DECORTICATED SUGAR BEET SEED

Published by

UTAH-IDAHO SUGAR COMPANY

Good News for This Spring

HERE'S good news for beet growers who want all the benefits inherent in the use of sheared seed—precision planting, machine thinning, mechanical weeding—without sacrificing good germination "stands." Decorticated seed will be offered—and recommended—for this spring's planting.

Both sheared seed and decorticated seed were developed by Professor Roy Bainer, of the University of California. After extensive tests with both types, Professor Bainer, and leading authorities generally now believe definitely that decorticated seed has advantages over sheared seed, especially where adequate germination "stands" have been difficult to obtain from sheared seed. Ample laboratory and field tests of our own have convinced us that this is a fact.

Decorticated seed has practically every merit of sheared seed plus better field emergence under average conditions of soil and moisture. Believing these facts, as we do, we will endeavor to supply all the decorticated seed our growers will need this spring, and we sincerely recommend its use to them.

Utah-Idaho Sugar Company

Salt Lake City, Utah

Decorticated Sugar Beet Seeds

Decorticated Sugar Beet Seed will be used by thousands of farmers in the area served by the Utah-Idaho Sugar Company this coming spring. This change in the processing of sugar beet seed has been adopted only after careful investigation and only after the entire management of the Company became convinced that it would be for the best interests of the thousands of farmers who will plant it.

What are the reasons for making a change in our seed processing? There are at least two major reasons why the management feels that a change in seed is necessary. We have been concerned with the prevalence of poor stands and also the extensive amount of replanting which has been necessary in many of our districts. Thin, irregular stands generally result in poor yields and lowered sucrose content. Furthermore, it has become increasingly evident that thin, irregular stands are the greatest single factor retarding the spring mechanization of the sugar beet crop. Spring mechanization can become a reality only as we learn ways and means of controlling spring weeds. Uniform stands of 400 to 500 beets per 100 feet of row are an essential in this program.

With these facts in mind, the management advised an increase in the planting rate of "7-9" sheared seed last year. This increase in seeding rate helped in many cases. However, extensive field trials indicated that use of processed seed having a higher sprout count per seed unit than that of "7-9" sheared seed would further improve germination stands and provide a "margin of safety" under unfavorable soil, climatic or insect conditions.

In some of our districts farmers were obtaining this benefit by returning to the use of whole seed. Whole seed, however, is hard to plant in a precision pattern and rather heavy seeding rates were necessary to insure adequate distribution of the whole seed. This heavy planting of whole seed resulted in an increase in the requirement of spring hand labor, and the goal of the industry is to eliminate as much hand labor from the spring program as possible.

It was felt that a modification of seed processing could be made which would provide the margin of safety provided by the whole seed, and also retain many of the benefits we have had through the precision planting of sheared or segmented seed. Dr. Roy Bainer of the University of California, who developed sheared or segmented seed, did some further experimenting and after considerable work suggested that we could obtain both of these benefits by sizing and decorticating seed, and he developed machinery to do this type of processing on a commercial scale. It was this decorticated sugar beet seed which had shown up so favorably in the field trials previously referred to.

What is Decorticated Seed?

What is decorticated beet seed? It is sugar beet seed which has been pre-sized and then run between a rubber pad and the flat surface of a carborundum stone. This process removes some of the germs from the largest, most multiple germed seed balls and most of the loose, fluffy, corky material from all the seed balls. This decreases the volume of a pound of seed and greatly increases the seeds' weight per bushel. Following the removal of the loose cork, the seed is then carefully sized to bring it within the limits of plus 8/64th and minus 11/64ths of an inch. It might, therefore, be referred to as "8-11" decorticated seed, as compared to the "7-9" sheared seed which has been in use for several years. It might be stated that decorticated seed is a compromise between whole seed and the highly processed "7-9" sheared seed which has been in use.

(*Continued on page* 6)

Figure 1. Whole Sugar Beet Seed Balls

Note the loose, fluffy, corky material surrounding the hard nut-like structure which contains one to several dormant seedling embryos. Whole seed varies greatly in size, generally from 7/64 to 20/64 of an inch. This extreme size range makes it hard to get uniform distribution of the seed through a planter, and considerable bunching of seed therefore occurs.

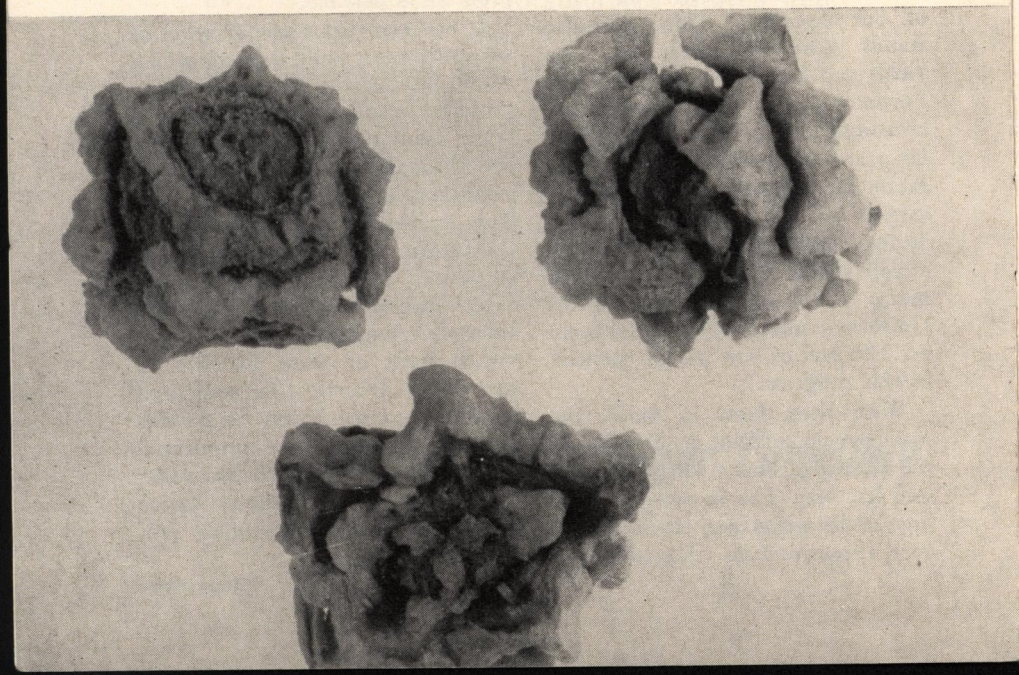
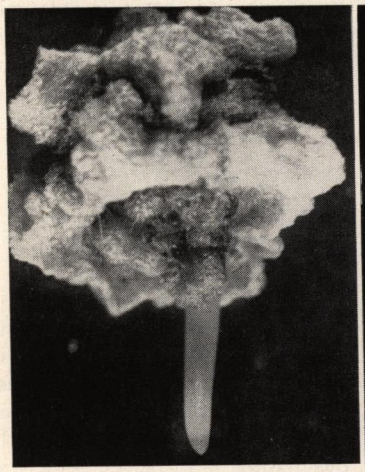
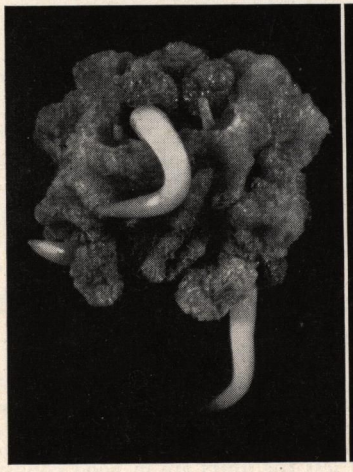


