

THESIS

COMMERCIAL POTATO CULTURE

IN

WASHINGTON

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MASTER OF HORTICULTURE

1909.

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Potatoes

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THESIS

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I N T R O D U C T I O N .

The peculiar climate and soil conditions of Washington are especially favorable for the production of potatoes. In many large sections the atmosphere is so dry during the growing period that it furnishes unfavorable conditions for the development of fungous diseases on the foliage, nor have we in this State the Colorado beetle, (potato bug), which is so destructive east of the Rocky Mountains and annually necessitates the expenditure of large sums of money for spraying.

There is little danger of overstocking the potato market here. The Eastern demand for Washington-grown potatoes is good and in the past has rarely allowed the price to fall below ten dollars per ton in car lots. In addition to this there is a rapidly increasing market for our potatoes in Alaska and at home. There is, however, no crop now grown in Washington which shows greater variation in yield per acre than the potato. This is largely because of the erroneous idea that potatoes as a crop do not need much attention. Many farmers give time and care to the potato crop only when there is nothing else to be done, and as a result the potato is neglected. This crop responds to good culture to a greater degree than any other, and the grower who exercises proper care with his potatoes is always repaid in yield and quality.

There are thousands of acres of land now devoted to summer-fallow which might produce good crops of potatoes with very little additional expense, and yet leave the soil in better condition for wheat than it is under the present methods of summer-fallowing. The average cost of producing potatoes in Eastern Washington is a little less than five dollars per ton. The plowing and harrowing which would have to be done on the summer-fallow land if potatoes were not grown is included in the cost. Therefore, the potatoes grown in the place of summer-fallow can be sold for a very low price and still leave a good balance. If the market remains as high as it has been for many years a net profit of fifteen to twenty dollars from what would otherwise be idle land can easily be secured.

Men are constantly coming into the State to engage in agriculture, and this bulletin is written to meet the great call for information on potato culture by such men and by older residents of the State who wish to add potatoes to their list of crops. The experienced grower also may find some valuable suggestions in the discussion.

In addition to the results of experiments with potatoes for the past three years on the Experiment Station Farm, this bulletin contains much information gleaned by the author from many of the best potato growers of this State and the large potato growing sections of the State of Michigan.

CLIMATE

Climate is one of the greatest factors to be taken into consideration in the commercial production of potatoes. Other things being equal, potatoes can be raised with less expense per acre in a climate where most of the precipitation of moisture comes in the late fall, winter and early spring months than in climates where rains are expected weekly during a large part of the growing season. This is especially true of soils naturally retentive of moisture. Large areas of Eastern Washington have just such climate and soil. Once a good surface mulch is established to conserve moisture, no further cultivation is necessary, except where weeds are bad, until a rain destroys the mulch. This mulch can usually be established with a harrow, and very little cultivation is necessary. The weed seeds that germinate early in the season are usually killed with the harrow, and few seeds will germinate later in the surface soil, provided no summer rains come to moisten the mulch.

In all cases the harrow or cultivator should be used as soon after rains as the soil will permit, to conserve moisture and kill weeds. In humid summer climates this is about once a week. The writer has seen potatoes on good soil in a climate where rain was expected every week until August suffer from drouth in late summer more than in Eastern Washington, where the rainfall is seldom above twenty inches. This is due to the fact that where rain comes so frequently, the best of farmers fail to cultivate

after each rain, and when the dry spell does come the soil is not in the proper physical condition to hold sufficient moisture to tide over the dry spell, and the crop suffers as a result. Whereas, in many parts of Washington the farmer knows that he must depend upon the moisture already in the soil at the beginning of the growing period, and he sees to it that the soil is put into the condition to retain as much moisture as possible. The moisture is retained by establishing and maintaining a soil mulch. The Washington farmer gets few showers to destroy the mulch; therefore, the expense of cultivation is small and the supply of moisture is more uniform than it is where summer rains are frequent. It is apparent, then, that light rains during the growing season are expensive to the potato-grower in semi-arid climates. The moisture from a light rain is not sufficient to soak down through the surface mulch to get to the roots, but from the establishment of capillary action it necessitates the expense of cultivating to re-establish the proper mulch.

