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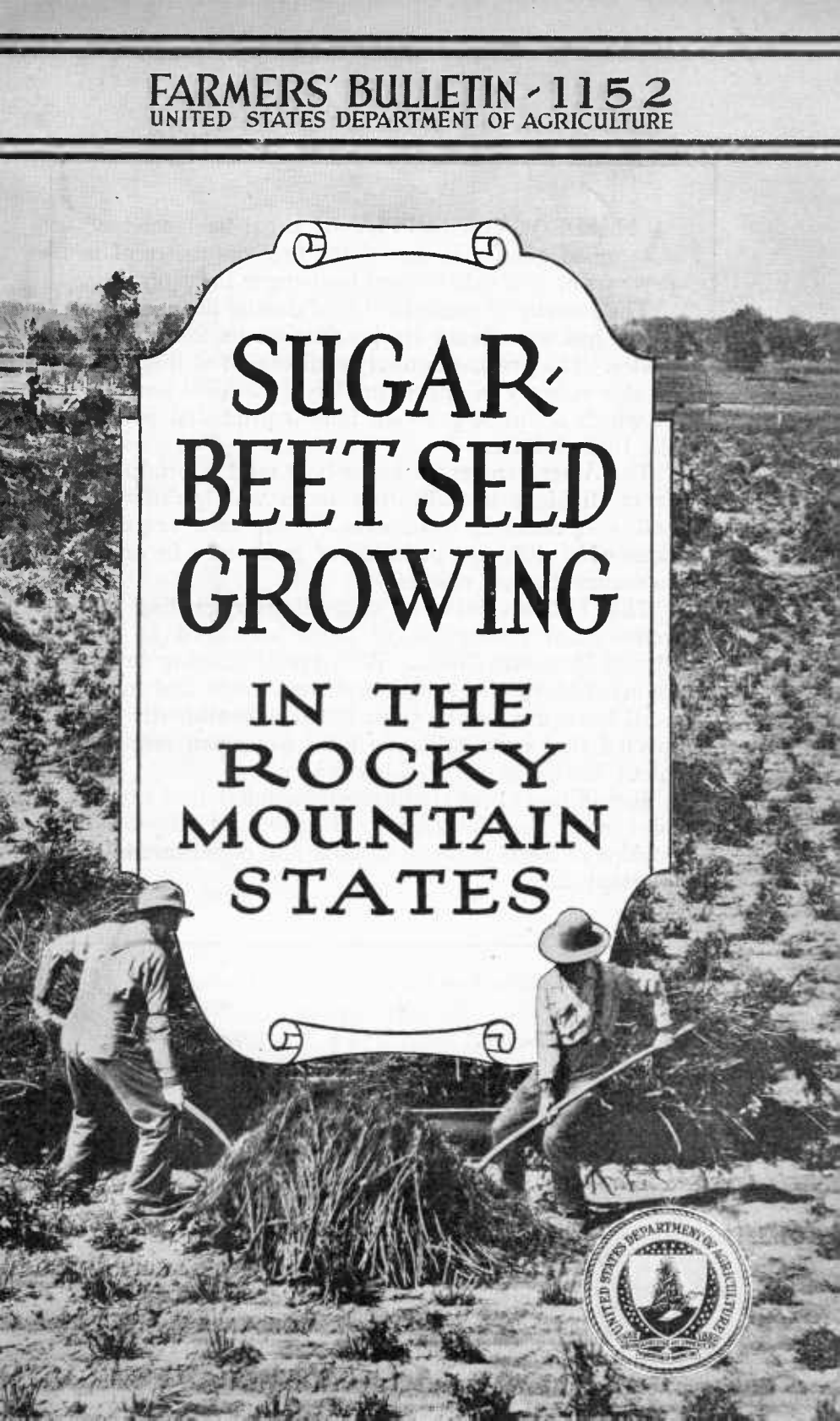
UNITED STATES DEPARTMENT OF AGRICULTURE

SUGAR-BEET SEED GROWING

IN THE ROCKY MOUNTAIN STATES



AN ADEQUATE SUPPLY of sugar-beet seed of good quality is one of the first requisites of a permanent and satisfactory beet-sugar industry.

The scarcity of sugar-beet seed during the past few years has stimulated its production in the United States. The present annual requirement of this seed in this country is approximately 16,000,000 pounds, of which about 50 per cent is now produced within the United States.

The American-grown sugar-beet seed is produced from Michigan to California under widely different soil and climatic conditions. Each area requires somewhat different methods of procedure in order to secure the best results.

This bulletin contains suggestions regarding the commercial production of sugar-beet seed in the Rocky Mountain States. With the continuing development of the beet-sugar industry more and more seed is required each year, but it is confidently expected that eventually the total American requirement will be grown in this country.

In addition to the commercial production of sugar-beet seed the developing of new and improved strains of beets is being studied and experimentally attempted.

Contribution from the Bureau of Plant Industry

WM. A. TAYLOR, Chief

Washington, D. C. October, 1920

SUGAR-BEET SEED GROWING IN THE ROCKY MOUNTAIN STATES.

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GROWING SUGAR-BEET SEED AN ESTABLISHED INDUSTRY.

THE PRODUCTION of sugar-beet seed in the United States is now an established and apparently profitable industry in several sections of this country. A description of the methods followed should, therefore, be of interest to prospective growers of beet and other seed crops. The development of the industry has been greatest in the irrigated sections of Colorado, Montana, Utah, and Idaho. Rains are less troublesome in this region at harvest time than in some of the other beet-seed growing States. Irrigation makes it possible to secure a more uniform growth of plants and more certain yields of seed. There are no difficulties with plants running to seed the first year nor with stocks deteriorating, as is the case in some parts of the Pacific coast region. The writer's experience has been largely confined to this favored beet-growing region, and the practices described and the illustrations presented here have reference to this irrigated section.

