

and trueness are concerned, and it establishes itself in its new position with aggressiveness. Vegetatively planted areas for supplying repair sod are so easily established and maintained that a club located in the northern turf-grass belt can not afford to be without them. If a good strain of carpet-bent is selected and a little intelligent care used, a supply plot may be maintained indefinitely, since the grass will soon returf the places from which sod was removed. Some clubs already have established vegetative repair plots and have found them exceedingly useful; a considerable number have signified their intention of doing so. For the benefit of those who may not be familiar with the vegetative method of propagating bent-grass turf, attention is called to the July 20, 1921, issue of *THE BULLETIN*. The time is drawing near when the maintenance of plots of good turf for repairing putting-greens will be just as much a regular feature of golf courses as is the making of compost piles.



Harvesting bent seed in Germany. Note that the grass is growing in open woodland and that the crop is gathered by very simple methods

Rate of Seeding Fine Grasses

C. V. PIPER and R. A. OAKLEY

The rate of seeding any broadcasted crop may be determined in two different ways. The first method and the one commonly used by agronomists is to sow like plots to different amounts of seed. For example, a series of ten one-tenth acre plots may be sown respectively with 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20 pounds of seed. By observations on these plots and by comparing the yields, the best rate of seeding is determined. This method is frankly empirical and the conclusion is reached regardless of any theory. Indeed the best rate of seeding is found to be different in different places and on unlike soils.

The second method of determining the rate of seeding is purely theoretical. If it be found that a perfect stand of alfalfa averages 15 plants to the square foot, an acre will contain 6,384,000 plants. As one pound of

alfalfa seed contains 240,000 seeds, a little more than 2½ pounds should suffice to plant an acre.

As a matter of fact, the average rate of seeding alfalfa in the West is 10 pounds per acre; in the East, 20 pounds per acre. If the theoretical method were true, the farmer is wasting from 75 to 87 per cent of the seed he sows.

At first sight it seems very puzzling why there should be such great discrepancy between rates of seeding as determined theoretically and as worked out practically. It must be borne in mind that seedlings have to contend against many difficulties, including drought, insects, diseases, weeds, etc., and that many of them inevitably perish while young. The more seedlings, up to a certain maximum, the better are the chances of securing a full stand. The farmer can not afford the risk of an imperfect stand for the cost of ample seed. Perhaps the greatest enemy of all to contend against is weeds, and a dense stand of the crop plant desired is one of the best methods of retarding the development of weeds.

In the accompanying table is given the ordinary farm rate of seeding broadcasted forage crops, with calculations showing the number of seeds sown on each square foot. It will be noticed that the number is large and that it varies greatly with different plants. Were such plants allowed to develop undisturbed by weeds, only a small portion of the seed would be required to give a satisfactory stand. It is difficult to determine what constitutes a perfect stand, but the numbers given are based on the room necessary for the full development of a young plant.

TABLE SHOWING THE GENERAL RELATIONS BETWEEN NUMBER OF SEEDS SOWN AND FINAL STAND.

	Average rate of seeding to the acre (pounds)	Number of seeds to the pound.	Number of seeds sown to the square foot.	Average number of plants to the square foot for a perfect stand.
Red clover	8	250,000	47	15
Crimson clover	15	130,000	45	15
Alsike clover	8	700,000	130	15
Alfalfa	20	240,000	95	15
Sweet clover	25	235,000	140	15
Timothy	15	1,100,000	350	90
Kentucky bluegrass	25	2,400,000	1,400	130
Orchard-grass	20	450,000	210	90
Brome-grass	20	137,000	65	60
Redtop	10	4,000,000	930	140
Meadow-fescue	20	250,000	115	90
Italian rye-grass	30	270,000	215	90
Perennial rye-grass	30	270,000	215	90
Tall oat-grass	40	150,000	140	90

The rates of seeding ordinarily used are purely empirical—the result of experience or of experimental field trials. The effect of the heavy seeding is to secure a dense stand of young plants, which in a measure restrains weeds, and which further insures that in competition with the weeds a majority of the survivors will be the plant desired. This dense stand is especially necessary in perennial grasses where the seedlings are slender and in their early stages grow but slowly, and thus are relatively inefficient against broad-leaved, vigorous weeds.

It is scarcely possible to seed perennial grasses and clovers so heavily that the resultant yield is seriously affected. With annuals, however, too dense seeding reduces the size of the individuals so much that the yield to the acre is also diminished.

In general the rate of seeding is least in regions where the crop is best adapted; that is, where the individual plants are most vigorous and the natural mortality therefore least. The weediness of the soil is also an important factor.

Where seed can be drilled, the amount necessary to secure a good stand is about 25 per cent less than when broadcasted. The reasons are evident; namely, the covering of the seed uniformly to the most favorable depths, as well as its more even distribution.

With the grasses used for fine turf there is not a very large body of definite experience or of accurate experiments. In general the seeding for fine turf should be relatively heavy, as the disappointment of a failure or partial failure is of far more consequence than the use of perhaps an unduly large amount of seed.

We have consistently advocated using for each 1,000 square feet of surface 3 to 5 pounds of redtop or Rhode Island bent or South German mixed bent; 7 pounds of Chewing's fescue; 3 to 5 pounds of Bermuda grass. Redtop contains about 4,000,000 seeds per pound; Bermuda grass, 1,800,000; Chewing's fescue, 500,000. Pure seed of the two fine bents has as many seeds per pound as redtop, but in the chaffy form in which they occur on the market probably only 1,000,000 to 2,000,000 seeds per pound.

From many trials we know that these amounts give excellent results. It may be possible to reduce them somewhat and secure equally satisfactory turf, but we have doubts whether the saving effected would compensate for the risk.

How Frequently Should Putting-Greens Be Mowed?

A Discussion

The following answers to the above question by fifteen different men, all of long experience, ought to be strongly suggestive, if not fully convincing. Probably all of the northern greens concerned in these answers are wholly or mainly bent grass; the two southern courses included have Bermuda greens:

I would unhesitatingly say, "Every day, if possible; remembering first that upon the character of the grasses will depend whether your greens are to be cut very short or longer. Bent grasses in this climate do better when cut *very close throughout the season*. Bluegrass, redtop, and fescue thrive better when not cut so close, but should be cut just as often; naturally they make slower greens. I am positive that down in this extreme climate it is injurious to allow any of these grasses to grow longer in excessively hot spells than at other times.

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At the Detroit Golf Club we cut our putting-greens every week-day after the season gets under way.

At the beginning of the season we set our blades up somewhat higher, and gradually work them down to about three-eighths.

You will find a considerable difference of opinion as to how closely a putting-green should be cut, but our experience has been very satisfactory at three-eighths during the hot months.

We went through the long, hot, dry spell of last summer without having a single case of burning on any one of our 36 holes.