The solid portion of potatoes is mostly starch. Starch is made in the green leaves, and only in the presence of light. In climates where the days are long and bright we have the ideal condition for the formation of starch. We have just such weather in a large part of Washington. The long, bright, dry days are favorable to the growth of potatoes and unfavorable to the development of most of the worst diseases. This not only favors the yield, but saves the great expense of spraying, which is absolutely essential to success with potatoes in most humid summer climates.

Soil

The selection of soil is a very important matter in growing potatoes. A deep, friable, mellow loam, rich in humus and well drained, is the ideal soil for potatoes. One hundred and three varieties grown on the Experiment Station farm gave much larger yields on clay loam than on soil containing a larger percentage of clay, regardless of year, and only ten varieties gave a slightly increased yield on clay soil over clay loam soil. No sandy soil was available for experimental purposes. Heavier soils may give good results by the incorporation of manure, or better by plowing under clover, or alfalfa sod. If the soil has a tendency to pack, the tubers are restricted in their growth and are often misshaped. Supplying humus to such soils not only makes them friable, but increases their water-holding capacity. The soil should, at all events, be in a good physical condition. Potatoes should not follow potatoes because so many of the potato diseases live over in the soil.

In the "Palouse Country" the north hill slopes and valleys are especially adapted to potato culture because the soil is lighter, richer, and more retentive of moisture than on either the south or southwest slopes.

Light soils can be worked earlier in the spring than clay soils and it takes less labor to put them in proper tilth. Potatoes grown on light, well-drained soils mature earlier and keep longer than those grown on stiff clay soil. Early potatoes should be planted on light soil with a warm exposure.

Fertilizers

With the exception of a few growers on high-priced land, near cities, the need of commercial fertilizers for the potato crop has not been felt in the State. If the farm manures are properly handled, commercial fertilizers will be unnecessary for years, and the writer is tempted to say, for generations. Commercial fertilizers may increase the yield, but in most places it is doubtful whether the increased yield would more than pay for the cost of fertilizers. We have so much land in the State adapted to potato growing that it is more profitable to increase the acreage than to purchase fertilizers.

It is almost impossible to supply too much humus to the potato soil. Humus increases the water-holding capacity and improves the texture of the soil, and therefore favors the growth of the plant and tubers. Manure is one of the best sources of material to make humus. Barnyard manure may be applied in almost unlimited quantities, provided the manure is "short" and is thoroughly worked into the soil. Coarse, fresh-made manure may be applied in small quantities, but if applied in large quantities it makes the soil too loose and consequently unretentive of moisture. Caution is urged, however, in the use of very fresh manure; fresh horse manure favors the development of potato scab. Humus may also be secured by plowing under a good green crop of oats, peas, rye, alfalfa, or clover sod.

PREPARATION OF THE SOIL

and

SUBSEQUENT TREATMENT

In order to catch and hold the winter precipitation and to allow the soil to be acted upon by the elements, plowing should be done in the fall and left rough all winter. This is especially important in semi-arid climates. The sub-surface soil has time to settle, and the surface can be worked earlier than if left to be plowed in the spring. On heavy clay soils this settling may be undesirable; in such soils disking in the fall and plowing in the spring is better than fall plowing. In most cases, deep plowing (8 to 12 inches) gives better results than shallow plowing, but if the land has been plowed shallow in the past, it is not advisable to put the plow down more than one or two inches deeper than in the previous year, unless the plowing is done so early in the fall that the newly turned-up soil will be exposed to the action of frost, etc., for a few months before the field is planted.

When spring plowing is practiced, the surface soil should be worked as soon after plowing as possible, to prevent the loss of moisture. In light soils--and all kinds of soil in semi-arid sections--some kind of sub-surface packer should follow the plow to firm the sub-surface. This should immediately be followed by a harrow, to work up a surface mulch. When the soil plows up cloddy, a plank clod smasher

should be used and followed with the harrow. When the soil cannot be plowed in the fall, it is a good plan to disk the land in the fall, so that the surface will be left rough to catch and hold the winter precipitation of moisture.