Growing sugar-beet seed is best adapted to large operators, the investment required for special machinery being so great that the business is rarely profitable on less than 100 acres. Therefore, the instructions given in this article refer to operations on a large scale.

SIZE OF ROOTS FOR SEED.

The sugar-beet plant is a biennial, and the roots do not under normal conditions send up seed stalks and develop seed until the second year. Only small-sized roots, not over 16 ounces in weight, are used for commercial seed production. The 8-ounce beets are usually

considered the most profitable, although those as small as one-fourth ounce will produce seed if handled with extreme care. In commercial operations it is quite impossible to use anything below 2 ounces in weight. All roots small enough to shrink or wilt badly before being set out are discarded by commercial growers.

The small roots used for commercial seed production are known among growers as stecklings. (Fig. 1.) As they do not furnish enough pulp to sample for sugar and are not indicative of the true shape and other characteristics of a strain, they can not be used for

FIG. 1.—An excellent stand of beet stecklings ready to top preparatory to being pulled for siloing. The erect habit of the plants will permit very close and exact cutting, but the heavy foliage must be raked off before a beet puller can be used. The large beet in the first row is a 5-pound root placed for comparison with the stecklings that have been pulled and laid above the spot where they grew.

selection and stock-seed purposes. When roots are intended for breeding, the seed must be planted early and the beets thinned so as to attain full size and normal development. (Fig. 2.)

TIME TO SOW SEED FOR STECKLINGS.

Roots for commercial seed production are usually started about the same time as beets intended for factory purposes. Disease, however, has more time to gain headway in early plantings, and the old leaves are naturally quite broken down and difficult to cut at harvest. For these reasons some growers have better success with later sown, more erect plants, and therefore start their stecklings in June. July sowings may be satisfactory if conditions happen to be just right, but usually such extremely late plantings contain a large percentage of roots too small for profitable handling.

SPACING FOR STECKLINGS.

To keep the roots desired for stecklings from growing too large, seed is generally sown at the rate of 10 to 16 pounds per acre, and the crop left unthinned. Where the ground is in good condition and the seed of fair germination, 12 to 14 pounds is usually about right. Excellent stands have been obtained with only 6 pounds where the ground was in extra good shape and the seed of high germination.

The distance between rows depends upon the tread of the mower that is to be used to cut the tops at harvest time and whether the axles can be extended to straddle rows of any desired width. Most growers make them 20 inches apart and extend their mower axles

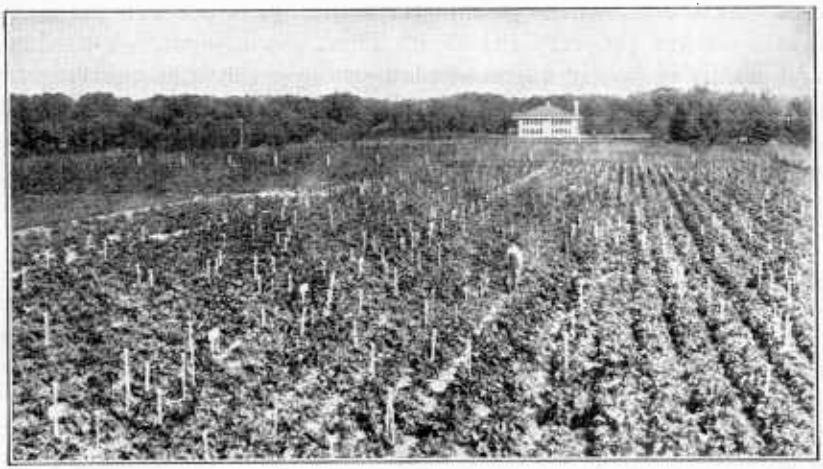

FIG. 2.—A field of pedigree beet stocks on the breeding plat of the United States Department of Agriculture being grown for comparison and further selection and improvement. The lath labels designate beets the foliage characteristics of which have been described. Later the roots will be described and analyzed for the purpose of breeding up strains uniform in foliage as well as root features.

so that the wheels exactly straddle three rows. Growers having mowers of 54-inch tread sometimes drill their rows 18 inches apart and thereby avoid the necessity of adjusting the axles.

For reasons that will be explained later the ideal steckling crop is one where the plants stand 1 to 1½ inches apart, where every root is the same in size, where none are large enough to grow out of the ground, and where the plants stand close together and are perfectly erect. An acre of such beets would supply enough stecklings to set out 20 to 30 acres for seed. In practice, however, commercial seed growers usually obtain not more than a sixfold crop.

PREPARATION FOR SOWING STECKLING SEED.

Growers should always make germination tests before planting their steckling seed and thus know what their stand is likely to be. If the seed is separated into large, medium, and small sizes and the planters adjusted according to the size and germination of each grade, a more even flow of seed and a more correct spacing of plants is possible. Usually all balls falling through a No. 10 and all running over a No. 12 screen[1] will be the small and large sizes, respectively, while those which fall through a No. 12 and over a No. 10 screen will be the medium size, generally comprising the bulk of the seed.

These measures will prove quite useless and most of the subsequent work will be futile if the ground for stecklings is not well prepared and the seeders properly adjusted. Thick sowings can not produce good stands if poorly adjusted planters drop the seed unevenly or bad spots in the field prevent it from sprouting. Good yields depend very largely upon the scarcity and the shortness of blanks in the rows. In a steckling field open spaces are especially objectionable, as will be explained later.

CARE OF STECKLING CROPS.

Where steckling seedlings are too thick, some help can usually be rendered with a hoe, especially where the sowings have been made wide by a scattering device that spreads out the seeds and makes it possible to thin out surplus plants by working sideways of the row. Stands are also often reduced by harrowing the rows crosswise. Thinning by hand costs $20 to $50 per acre and is usually too expensive to be practicable.