Figure 2. **The sequence A, B, C, D (figure 2) illustrates the fact that whole seed may contain from one to four and occasionally even five viable seedling embryos. This fact, coupled with the uneven distribution of whole seed by the drill, causes an excessive amount of hand finger-thinning to eliminate excessive "multiples." Processed seed overcomes, to a large extent, both these difficulties.**

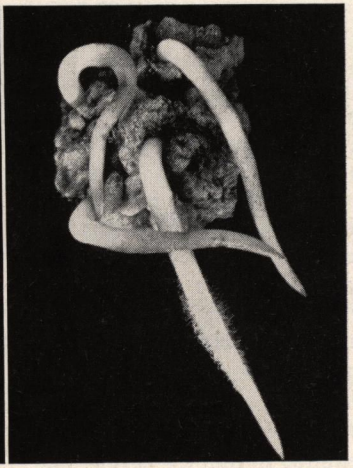


Whole Seed—Single Germ

Whole Seed—Double Germ



Whole Seed—Three Germ



Whole Seed—Four Germ

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For example, whole seed averages about 25,000 seeds per pound, "8-11" decorticated seed averages about 35,000 seeds per pound, and "7-9" sheared seed averages about 43,000 seeds per pound. Whole seed averages about 2.0 sprouts per seed unit, with many seed balls showing multiple sprouts; "8-11" decorticated seed averages about 1.55 sprouts per seed unit, and although many seed units develop double sprouts there are very few multiple sprout units; "7-9" sheared seed averages about 1.15 sprouts per seed unit, which indicates that almost all seed units have been reduced to one viable sprout. If "7-9" sheared seed could be planted under ideal seedbed conditions, and if there were no spring weeds, then there would be little question but what precision planting of about three pounds of "7-9 sheared seed with its single germ condition would give the greatest saving in spring labor. Experience has shown, however, that we must reckon with soil crusts, insects, untimely frosts, wind, seedling diseases and spring weeds. All of these factors have prevented realization of the full benefits which otherwise might have attended the use of the "7-9" sheared seed. Extensive thinning time studies showed that in many cases where almost ideal beet stands were obtained, weeds developed so thick and fast that as much hand labor was necessary to thin these fields as was required to thin the heavier beet stands obtained with whole seed. Further experimental work and field experience during the past two years has indicated that control of spring weeds and reduction of beet population must be made a combined job and that this can best be accomplished through the timely use of such tools as the finger weeder, harrow, and other similar tools. To get the most out of this type of a program, we must have good germination stands, and the use of decorticated seed, with its increased "margin of safety," fits into this program.

Making the shift to "8-11" decorticated seed presents one serious problem. It will require a modification of present drilling equipment. All John Deere and International plate feed drills can be converted by purchasing new plates, which will be slightly thicker than the plates you have been using to plant "7-9" sheared seed, and the cell size will be increased to slightly larger than 12/64ths of an inch. It is not recommended that you try to get by, reaming out the holes in your present plates. Even if you do this they will still not be of the correct thickness. The exact cost and specifications of these new plates will be furnished your fieldman just as soon as the information is available. In the case of Cobbley drills, the conversion is not so simple and will be more costly. In view of this fact, it is not recommended that you have the holes in the rotors of your Cobbley units reamed out unless the units are in good condition.

