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U. S. DEPARTMENT OF AGRICULTURE.

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FARMERS' BULLETIN 464.

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# THE ERADICATION OF QUACK-GRASS.

BY

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LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF PLANT INDUSTRY,  
OFFICE OF THE CHIEF,  
*Washington, D. C., June 14, 1911.*

SIR: I have the honor to transmit herewith a manuscript entitled "The Eradication of Quack-Grass," by Mr. J. S. Cates, Assistant Agriculturist, Office of Farm Management, and recommend that it be published as a Farmers' Bulletin.

Respectfully,

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

HON. JAMES WILSON,  
*Secretary of Agriculture.*

464

2



## CONTENTS.

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	Page.
Introduction.....	5
The underground stems of quack-grass.....	5
Types of quack-grass land.....	6
Midsummer the best season to begin eradication.....	8
How to kill quack-grass.....	9

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## ILLUSTRATIONS.

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	Page.
FIG. 1. Cross section of cultivated land, showing quack-grass rootstocks scattered through the soil to a depth of 7 inches.....	6
2. Cross section of quack-grass meadowland, showing rootstocks confined to the first 3 inches below the surface.....	7
3. Cross section of old pasture sod, showing quack-grass rootstocks confined mainly to the first 2 inches below the surface.....	8
4. Scotch-bottom plow used in turning quack-grass sod.....	9
5. Meadowland sod as it appeared in the fall, after having been plowed shallow following haying in July and then disked at intervals of 10 days for the remainder of the summer.....	10
6. Meadowland sod as it appeared in the fall, after having been disked following haying in July.....	10

1911

LETTER

U. S. DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY

WASHINGTON, D. C.

Dear Sir: I have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the matter of the ...  
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# THE ERADICATION OF QUACK-GRASS.

## INTRODUCTION.

While the studies outlined in this bulletin have been made on ordinary quack-grass or witch-grass (*Agropyron repens*), prevalent in the North-Central and Northeastern States, other observations not presented in this paper lead us to believe that the same principles here laid down apply equally well to all rootstock-producing species of this same genus, embracing a large number of closely allied grasses found in the Rocky Mountains and the Pacific States.

## THE UNDERGROUND STEMS OF QUACK-GRASS.

The underground stems are the seat of the remarkable vitality of quack-grass; therefore, for a full understanding of this subject the plant in its relations to the underground stems will first be briefly considered. These stems are often called roots. They are not roots in the true sense of the word, but rootstocks, that is, underground stems. The distinction between rootstocks and roots is that rootstocks have buds on them as stems do, while roots do not. Another very important distinction is that rootstocks do not absorb material from the ground, while roots do. The rootstocks are dependent for their growth upon the material absorbed by the roots and elaborated in the leaves in combination with the material which the leaves draw from the air. This material elaborated in the leaves then goes down to form the underground stems, or rootstocks. The plant is simply storing up material to draw on next year.

As the material for the growth of rootstocks comes from the leaves, the amount of leaf growth which the plant produces in any one season is largely a measure of the amount of rootstock growth. So, by limiting the development of top in any way the number of underground stems produced is thereby limited. If little or no top is allowed to grow very little rootstock will be developed. Just as we would expect a small crop of potatoes if we were to keep the top of the potato plant cut back close to the earth, so should we expect a minimum of rootstock growth to be produced by the quack-grass plant if its top is kept closely cut. By actual observations this is found to be true.

There are three types of management of quack-grass land that bring about three widely different conditions in the vitality of the plant. The three resulting types of quack-grass land are given below.

#### TYPES OF QUACK-GRASS LAND.

(1) **A cultivated field infested with quack-grass.** (Fig. 1.)—The deepest and most vigorous rootstock development of quack-grass is found in cultivated fields. There are several factors which cause this. The principal one is probably deep preparation of the land.



FIG. 1.—Cross section of cultivated land, showing quack-grass rootstocks scattered through the soil to a depth of 7 inches.