Unthinned stecklings standing thickly in the row show great differences in size and vigor, and large numbers of small weak-growing plants will often be crowded out by the larger growing beets. Losses from such crowding and from accidents of different kinds usually make it desirable to thin the plants so that they average about one-half inch apart. Spaced at this distance a proper proportion of the young seedlings will usually survive and result in mature stecklings, one every 1 to 1½ inches.

Steckling fields should be kept cultivated and in vigorous growing condition until harvest. It is not necessary that the plants be ripened off, as in the case of beets grown for sugar. Age and the ripening off of stecklings appear to have little relation to seed production. Soundness, proper size, and freedom from disease seem to be the most important factors.

[1] The No. 10 standard metal screen has round openings 10 sixty-fourths of an inch in diameter and the No. 12 screen has round openings 12 sixty-fourths of an inch in diameter.

TIME TO HARVEST STECKLINGS.

Roots standing in open, exposed places and growing out of the ground may easily be ruined if the temperature goes only a few degrees below freezing, but where stecklings are still small enough to be entirely below the surface and where stands are full and the beets well protected by an erect, close, dense growth of foliage, temperatures of 20° F. or lower may cause no great damage. Instances have been reported where frozen crops have been saved by allowing the roots to remain in the ground for several days to thaw out gradually before harvesting, but the writer can not say from experience that frozen roots can actually be reclaimed in this way.

The steckling harvest should be started before freezing weather for several other reasons than because of danger to the standing crops. If, for example, harvesting is delayed until late in October, it becomes necessary to cover the silo heavily and completely very soon after the roots are pulled. Cold days and nights then are usually too frequent to permit openings to be left in the silos for a length of time sufficient to lessen the injury that may occur from heating after the roots are stored. Sudden drops in temperature may also freeze the ground before the covering of the silos is completed, leaving nothing but frozen lumps of earth for protection, which, if not mellowed later by rain and warm weather, afford but little better resistance to cold than cobblestones. Long rainy spells often make it impossible to handle soil successfully. If such rains occur late in the season and are followed by sudden cold spells, the unfavorable conditions may be prolonged until the stecklings are all frozen and completely ruined.

In northern Colorado the steckling harvests generally commence by September 20 and are usually completed, with all beets in the silos, by October 10. The final covering is commonly finished by November 10.

Unlike factory beets, stecklings must be hauled immediately after being pulled. This gathering of freshly dug roots by hand is often disagreeable and slow work if delayed until late in the season, when the beets are ice cold and wet and perhaps incompletely pulled or partially buried in soil also cold and wet.

PREPARATIONS FOR HARVESTING STECKLINGS.

Before stecklings are pulled it is necessary that the tops be cut off as close to the crown as practicable. The only economical way of doing this appears to be by mowing. If the mowers are run down first one way and then back again (fig. 3), many leaves will be cut off which would not be removed if the machines were run in one direc-

tion only. Close and uniform cutting is quite impossible where rough ground or uneven irrigation furrows interfere with the steady run of the mower. An irrigation ditch should always be made after every row. If made only after every other row, one wheel of the mower will have to travel in a depression and cause the sickle bar to run on a slant and cut unevenly unless continual attention is given to proper adjustment.

The gathering of stecklings is sometimes quite difficult when small roots, plowed out of dry soil, lie compacted in large hard clods or are deeply buried in the upturned soil. To make stecklings plow up properly it is therefore frequently necessary to irrigate before harvesting. These irrigations should be given in plenty of time to allow

FIG. 3.—A mower cutting off the tops of beet stecklings that are to be pulled in a few days with a beet puller. The plants are too spreading and broken down by age and disease to make thorough cutting possible. The mower has run down three rows in one direction and is now coming back over the same rows to cut off the leaves not removed in the first operation.

the soil to dry out sufficiently for running a mower through the field. If this is not done or if frequent rains or dews leave the ground or the foliage in a wet condition, the mower will clog badly and completely block harvesting operations, sometimes for several days or until other means of removing the tops are resorted to. These conditions are especially likely to occur when harvesting is started late.

Thorough cutting of the tops by the mower is possible only where the steckling stand is uniform, the tops erect, and the ground and irrigation furrows regular and smooth. Where numerous open places permit a considerable portion of the roots to grow large and out of the soil and the foliage to spread out flatly, or where disease, hail, wind, and other causes produce many dead and broken leaves,

it becomes quite impossible to use mowing machines successfully. In such cases sharp hoes may be used to remove the tops, but this is an exceedingly slow and costly operation, especially where leaf-spot has resulted in numerous dead flat-lying leaves. If the bulk of the foliage can not be removed, the stecklings must be stored thinly in the silos.

If the foliage of the stecklings is thick and heavy, it pays to gather the leaves and silo them for feed. Raking is absolutely necessary where growth is extra heavy. Unless it is done, the beet puller clogs badly and many roots get mixed with the abandoned

FIG. 4.—Freshly pulled beet stecklings being pitched from wagons into a silo. Two men will presently spread out the roots evenly and build earth partitions every 50 to 100 feet. Toward evening plows will throw a few inches of earth over the roots that have been placed in the silo during the day.

foliage and lost. In general, the tops are neither raked nor gathered for feed. The usual custom is to allow them to wilt until a puller can be run through the rows. Most of the leaves finally get buried in the soil, dry up, or blow away.

SILOING STECKLINGS.

Stecklings are siloed in long trenches made with plows, irrigation "A's," and road graders. The trenches are usually a rounded V in shape, as shown in figure 4. The roots are piled up to the level of the original surface, generally about 18 inches deep at the middle and 4 inches or less at the sides. Divisions are made every 50 to

100 feet by walls of earth, so that if disease starts in one place it can not spread to other sections.