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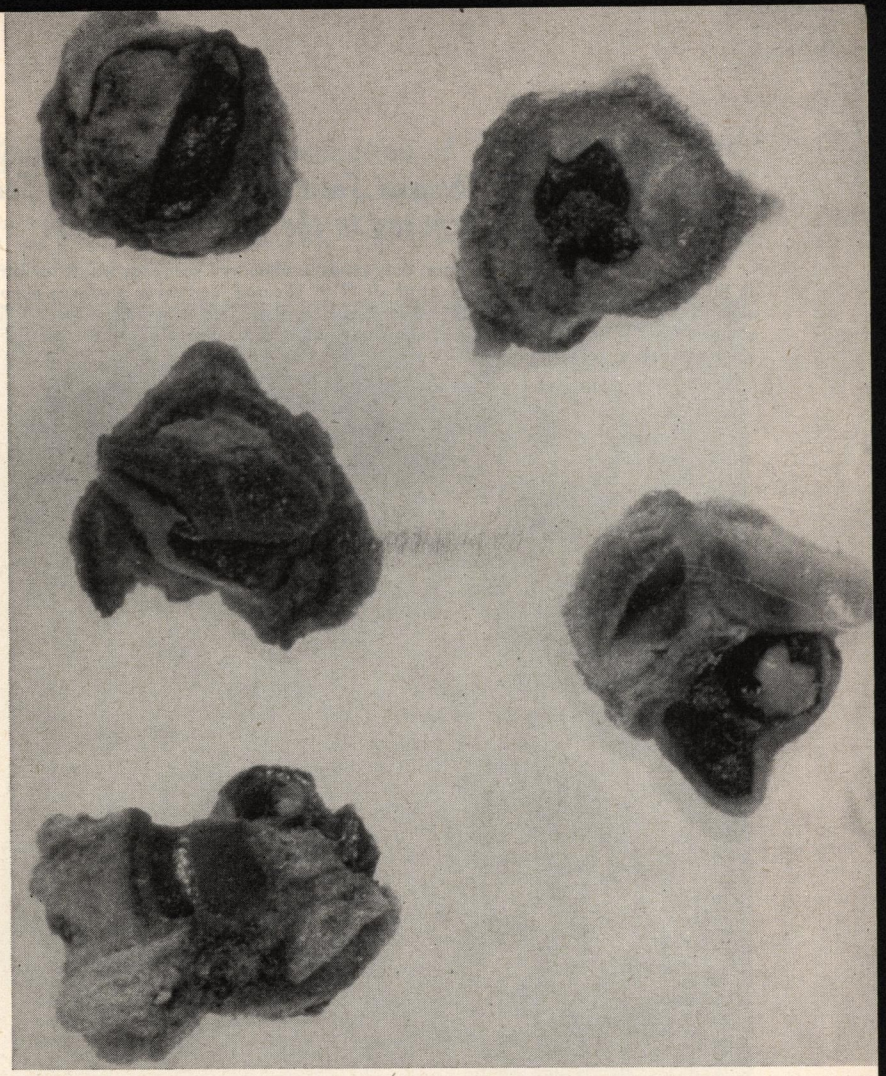

Figure 3-A. "7-9" Sheared Sugar Beet Seed, containing only one Viable Seedling Embryo per Seed Unit

Note the exposed seed cavities which have been sheared through, thus eliminating the seed germs. Many farmers have reduced their spring labor as much as 50 per cent through the precision planting of sheared seed. In many other cases, spring weeds have prevented much or any saving in labor requirements.

Figure 3-B. "7-9" Sheared Seed with all the Viable Seedling Embryos Exposed in the Shearing Process

Although these seeds germinate, they produce abnormal seedlings which do not live in the field. Abaut 12 to 15 per cent of all "7-9" sheared seed made produces abnormal seedlings like these. This fact reduces the normal blotter germination of "7-9" sheared seed to about 70-75 per cent. In 13 widely separated field tests, "7-9" sheared seed averaged only 35 per cent in field emergence.

Figure 3-C. Blotter Germination of "7-9" Sheared Seed

The three seeds on the left are all producing normal seedlings. This is representative of the germination of seeds shown in figure 3-A. The three seeds on the right are producing abnormal seedlings. This is representative of the germination of seeds shown in figure 3-B.

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It is possible to have the necessary changes made in your Cobbley drills, however, and should you decide that you want to do so, you should make arrangements to have the job done by contacting your fieldman. It is extremely important that every beet grower or prospective beet grower give this seed question serious immediate consideration and reach a decision so that where drill changes are necessary these changes can be made well in advance of planting time. This coming year growers will be given a choice as to whether they continue to plant "7-9" sheared seed or change to the "8-11" decorticated seed. We honestly feel that it will be to your advantage to make the change, but we want you to have a choice in the matter.

The data in Tables 1 to 4 give a rather complete comparison of the characteristics and performance of "7-9" sheared and "8-11' decorticated seed as indicated by germination and field tests. You are urged to study these through carefully, as they contain information which is fundamental in making an intelligent decision as to your choice of seed for 1949. Let us look at a few of the items in these tables. The first three items in Table 1 have to do with germination percentages. Note that in the shearing process, 12 to 15 percent of the seed units produce abnormal seedlings which do not grow under field conditions. Abnormal germination is practically absent in decorticated seed, and it is therefore possible to furnish you seed which has a potential normal germination of at least 90 percent, as compared to 70 to 75 percent in the sheared seed. The average number of viable sprouts in each seed unit is 1.15 in sheared seed as compared with an average of 1.55 viable sprouts per seed unit in decorticated seed. This increase in sprouts per seed unit in the decorticated seed, will give you more double plants than will the "7-9" sheared seed.

However, in relation to the question of increased doubles from decorticated seed, the following facts should be noted: During the past three years it has been thoroughly demonstrated that doubles are not as objectionable as we have previously thought. In fact, in many field tests, up to 25 percent doubles have increased rather than decreased yields. The data in Tables 2 and 3 also illustrate another point that was first called to our attention by Dr. Roy Bainer and Dr. Lyle Leach of the University of California. You will note that, although the percentage of inches containing single beets is lower with decorticated seed than with sheared seed, this disadvantage is offset by the fact that there are actually more inches with singles per 100 feet with the decorticated seed than there are with the sheared seed. This increase in number of inches containing "singles" results from the increased emergence percentage from decorticated seed.

Dr. Bainer has pointed out that the increased opportunity of labor to cut to "singles" in each 100 feet

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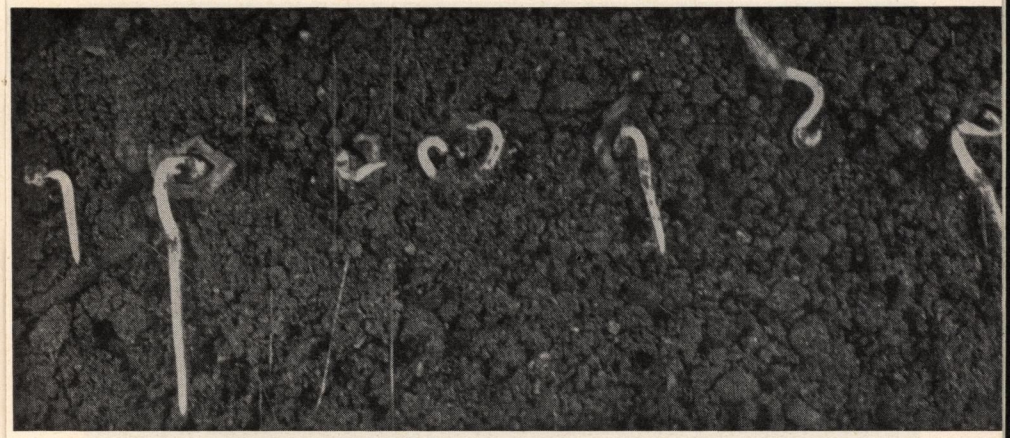


Figure 3-D. Sack Run of "7-9" Sheared Seed Planted in the Soil

Some of these seeds are producing normal seedlings, while others are producing abnormal seedlings.