When the plant is left undisturbed the rootstocks have a tendency to get nearer the surface every year. (Figs. 2 and 3.) Deep plowing puts the stem back to the bottom of the furrow, and a mass of tangled growth is then sent out toward the surface, a large part of the vitality of the buried stems going into new stems reaching toward the surface. This new growth lives until the next year. When the stems are buried deeply to begin with and cultivation is not kept up long enough to kill out the grass (and it usually is not on this type of land), the plant takes on a new lease of life after cultivation stops, the loose deep soil furnishing an ideal place in which to grow. As a

consequence, the plant becomes firmly established and is well able to stand the next year's battle.

(2) **Meadowlands.** (Fig. 2.)—If the meadow has been down for several years, and especially if two cuttings of hay a year have been secured, the rootstock development is found to be about half the extent and depth of that found in cultivated land.

(3) **Pasture lands.** (Fig. 3.)—The smallest rootstock development is found in closely grazed pasture lands. Here the underground growth of quack-grass finally becomes a few mere shreds of rootstocks, and these are very near the surface.

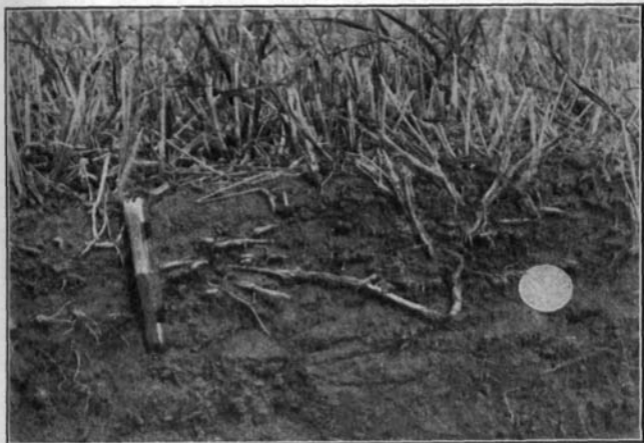


FIG. 2.—Cross section of quack-grass meadowland, showing rootstocks confined to the first 3 inches below the surface.

After completing the studies, as heretofore outlined, of the rootstock habits of quack-grass under different field conditions, experimental work was undertaken looking to the discovery of a practical method for the control of this pest. That quack-grass can be destroyed by persistent clean cultivation is well recognized; that the grass in its worst form (where infesting a cultivated field) can be killed in one season and a crop produced simultaneously has been demonstrated.<sup>1</sup> The chances of a farmer, however enthusiastic he may be at the beginning of such an undertaking, carrying work of

<sup>1</sup> See Bulletin 149, Vermont Agricultural Experiment Station.

this kind through to a successful conclusion are very problematical. Such work requires considerable labor of a more or less careful, painstaking nature at a very busy season of the year. The early growing season is a period of many interests, and generally as soon as the farmer finds that the quack-grass is fairly well under control he immediately centers his interest on some other seemingly more important line of farm work. The result is that the pest soon gets another good start, and the crop by this time has advanced so far toward maturity that strenuous cultivation would be detrimental to the yield. Consequently, the remainder of the work is taken out in good intentions for the next year.

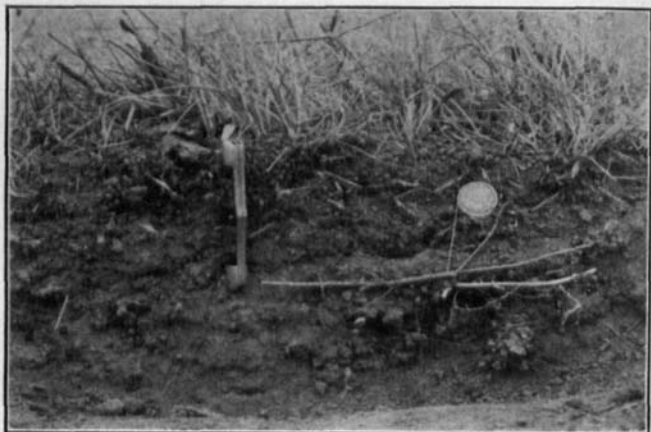


FIG. 3.—Cross section of old pasture sod, showing quack-grass rootstocks confined mainly to the first 2 inches below the surface.