Where stecklings are stored on the same ground on which they are grown, trenches are made every 70 to 100 feet or at every fortieth to sixtieth row. This method does away with long hauls, but is objectionable because it ties up large tracts of land from fall, winter, or early spring plowing and leaves the fields in a rough condition that requires much grading to put it in shape for irrigation. Level fields that have once been used for silos may be left so uneven that for many years afterwards irrigation will be difficult. For this reason many people prefer to haul their beets to fields where irrigation is not practiced or to locations where the grade is steep and where siloing does less harm.

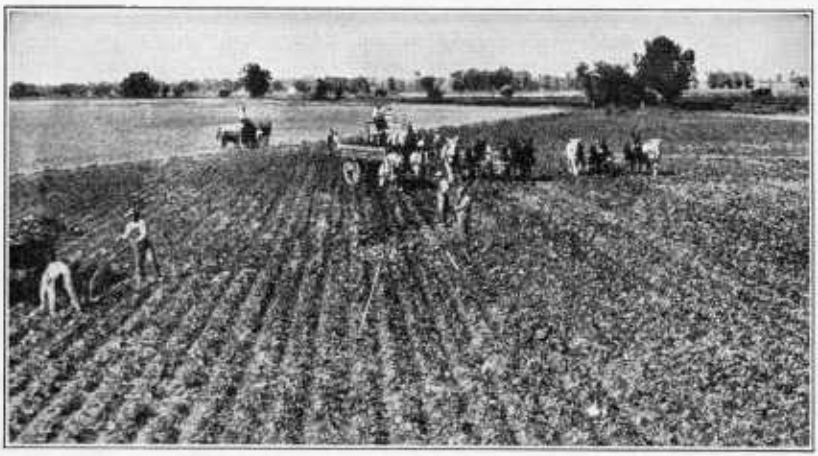

FIG. 5.—Pulling and gathering beet stecklings for siloing. The beet pullers on the right are successfully lifting out the stecklings for gathering after the mowed tops shown in figure 3 have become sufficiently dried to permit the use of a puller without clogging. In order to prevent wilting, the roots are being gathered within a few minutes after being pulled.

All stecklings must be gathered as soon as they are pulled. (Fig. 5.) A few hours of drying weather or of hot sunshine on small roots is very serious, because it greatly impairs the keeping and seed-production qualities of the crop. Beets left exposed to the hot sun too long go into the silo very warm, become heated, and may soon be ruined.

At the close of each day's operations all newly filled silos are covered lightly by means of plows or irrigation "A's." The centers are left open at first if there is danger of heating. As soon as one length of silo is complete the permanent winter covering is begun and continued until the roots are protected with at least 30 inches of earth. As this work requires considerable time, it must be commenced early in order that it may be finished before winter sets in. In northern Colo-

rado growers plan to have all silos completely covered by November 10. In order to provide equal protection to all beets against sudden cold spells, covering operations proceed gradually and about equally on all silos.

The first earth is thrown on with plows, irrigation "A's," and road graders, but the high covering required in northern Colorado is soon beyond the capacity of these implements, and elevated road graders are used for most of the work. (Fig. 6.) These graders are expensive machines and require a 35-horsepower tractor or 12 horses to pull them.

Chimneys or ventilation flues made of straw or boards reaching from the interior of the silo to the outside air are often recommended

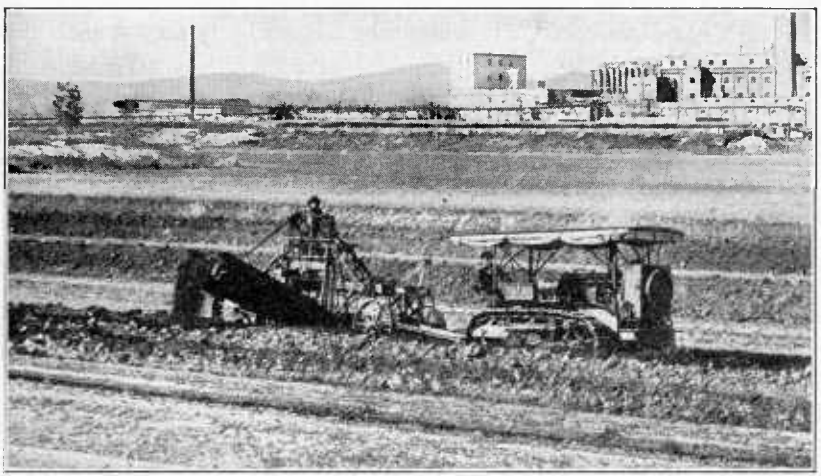

FIG. 6.—An elevated grader, such as coutractors use ou road work, plowing furrows 14 inches wide and 10 inches deep and spreading the earth over a beet silo. Traveling at the rate of 2 miles an hour, this grader moves more soil than 100 men could handle with shovels. A 35-horsepower tractor pulls the grader, and two men operate the outfit. In order to get enough earth to cover the beets, the grader must plow 20 feet on each side of the silo.

by horticultural writers for different root crops. In northern Colorado their influence seems to extend only to the beets immediately surrounding the openings and to be quite negligible. They are not used at all by large operators.

For reasons that are not always explainable, roots often sprout badly in the silo. Such sprouting is not serious unless it proceeds so far that flower stalks develop. The entire absence of sprouting is a pretty sure indication of diseased and worthless beets. The best yields are obtained from stecklings coming through the winter with small sprouts over the entire crown, none over three-eighths of an inch long. Less than 5 per cent of such beets are likely to be affected by disease, and practically all are as solid as when pulled in the fall.

The sprouts that start in the silo dry up and become rubbed off during the transplanting operations, and seed is produced only from the shoots that start after the roots are set out.

TRANSPLANTING STECKLINGS.

Stecklings usually give the largest yield when planted very early. In northern Colorado transplanting commences the middle of March if the weather is favorable at that time. All work is rushed so as to be completed, if possible, by April 15 or earlier.