Figure 3-E. An Enlarged View of some of the Abnormal Seedlings

These will not produce normal plants. Compare these with the normal germination and seedling development shown in figures 5-A and 5-B.

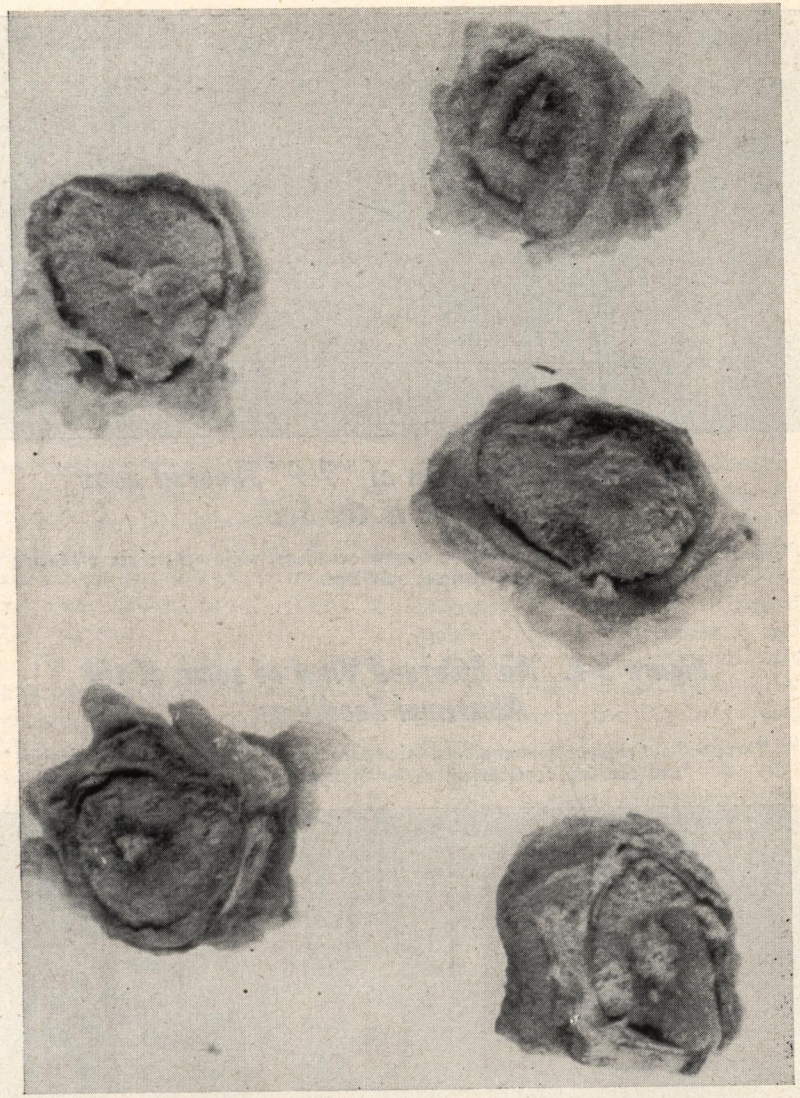


Figure 4-A. This is "8-11" Decorticated Sugar Beet Seed

The whole seed was sized before processing. This represents the 12/64 to 14/64 fraction after it was decorticated. You can see that it has been processed rather lightly. Note that a small amount of the outer cork is still present. The seed is uniform in size and generally round in shape. It handles well in the seed drill.

