchard grass is of considerable value for early and late pasture, and in the southern part of the region where it is grown can be pastured nearly the entire year. When used for pasture, bluegrass and white clover are commonly grown with it.

Orchard grass hay is of value, especially when it contains red clover, and can be fed to horses successfully. It is a good forage for cattle that are being fattened for market.

When grown for seed, orchard grass is a profitable crop, as it yields on an average 10 to 12 bushels to the acre and sells for \$1.25 a bushel. Aside from securing a crop of seed, the aftergrowth may be either pastured or cut for hay. This aftergrowth makes a very fair quality of hay, and when cut during the latter part of August or September gives a yield of from one-half to one ton to the acre.

Although not previously stated, orchard grass is quite valuable for binding soils, and on rough land that washes badly it can be used for this purpose effectively.

Orchard grass may be seeded either in the autumn or spring with about equally good results. Spring seeding, however, seems to be the most common practice. In most cases it is sown broadcast on fall wheat on fields that have been in wheat the previous year. One bushel of seed is a sufficient quantity when the grass is to be grown for seed. When grown for hay or pasture, more than this should be used. A good catch may be obtained by scattering the straw evenly and thinly on fall wheat in early spring.

Red clover can be profitably sown with orchard grass at the rate of 1 bushel to 5 or 7 acres. Mixtures of orchard grass with other grasses, especially with tall meadow oat-grass and meadow fescue, are giving good results for hay and pasture in places where they are being tried.

The average life of an orchard grass meadow is from five to seven years, after which it is plowed up, usually late in the fall, and put into corn.

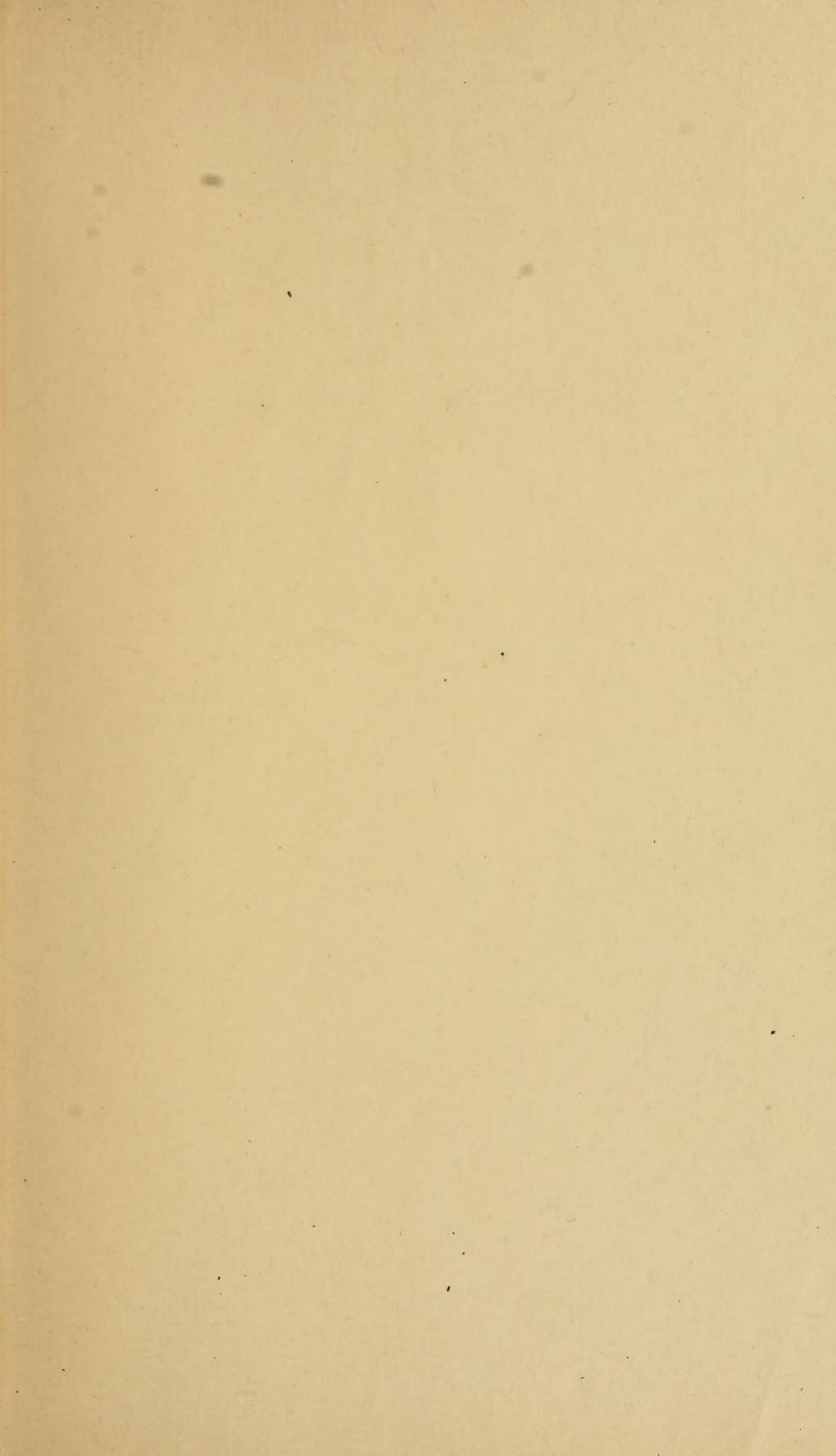
Orchard grass is harvested for seed from about June 15 to June 25. It is cut with an ordinary grain binder and bound into small bundles, requiring about 5 pounds of twine to 100 bushels of seed. The bundles are put three in a shock and bound at the top with a band of grass to make them more stable and to prevent the seed from shattering. Thrashing is done from the shock after the grass has stood in the field from two to four weeks, with an ordinary separator, using special riddles.

Sheep are pastured on orchard grass in the spring to keep down the weeds. They are sometimes allowed to remain in the field until nearly time to harvest. This practice is very effective in keeping clean the fields that are grown for seed.

The percentage of meadow fescue, rye-grasses, and other grasses in orchard grass fields that are grown for seed is so small as not to be worthy of consideration.

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