The covering of the silos down to the level of the original surface is removed with plows, road graders, and special contrivances resembling long irrigation "A's." (Fig. 7.) The few inches of soil remaining after these implements have done their work is easily scraped off with hand shovels. The roots are immediately sorted into three

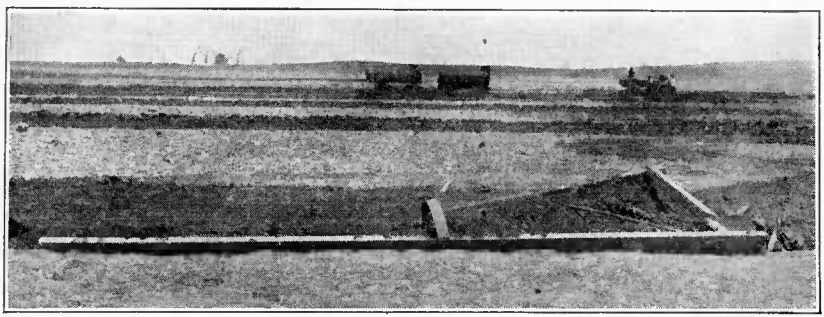

FIG. 7.—Leveler, in use for uncovering beet silos, 20 feet long, 7½ feet across, made of lumber 18 by 3½ inches. Rear opening, 18 inches. The silo over which the leveler stands has been worked down to the original surface of the ground, and the stecklings are ready to take out as soon as the few inches of earth remaining have been removed with shovels.

sizes. The large beets comprise everything over 3 inches in diameter; the intermediate, everything between 1½ to 3 inches; and the small, everything below 1½ inches. All diseased beets are discarded.

Stecklings usually start better and are more easily planted when their taproots are cut off to the solid portion. The lower, limper part generally curls upward when the roots are set out, and being more or less bruised and dried is seldom of any service.

Where stecklings are over 20 ounces in weight they may be divided lengthwise and each half planted like a whole root. This practice is of decided advantage only with roots weighing 2 pounds or more. It never pays purposely to permit roots to grow large with the intention of halving them.

Stecklings are planted in rows 36 inches wide and are distributed by gangs who carry the roots in sacks and drop the beets 20, 16, or 12 inches apart, depending upon whether they are large, medium, or

small in size. Planting gangs immediately follow, setting the roots out, sometimes with shovels and spades, and sometimes sticking them into loosened soil made by running a subsoiler, a modified alfalfa renovator, or other specially regulated digger down the row. (Fig. 8.) If a subsoiler is used it must be symmetrical, so that it will stir the earth equally on both sides of the row. If this work is properly done, the roots can be shoved far enough down into the soil to permit earth to fall over them, so that transplanting can be accomplished entirely by hand and without an additional covering operation.

When the roots are set out with shovels or spades the earth is tamped around each beet with the heel of the shoe. When subsoilers

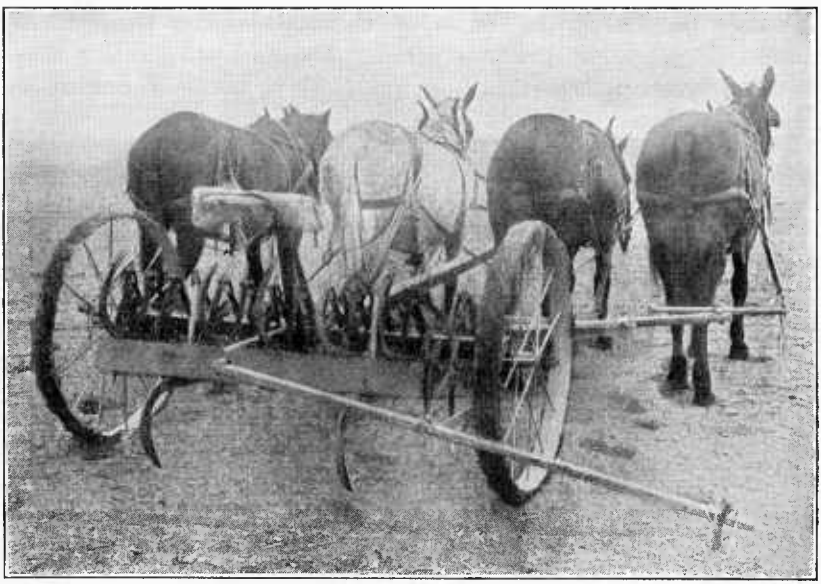

FIG. 8.—An alfalfa renovator, with some of the cultivator teeth turned up, standing ready to make 10-inch deep slots in the earth, so that two rows of beet stecklings can be set out by shoving the roots into the loosened soil. Orchard cultivators and other similar implements of equally strong frame can also be fitted for this work.

are used the earth is packed by a special machine consisting of two heavy beveled rollers. These straddle the rows in such a way as to exert an inward and downward pressure that firms the soil close to the roots.

The feeding hairs of a beet plant grow at the lower part of the root. Firming operations should therefore be directed principally to packing the soil around that portion rather than about the upper part of the beet. The surface of the soil generally gets sufficiently packed by rains and irrigations, but the deeper part needs solid firming, heavy irrigations, or soaking rains to close effectually all

air spaces. Firming around the tips of the beets is especially important where shovels or machines have dug too deeply into the soil and established large air spaces. If these are not at least partially closed by solid firming or rolling, soaking rains or heavy irrigations are likely to drag small stecklings so far into the soil as to make it impossible for the shoots ever to reach the surface.

The success of a beet-seed crop depends greatly upon how thoroughly the earth is firmed around the roots at transplanting time. If the beets could be set out as solidly in the ground as they grew in the fall, they would start immediately. Tamping and rolling can never approximate this ideal condition as closely as a thorough irrigation. Only a decidedly soaking rain will take its place. Whether the soil is dry or moist at transplanting time, furrows should always be made for irrigating, and no transplanting should be started until it is certain that water can be obtained immediately after the roots are set out.