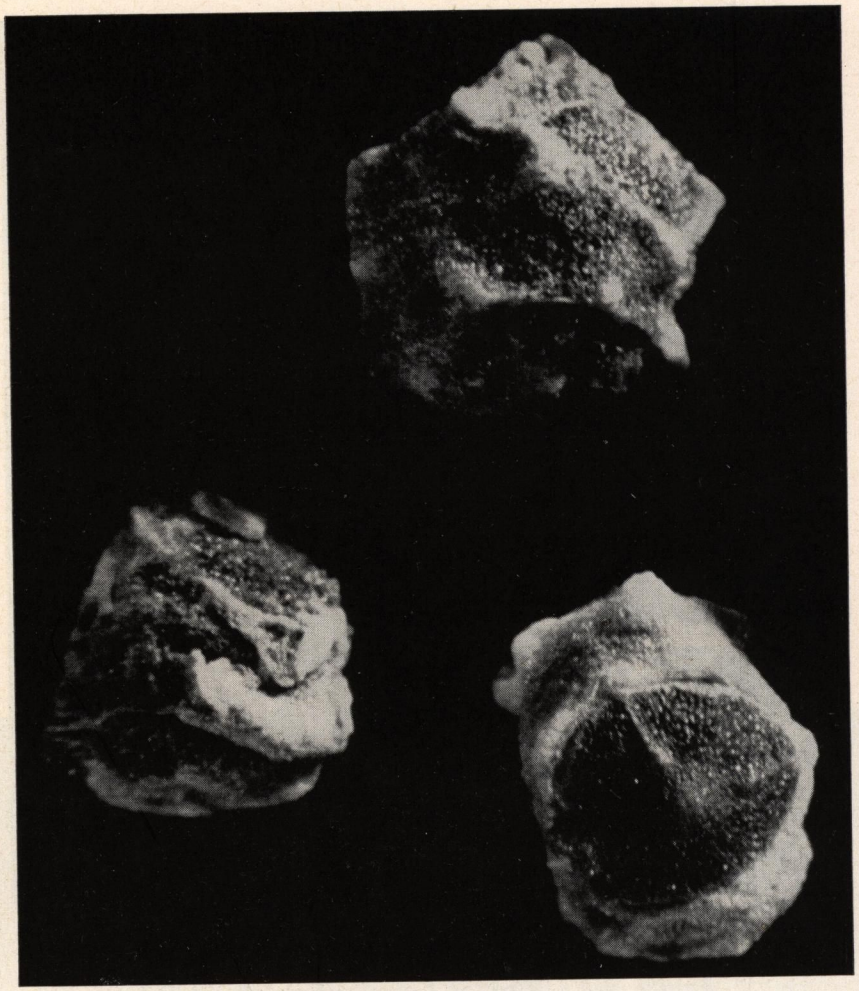


Figure 4-B. This also is "8-11" Decorticated Beet Seed

But it represents the large-sized whole seed after decortication. It is evident that this seed has been processed more severely than was the smaller seed shown in figure 4-A. On the larger sample only the hard nut-like covering remains, and some seed embryos have been removed to eliminate "multiples." About 50 per cent of the "8-11" decorticated seed produces double sprouts. Note, however, the uniformity of size and shape. This seed can be distributed in a precision pattern.

Figure 4-C. Blotter Germination of "8-11" Decorticated Seed

Note that all sprouts are developing normally and that one of the seeds shown is producing two sprouts. Again you will note that the two top seeds which were originally large seed balls have been processed more severely than have the two bottom seeds which were originally in the "12/64 to 14/64" size class; consequently, only a light decortication was necessary to bring them below 11/64 in size. Decortication reduces "multiples" and also makes it possible to furnish seed of uniform size for precision drilling.

(*Continued from page* 10)

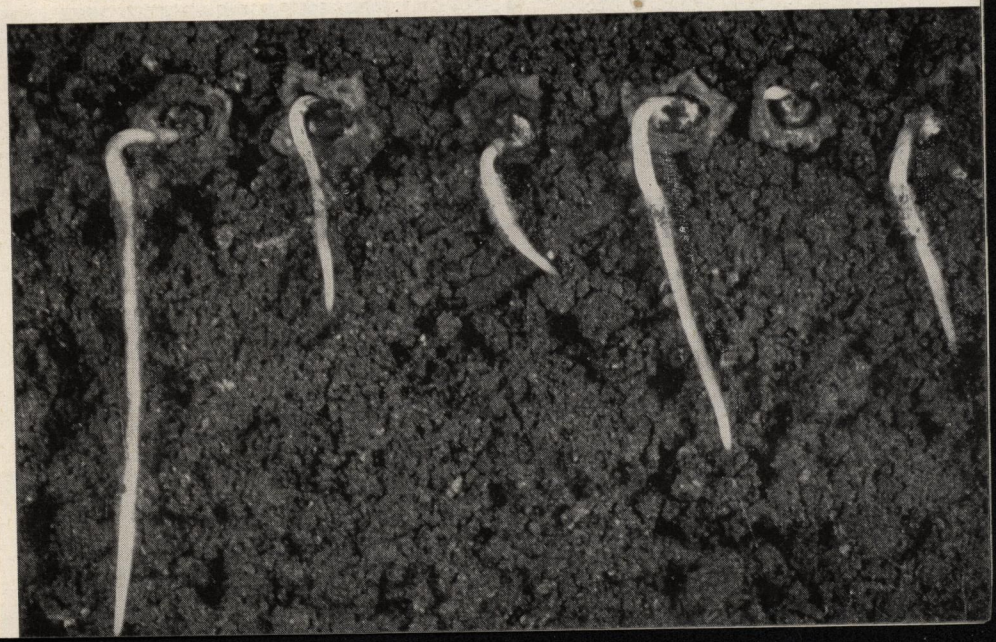
of row is actually more important than is the percentage of inches with "singles." One other fact should be stressed at this point: the use of such tools as the finger weeder and harrow on beets in the seedling stage, for the purpose of getting both weed control and beet removal, tears out many of the doubles and thereby increases the percentage of "singles" in the field.

In view of all these facts it is felt that the increased "margin of safety" provided by the increased sprout count per seed unit where decorticated seed is used, weighed against such hazards as insect damage, seedling diseases, frost, wind, and other unfavorable factors, has many more advantages than disadvantages.

You will also note from the data in Table 4 that, in extensive field trials, the emergence percentage of sheared seed averaged about 36 per cent as compared to an average of 53 per cent for the decorticated seed in the same tests. Based on the results of these tests, you will note that at the recommended seeding rates as shown in Table 1 you

Figure 4-D. Decorticated Sugar Beet Seed Germinating in the Soil

Note that all the young seedlings are developing normally and that germination is fairly uniform. Field emergence of "8-11" decorticated seed has averaged about 50 per cent. Compare these seedlings with the stages of seedling development shown in figures 5-A and 5-B.



should expect from 100 to 150 more inches with beets per 100 feet of row as a germination stand from the decorticated than from the sheared seed. This increased stand should enable you to obtain more effective weed control and a more uniform thinned stand.

The "8-11" decorticated seed will cost considerable less per pound than the "7-9" sheared seed. The price may vary somewhat from year to year, but it should always be considerably less than "7-9" sheared seed. This difference in price is due to the fact that there is a higher recovery of the original seed in the decorticating process than is possible in the shearing process.

This discussion will introduce you to the seed and drill problem. Meet ings will be held in your district in the near future to discuss various aspects of this problem more completely and at these meetings members of the Field Staff will attempt to answer questions which this discussion may leave unanswered.

Remember, drill changes take time and consequently decisions must be made early as to what your future program is to be.

Figure 5-A. Stages in the Germination of Sugar Beet Seed in the Soil

The root of the small seedling always develops first. Here you see the root from the time it first emerges from the seed until it has grown to about 1½ inches in length. At this time the cotyledons, or first leaves, remain in the seed so that they can absorb food for the developing seedling. The next stages in seedling development are shown in figure 5-B.