#### MIDSUMMER THE BEST SEASON TO BEGIN ERADICATION.

Bearing these facts in mind our investigations have naturally centered on methods that could be used during the periods when other farm work is not very pressing. In midsummer, immediately after haying, there is usually a period of more or less relaxation from general farm work. This is a season of the year also when rootstock grasses seem to be at their lowest state of vitality. The hay crop too has been secured from the sod land and nothing more is to be produced the current season on these lands; therefore, no crop is



lost. If the work is begun on pasture lands, at least a half season of pasturage has been obtained. It is only on sod and pasture lands that it seems to be advisable to attempt to destroy quack-grass by the method here outlined, as was pointed out in the discussion of the root-stock habits of the grass under varying field conditions.

### HOW TO KILL QUACK-GRASS.

The process of killing quack-grass on sod or pasture lands, beginning in midsummer, is a very simple one.

The first step is to plow the sod, cutting just under the turf, which is usually about 3 inches deep. To thoroughly turn over a stiff quack-grass sod as shallow as 3 inches it is advisable to use a special type of plow (Scotch bottom) having a very long, gradually sloping moldboard. (Fig. 4.) It has been found that with this type of plow the sod can be turned very shallow. The next step is to go in a week or ten days later with a disk harrow and thoroughly disk the



FIG. 4.—A Scotch-bottom plow used in turning quack-grass sod.

sod. Repeat this treatment every ten days or two weeks until fall, when the quack-grass will be completely killed out.

It sometimes happens that with certain kinds of soil during drier periods in the summer the ground becomes too hard to plow. With the type of plow suggested, however, it has been found that very hard and dry sods can be turned. In case it is not possible to turn the sod on account of dry weather, the treatment can be given with the disk harrow alone. We have been able to thoroughly kill the grass with either the disk or the combination of plow and disk treatment. Where plowing is possible, however, it is usually cheaper to kill the grass with plow and disk than with the disk alone. (Fig. 5.)

If the disk alone is to be used, it should be set practically straight, well weighted with bags of dirt, and the field gone over three or four times. The first two cuttings should be at right angles and the other cuttings diagonally across. The sod in this way is divided into small blocks. Then the disk is set at an angle, when it will be found that the first 2 or 3 inches of the sod, which contain practically all of the quack-grass roots, can be cut loose from the soil



FIG. 5.—Meadowland sod as it appeared in the fall, after having been plowed shallow following haying in July and then disked at intervals of 10 days for the remainder of the summer.



FIG. 6.—Meadowland sod as it appeared in the fall, after having been disked following haying in July.

below. The exposure to the sun and the breaking loose from the lower soil soon kill out the quack-grass. (Fig. 6.) This ground should be gone over at intervals of ten days or two weeks throughout the remainder of the season.

The following spring the infested land, on which the grass has been killed either by the disking method or by the combination of plowing and disking, should be plowed to a good depth in order to bury the mass of dead roots thoroughly. This will facilitate the cultivation of the spring crop. If the work has been carefully done the quack-grass will not show up at all in the spring crop.

Both these methods have been thoroughly tested on the farm of Mr. C. W. Locke, of Turner, Me. Figure 6 shows a view of disked land on this farm and figure 5 an area that has been both plowed and disked. The photographs from which these illustrations were made were taken in October, 1910. Quack-grass was thoroughly killed in both cases at that time.

A test of the method of plowing after haying, followed by disking until fall, has been made on the farm of Mr. Carl S. Kinney, Massena Center, St. Lawrence Co., N. Y. The sod, which has been down for several years, was plowed shallow in July and disked at intervals of ten days or two weeks until fall. The following spring it was cross-plowed, harrowed, and planted to corn. The corn received three cultivations but no hoeings. When examined in the midsummer following, not a sprig of quack-grass could be found.

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