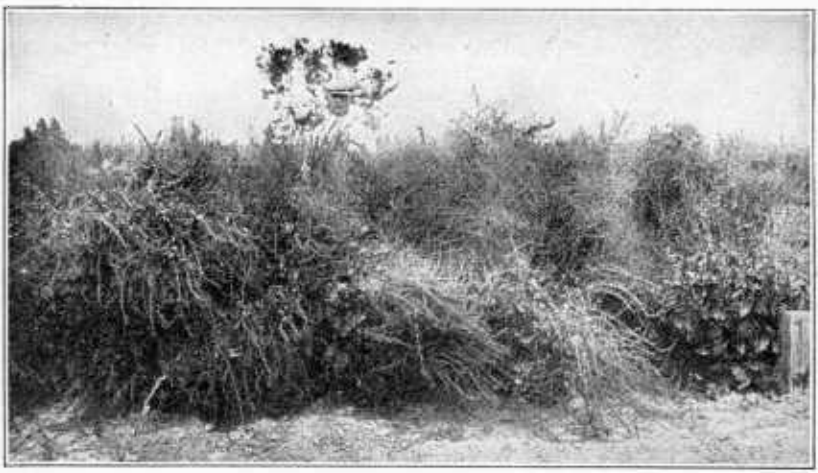

FIG. 9.—An extraordinarily heavy growth of beet seed ready to cut within 10 days. Some stalks are less ripe than others, but the plants are so matted together as to make separate cuttings impossible. The field promises a yield of 3,000 pounds of seed to the acre.

Stecklings start most easily when covered with only about one-half inch of soil. This light protection is safe when all danger of a freeze is past, but early plantings require 1 to 2 inches of covering. Shoots will occasionally break through 3 inches or more of soil without being appreciably weakened. The greatest injury occurs when rains come after the shoots have gotten part way through the soil. Such rains are damaging because they pack the soil around shoots that have previously been working through loose earth. Suddenly deprived of the air spaces they have developed, the young

sprouts often rot or bend over without ever being able to work through. After rains many soils crack. This often saves deep-planted stecklings if they have not already sprouted. It will also save sprouted stecklings if the cracks appear before the shoots have been smothered.

Some eastern growers are said to have better success when the crowns are not covered with earth. In the dry air of irrigated sections such exposure causes a shriveling up of the young shoots almost as soon as they develop. For this reason some covering is necessary in the Rocky Mountain States.

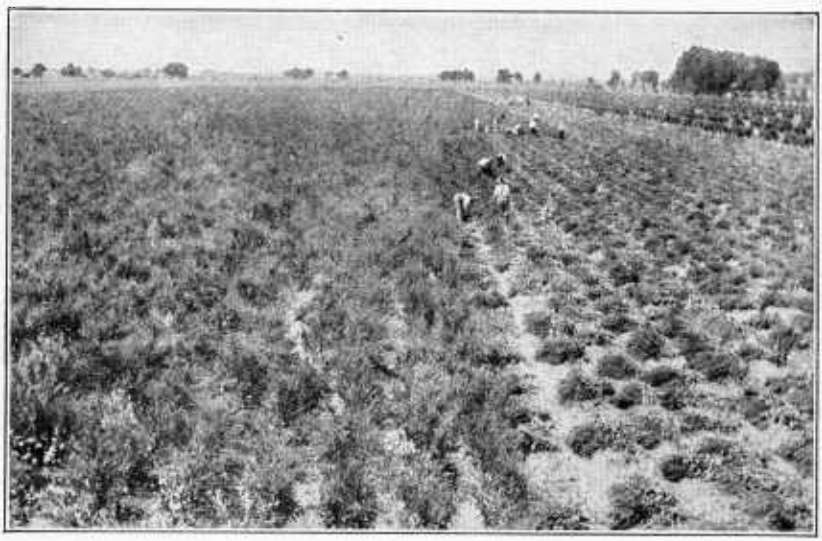

FIG. 10.—An ordinary beet-seed crop being cut and shocked. The stalks have been left in the sun for a long time and have become so wilted that they can not be made to stand up in shocks without first being tied into bundles. The field promises a crop of 1,500 pounds of seed to the acre.

CULTIVATING SEED CROPS.

Beet roots naturally start quickly, and early cultivations are very important. If the soil is not stirred after the first irrigation, the earth frequently shrinks away from all but the lower part of the roots. This results in a general drying up of the beets and a decided unevenness in the maturing of the crop. Where the growth of seed stalks is heavy and the matting together of plants complete, as it often is in irrigated sections, different cuttings can not be made, even if some plants mature earlier than others. (Fig. 9.) For this reason roots should get an even start, so that all plants will ripen at about the same time.

Beet seed stalks grow rapidly, sometimes 2 inches a day. This quick growth makes it imperative that the plants be cultivated and

irrigated when they require it. If a steady, even development is not maintained throughout the blooming period the blossoms are likely to blast and much chaff result at harvest time. If growth is checked during the seed-setting stage, many partly developed seed germs may shrivel, and what appears to be a fine crop may turn out at thrashing time to be mostly empty hulls.