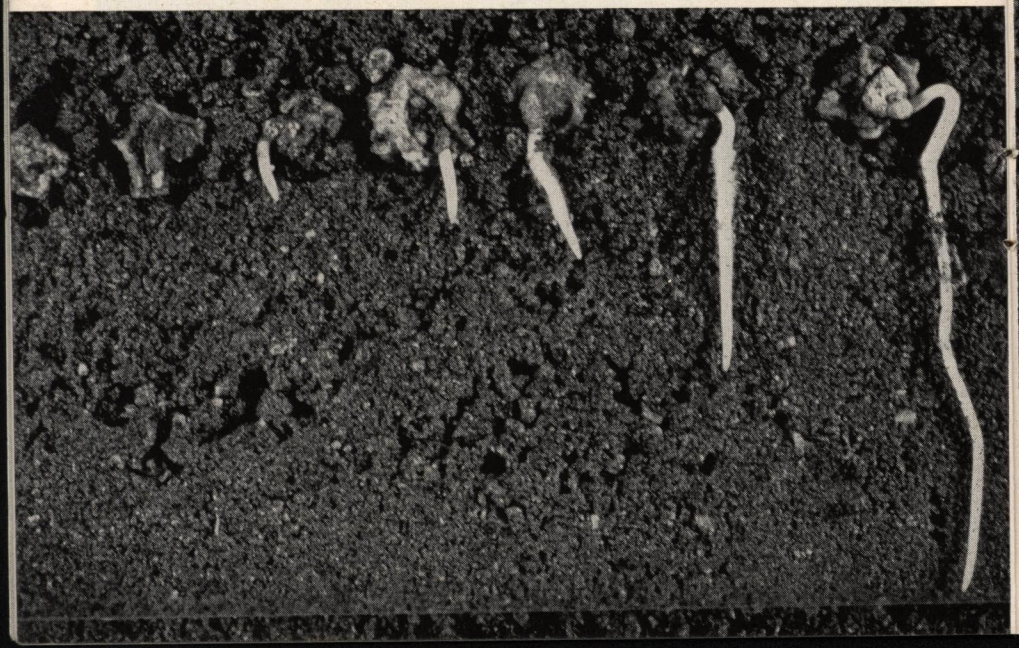


Figure 5-B. FURTHER STAGES IN SEED GERMINATION AND THE DEVELOPMENT OF THE SUGAR BEET SEEDLING

After the root has grown to be about 1½ inches long, the stem or hypocotyl starts to develop, and the cotyledons are pulled free from the seed. The small seedling is now "on its own" and must live off its own tissue until it emerges and can start to manufacture food. Note how the cotyledons hang down so they can be pushed up through the soil to the surface where they open up, turn green, and start manufacturing food.

●

Get everything ready to plant early this coming spring. And if you don't have sufficient moisture to insure rapid, uniform germination, give your beets an early, light irrigation. It may increase your yields 3 tons per acre.

Figure 5-C. A HIGHLY MAGNIFIED VIEW OF A YOUNG DEVELOPING SEEDLING SHOWING THE ROOT PUSHING DOWNWARD INTO THE SOIL

Note the many small root hairs. It is through these root hairs that the sugar beet plant absorbs water and soil nutrients such as nitrogen and phosphorus.

●

Plant roots do not disturb nutrient materials in the dry state. Nitrogen, phosphorus, and all other elements must be in solution before they can be utilized by the plant. This is doubley important when the seedling is just getting established. The root from the germinating seed shown below is greatly magnified. The root hairs are normally almost microscopic in size. It is essential, therefore, that there be sufficient soil moisture to carry the plant nutrients to the small root hairs. Seedling beets cannot establish a root system in dry soil.

Figure 6-A. This is the Kind of Stand some of the Best Farmers got

by planting about 3.5 pounds of "7-9" sheared seed per acre. This farmer has no weed problem and he has sufficient beets to leave a uniform stand after thinning. He does not have a surplus of seedlings, however, and so cannot afford to lose any plants to seedling diseases or insects, nor can he work his beets for in-the-row weed control. For the farmer who has full control of all unfavorable factors, including late frosts and weeds, this type of stand approaches the ideal.

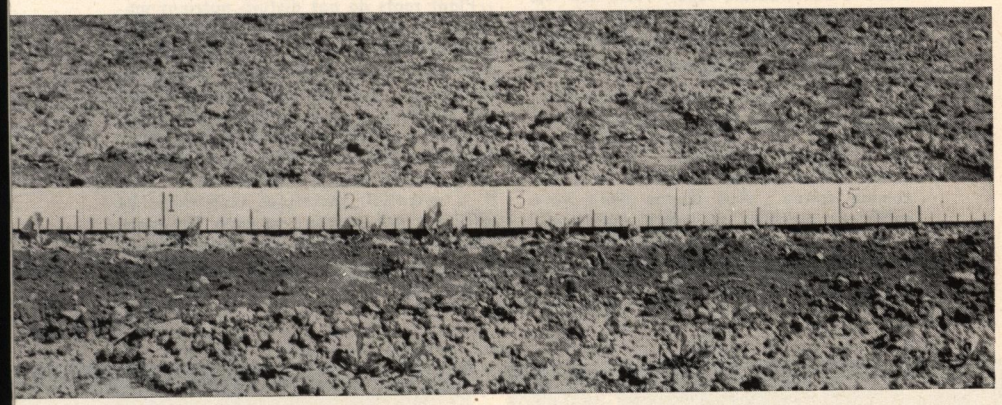


Figure 6-B. This is the kind of Stand

we expect a farmer to get from planting 6 to 8 pounds of decorticated beet seed per acre.. This rate of seeding should give a germination stand of 400 to 500 inches, with beets in each 100 ft. of row. This rate of emergence provides a margin of safety for damage from insects, disease, wind, frost; and, most important of all, it provides enough plants so you can really give them a working over with the finger weeder, harrow, side-delivery rake, or other similar tool. So follow this procedure and get set to finger weed and thin your beets mechanically this spring. The first essential is a good stand of beets. Decorticated seed will help you achieve this.