Beet seed is sometimes of low vitality even when growing conditions have apparently been favorable. Whether any particular low germination is due to hot winds or drying weather and a consequent shriveling of the pistil or drying of the pollen, or to incomplete

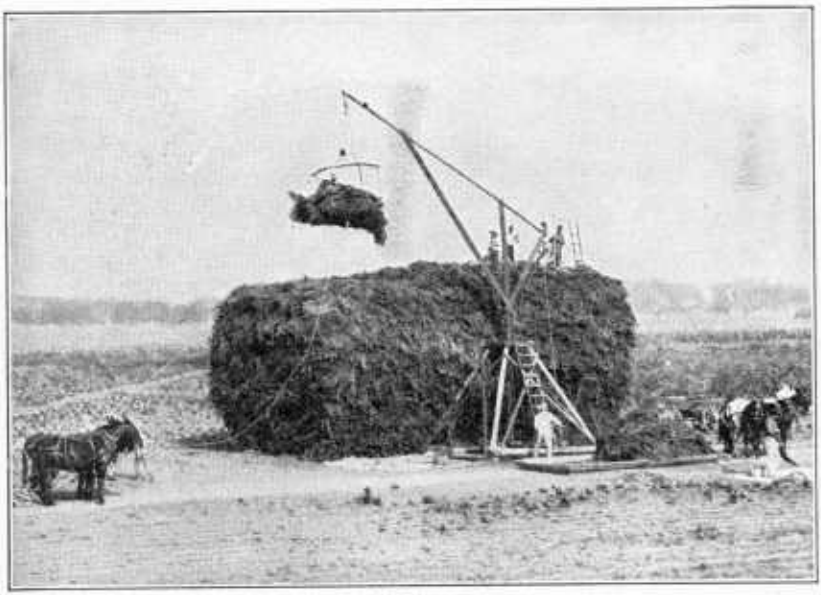

FIG. 11.—Beet seed being lifted from sleds and stacked for thrashing. Two nets have been placed on each sled, and two operations will empty a 2,500-pound load in eight minutes. Four men build the stack, four teams of three horses each haul the seed, and two crews of two men each pitch the shocks on the sleds, as shown on the title-page. Two men operate the derrick and one drives the team. This crew of 15 men, including drivers, and 14 horses will stack 10 acres a day.

fertilization arising from other causes, or to improper cultural treatment can not always be definitely determined. Much is yet to be learned along these lines. In general, seed is likely to be good where pollen is abundant. Its presence in quantity is shown by a characteristic strong odor that extends far from the fields. During the middle of hot days plants often wither a good deal, but this should cause no concern unless the stalks droop very considerably or fail to freshen up toward evening.

Diseased or injured beets or those weakened in breaking through a hard crust may make a vegetative growth of blind seed stalks and

remain green and continue to grow until freezing weather. Such plants are called trotzers when the vegetative growth is complete, and half trotzers when some seed-producing stalks are put forth. The roots of the former are usually of mammoth size, very fleshy, and make excellent feed. Those of the latter are smaller, less crisp, and are not as good feed. Roots which have borne a heavy crop of good seed are usually small, hard, woody, and totally unfit for anything.

Trotzer development sometimes appears to be due to the stecklings getting a second growth in the fall. Owing to a drought or other check occurring in midsummer, the plants stop growing and the roots become hard and remain dormant for several weeks. When refreshing rains come and the weather is cooler, such roots often start to grow again and apparently lose the tendency to produce seed the following year. The beets may keep over winter perfectly and start out early and vigorously in the spring with every prospect

FIG. 12.—Rear view of an ordinary separator fitted to thrash beet seed. A crew of 10 men can thrash 30,000 pounds of seed a day, and two men can haul the thrashed seed to the warehouse.

of good seed crop, but most of the plants may turn out to be trotzers and cover the whole field with a dense vegetative growth.

The yields of sugar-beet seed in the Rocky Mountain States average approximately 1,000 pounds to the acre, with a range of 300 to 3,000 pounds. (Fig. 10.) Yields of 2,000 pounds are uncommon, while 3,000 pounds per acre is the largest yield which has so far come to the writer's notice. (Fig. 9.)

False chinch bugs and webworms sometimes damage or entirely destroy seed crops in the West. The former are difficult to control when once they appear in a field. Nicotine and soap sprays and shaking the bugs into pans containing a thin film of oil have been recommended, but the writer has never found these remedies effective after the insects appear in large swarms. If infested areas can be located, great numbers may be killed in winter and early spring by burning

the dead weeds and other rubbish in which they harbor. Plants frequently escape harm if set out early, so that they come into flower before the insects appear in large numbers. Webworms may be destroyed by Paris green sprays applied from large high-wheeled sprayers with elevated bodies that can be driven over the tops of the plants.

HARVESTING SEED CROPS.

In arid sections of the United States beet-seed crops may safely be cut while the foilage is still green and before the seed balls have become dry enough to shatter. (Figs. 9 and 10.) In northern Colorado this period is usually during the latter part of July or the first part of August. A great deal of experience is necessary to decide when a crop is ripe enough to give good seed and still green enough to harvest without shattering. The right time depends principally

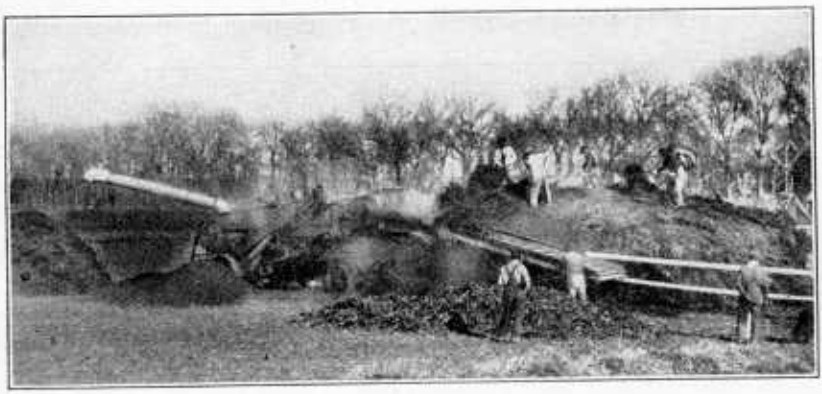

FIG. 13.—Side view of the beet-seed separator shown in figure 12. When the men on the stack can not keep the seed spread out evenly on the straw carrier, an additional man is sometimes specially detailed for this work. Even feeding results in decidedly cleaner seed.

upon when most of the seed balls have reached the dough stage. (Fig. 10.) Harvesting usually must be done quickly, within the course of a few days; otherwise much of the best seed will get too ripe to gather without shattering.