Table I

COMPARISON OF "7-9" SHEARED SEED AND "8-11" DECORTICATED SEED AS DETERMINED BY GERMINATION TESTS AND FIELD TESTS

Comparison Being Made	"7-9" Sheared Seed	"8-11" Decorticated Seed
Total Germination	85- 90%	90- 95%
Percent Abnormal Germination	12- 15%	0- 2 %
Net Possible Normal Germination	70- 75%	90- 93%
Average No. Sprouts Per Seed Unit	1.15-1.20	1.55-1.65
Average Field Emergence	35- 45%	50- 60%
Average No. of Total Plants From Each 100 Seeds Planted in the Field	34	70
Average No. of Inches Containing Beets From Each 100 Seeds Planted	29	50
Recommended Seeding Rate:		
Seeds Per Foot of Row	10- 12	8- 10
Pounds Per Acre	5- 6	6- 8
Germination Stand:		
Inches Per 100 Feet Containing Beets under average conditions	290- 350	400- 500
Total Plants Per 100 Feet of Row under average Conditions	340- 408	560- 700

Table II

FIELD TESTS AT LEHI, UTAH AUGUST 1948

	"7-9" Segmented Seed	"8-11" Decorticated Seed
Inches Containing Beets Per 100 Inches	28	46
Inches Containing "Singles" Per 100 Inches	21	30
Total Plants Per 100 Inches	36	66
Percent Inches With "Singles"	75	65

Table III

FIELD TESTS AT IDAHO FALLS, IDAHO AUGUST 1948

	"7-9" Segmented Seed	"8-11" Decorticated Seed
Inches Containing Beets Per 100 Inches	40	59
Inches Containig "Singles" Per 100 Inches	31	37
Total Plants Per 100 Inches	49	85
Percent Inches With "Singles"	78	62

Table VI

COMPARISON OF THE EMERGENCE PERCENTAGES OF 7-9 SHEARED SEED WITH THAT OF 8-11 DECORTICATED SEED IN EXTENSIVE FIELD TESTS

Location of the Test	"8-11" Decorticated Seed	"7-9" Sheared Seed
	Percent	Percent
Rocky Ford, Colorado	75	50
Sheridan, Wyoming	20	25
Sterling, Colorado	20	25
Torrington, Wyoming	32	29
Sugar City, Colorado	60	38
Windsor, Colorado	62	44
Scottsbluff, Nebraska	35	9
Colorado A. & M. College	35	27
University of California:		
Test I	80	70
Test II	48	33
Test III	35	19
Utah-Idaho Sugar Co. Tests		
Lehi, Utah	61	37
Idaho Falls, Idaho	78	53
AVERAGE OF ALL 13 TESTS	53	36

CAUTION: Decorticated Seed Not a Cure-All

Now, just a word of caution and a few suggestions: caution that decorticated seed is not a "cure-all" for poor stands, but that it is merely a help. It can give you the most benefits if you will farm the best way you know how. The suggestions therefore might be summarized as follows:

1. Prepare the best seed bed you can, and prepare it early.
2. Plant early, planting 10 to 12 seeds per foot of row.
3. Plant carefully, checking your drill frequently, and hold drilling speed to 2 to 2.5 miles per hour. If you plant faster than this you greatly reduce planter efficiency.
4. Don't gamble on the weatherman; he generally does something different from what you expect. If your seed bed lacks moisture, or if it is of a texture that loses moisture rapidly, irrigate early to secure early, rapid, uniform germination.
5. As aids to successful early irrigation, make a good furrow and use frequent cross ditches. Don't run water more than 250 to 300 feet. Early irrigations should be light. It is undesirable to saturate the soil.
6. When your beet seed has started to germinate, and as soon as the soil has dried sufficiently, cross harrow your beets with the teeth lying fairly flat. This kills weeds and prevents the formation of surface crusts.
7. As soon as the beets are up and starting to get the first set of true leaves, go to work with the finger weeder, harrow, or similar tool, and control the weeds while they are still too small to see.
8. Continue finger weeding operations for weed control and beet elimination. Stirring the soil will stimulate early seedling growth and greatly reduce spring hand labor requirements.
9. If insects, such as the small black flea beetle, are eating the seedling beets, call your fieldman and arrange to dust with DDT. Bugs can be controlled!

Profitable sugar beet production requires close co-operation between processor and grower. We would like to help you when we can. In return we ask your co-operation in helping to carry out the best production practices that can be devised.