Beet stalks should be cut close to the ground with hand sickles and immediately shocked in bundles about 30 inches wide at the top. If allowed to wilt badly before shocking, the green stalks are difficult to set up straight. In 10 to 20 days they are usually dry enough to thrash or stack. (See illustration on the title-page.) Rains sometimes make it necessary to open up and reset shocks so that the seed can dry out without sprouting. This overhauling shatters considerable seed and is costly in time and money. Every endeavor is therefore made to thrash or stack the seed as soon as it is dry enough.

THRASHING SEED CROPS.

Thrashing beet seed is comparatively slow work, and where crops are hauled direct to the machine from the field a large part of the shocks necessarily remain exposed for many weeks to damaging rains. For this reason Rocky Mountain growers almost invariably stack their seed and get it under cover as soon as possible. (Fig. 11.) Thrashing is done in the late fall or early winter and at a time when labor is most available. (Figs. 12 and 13.) If rains or storms occur, thrashing can proceed immediately after they are over, as it is not necessary to wait for long periods for stacks to dry out. Heavy dews also do not interfere with early-morning operations, and in many ways thrashing progresses with less interruptions when the crop is stacked.

Stacks are made in the field, generally one to every 10 to 25 acres. If properly built, of correct shape, and well protected at the top with

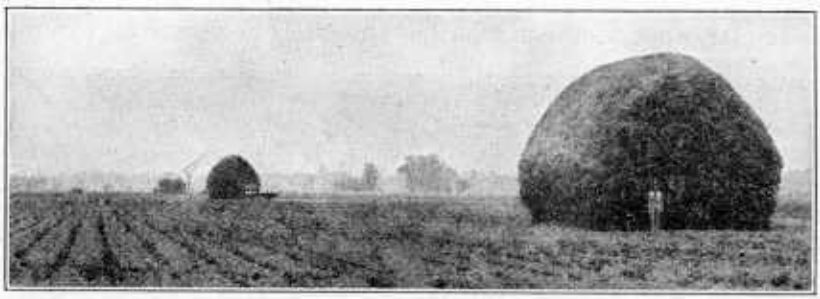

FIG. 14.—Well-built beet stacks similar in size and form to alfalfa stacks. The tops are protected with 2 feet of straw.

straw, they will keep through almost any weather. (Fig. 14.) The greatest danger comes when rains or storms appear suddenly while the stacks are being built or during thrashing.

Beet-seed shocks are hauled most economically from the field on flat sleds about 10 by 18 feet in size, built with sloping sides about 1 foot high. (Fig. 15.) Such sleds are best because the seed can be loaded by two men, without the use of canvas and without the loss of seed. Wagons are not liked, because three or more men are necessary for loading and because canvases have to be dragged from shock to shock to catch seed that falls from pitching so high. Wagons carry somewhat larger loads than sleds, and only two instead of three horses are required, but the saving of labor in loading is compensation. Seed is unloaded from the sleds to the stacks by the use of slings and stackers. (Figs. 11 to 15.)

Sugar-beet seed is satisfactorily thrashed with ordinary grain separators and equipment, except that the feed carriers are considerably

extended, the wind and speed much reduced, and lip sieves substituted for grain sieves. The teeth of the cylinders must sometimes be increased and sometimes reduced, and other adjustments, which an expert thrasher will recognize, are often necessary.

In well-regulated separators the thrashed seed will contain not more than 15 to 25 per cent of trash. Seed is occasionally blown over into the straw pile, and it sometimes pays to rethrash. Second thrashings require only one-sixth to one-third of the time required for the first and turn out less than 2 per cent to more than 10 per cent as much seed, depending upon whether the first operation was thorough or incomplete. Tare in second thrashings is very large, sometimes 80 to 90 per cent.

CLEANING SEED CROPS.

Sugar-beet seed is one of the most difficult, expensive, and disagreeable of all seeds to clean. Special equipment, such as only specialists and large operators can afford, is absolutely necessary for turning

FIG. 15.—Sleds used to haul the beet shocks to the stacks, showing their construction. A double floor is made by nailing matched lumber to the upper and lower sides of five crosspieces of 2 by 6 inch scantling. The sleds pull best without runners. After several years' use the bottom floor becomes worn and the upper one full of cracks, and both must occasionally be replaced. The sled to the right shows how the slings are placed.

out a merchantable product. The seed is first run through a side-shake grain cleaner of large capacity, consisting of at least three series of sieves. The mill must be well equipped with traveling brushes kept in good condition at all times. The sieves of standard cleaners have too long a run, and to prevent too many stems falling through with the seed it is necessary to construct sieves with the lower two-thirds blank.

Properly adjusted grain cleaners generally remove the greater portion of the sticks and other trash in one operation. If they fail to do this, recleanings should be made until the mills have done all that might reasonably be expected of them. Whatever sticks are not removed by the cleaners must be taken out by running the seed over inclined canvas aprons moving over large rollers. This operation is

exceedingly slow and expensive, and it does not pay to run seed over aprons when it contains sticks that can be taken out more cheaply by rapid-working grain cleaners.

The efficiency of a seed-cleaning house depends largely upon the right proportion of sieves and seed drapers. If the surface of the former is too small, the revolving aprons may very easily be overworked and fail to clean the seed properly. The canvas cleaners now in use by American growers contain apron agitators, cleaning brushes, and many fine adjustments that make them greatly superior to the German drapers in use eight years ago. Well-equipped seed-cleaning houses are to-day supplied with efficient suction drafts, which very largely remove the dust that formerly made beet-seed cleaning so disagreeable.

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