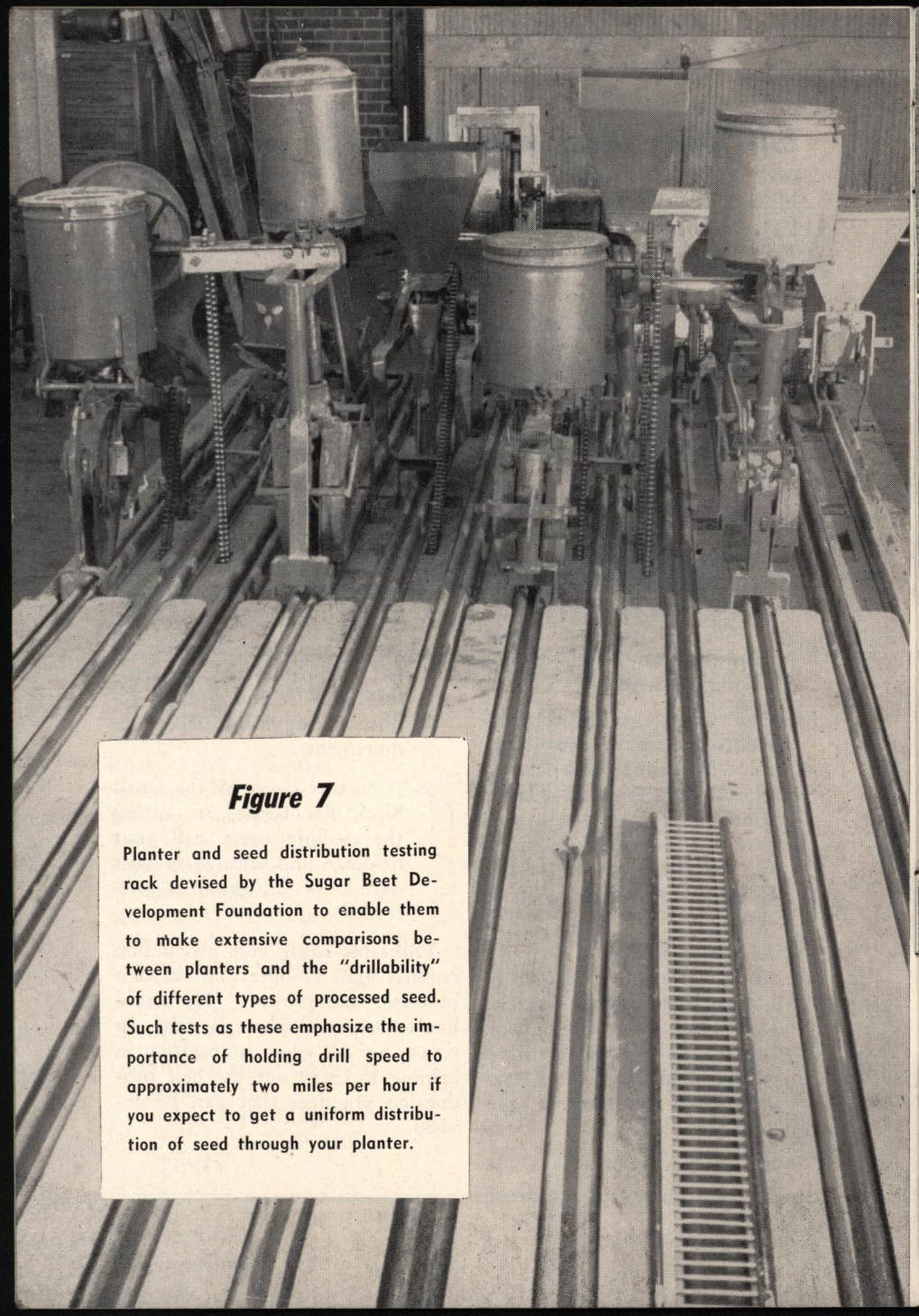
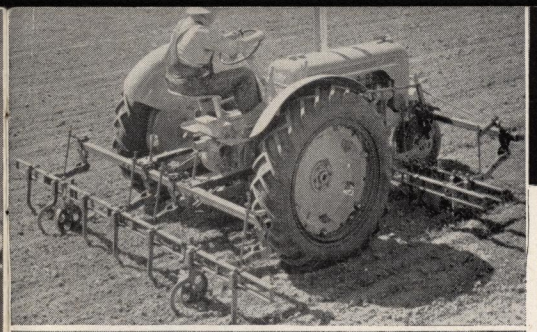


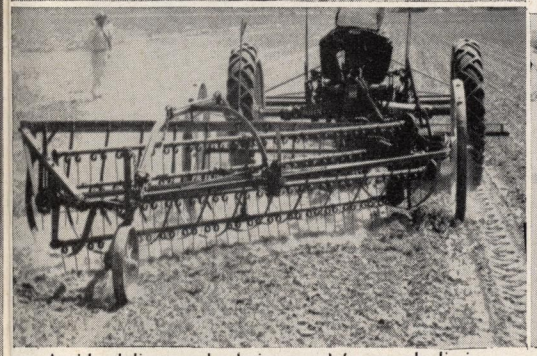
Figure 7

Planter and seed distribution testing rack devised by the Sugar Beet Development Foundation to enable them to make extensive comparisons between planters and the "drillability" of different types of processed seed. Such tests as these emphasize the importance of holding drill speed to approximately two miles per hour if you expect to get a uniform distribution of seed through your planter.

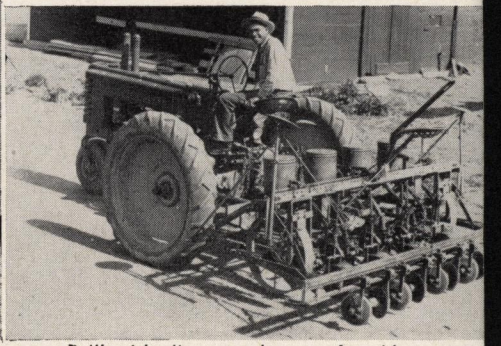
Use Right Tools For Spring

Good tools, properly set and effectively operated, can save many man-hours needed for weeding and thinning.





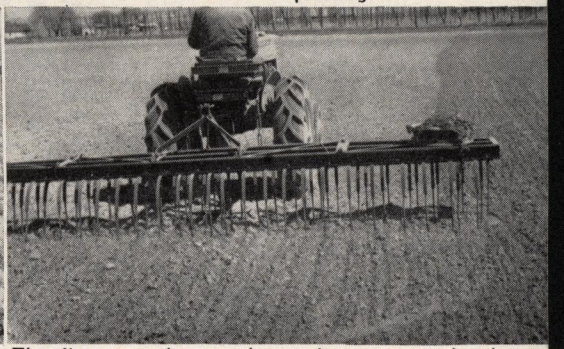
A side-delivery rake being used for weed elimination and to thin down the stand of beets.



Drill with disc attachments for ridge-cover planting.

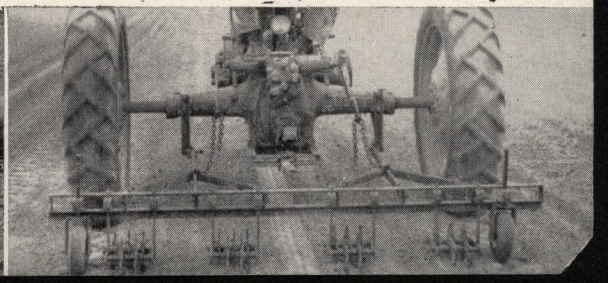
John Deere clod breakers mulch soil before hand or machine thinning.

Harrow with wheels gives better control of thinning and weeding action.



The finger weeder can be used as a crust breaker, weeder, and beet thinner.

John Deere Rotary hoes, fit on cultivator tool bar. They give excellent crust control when used with guage wheels to control depth of the steel fingers.



For Better "Stands" This Spring—Switch to Decorticated Seed

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