Fall-plowed ground should be well harrowed as early in the spring as the soil will permit. If not immediately planted, it should be harrowed at frequent intervals. This will conserve the moisture and kill all the weeds that start after the first harrowing. Some successful farmers harrow immediately before and after planting. Other equally successful farmers do not harrow just before planting, but thoroughly harrow after planting, and again, once or more, at intervals of a week or ten days. A spring tooth harrow, so provided with shoes or wheels that the depth can be regulated, or one of the outting or "scuffle" type harrows, is the best for harrowing before the plants reach the surface. While the plants are coming up and until they are four or five inches high, a spike tooth harrow can be used. Where weeds are not bad and no rains come to destroy the mulch, very good crops have been obtained without further cultivation. The dust mulch made with the harrow should be maintained, however, until almost time for the tubers to mature. To do this the field should be well cultivated after every shower, as soon as the surface is dry enough to permit. The harrowing will kill all weed seeds that germinate early, and in many cases there is no further trouble. But where weeds are bad they should be removed even if hand labor is required.

The main object of summer cultivation is to prevent the

soil from crusting or baking and to conserve moisture. This is accomplished by removing the weeds and maintaining a dry mulch on the surface.

Hilling

Very few farmers east of the Cascade Mountains practice hilling to any appreciable extent, but west of the mountains it is commonly practiced. Experience of farmers and careful experiments by many of the Experiment Stations teach that hilling to any appreciable extent is a poor practice, except where the soil is poorly drained, or where a water table is but a few inches below the surface. Hilling is usually done about the time that the tubers are "setting". To get the soil thrown up against the plants the plow must go deep. This deep plowing breaks quite a large number of feeding roots at the critical stage of growth. It not only checks the growth by root pruning, but it exposes more evaporating surface, and the moisture is taken from the soil when it is most needed by the plants.

Field after field of potatoes west of the Cascade Mountains suffers for the want of moisture some time during the season almost every year. A number of the owners of such fields were asked why they hilled their potatoes so much. Without an exception they said that they had to hill to keep the potatoes from sunburning. They had not tried any other method of overcoming the difficulty. Other potato-growing regions are now practicing the level culture method, after the hilling method was practiced for several years.

It is true that potatoes often do force themselves above the surface of the soil and are ruined for table use by the sun; but a large proportion of that loss can be eliminated by practicing deeper and closer planting. When the hills are closer together there are not so many large potatoes in a hill, and therefore they are not forced out of the ground. An individual hill will not produce so many pounds of marketable tubers under close planting as when the hills are at a greater distance, but the yield will be just as heavy on account of the larger number of hills on the same area.

Mulching

Some people advocate mulching with hay, straw, manure, or other litter, to take the place of cultivating, but it is generally cheaper to maintain a soil mulch by frequent cultivation than it is to apply litter. The mulched potatoes at the Experiment Station farm yielded the same as those cultivated. The straw mulch was spread over the whole surface at the time of planting. Other stations report increased yields by mulching, over cultivation, but in nearly all cases they advocate placing the mulch between the rows after the potatoes are up, which is no doubt the best time.

P L A N T I N G

Time to Plant

The best time to plant potatoes depends upon the climate. The potato plant should have ample moisture when the tubers are "setting"; therefore, the grower should plan to have his plants reach that stage of development when the soil is likely to have plenty of moisture. In places where summer rains cannot be depended upon and where irrigation is not practiced, the earlier the potatoes are planted, the better, provided there is no danger from late frosts. Our experience at the Experiment Station teaches us that it pays to plant the late maturing varieties quite early, as well as the early maturing varieties.

Distances Apart

The distance between rows and hills in the row is one of the important points in potato culture. No one particular distance will apply for all conditions and we find that practice throughout the State varies considerably. Some farmers plant in hills thirty-two by thirty-two inches so that they can be cultivated both ways. Others plant in drills twenty-eight to forty-eight inches apart, the plants being from ten to twenty-four inches apart in the row. The variety of potatoes and the fertility of the soil should determine the distances. Vigorous-growing varieties require more space

than those having small vines. Soil will admit of close planting in proportion to its fertility, amount of moisture, and care given. On soils where the tubers have the tendency to grow very large, it is best to plant close. When potatoes are grown on high-priced land, intensive culture should be practiced and the rows and hills planted as closely as the fertility of the land will permit. Increasing the size of the "seed" pieces will give the same results as decreasing the space between the plants, but it increases the number of sunburned tubers.

Methods of Planting

There are innumerable methods of getting the seed into the ground. One cheap way, but not a very desirable one, is to drop the seed into every second or every third furrow when plowing. Another rather common method is to prepare the soil in the ordinary way and then open up a furrow with a single shovel plow or "lister", deep enough to drop the potatoes into. Some farmers use a common breaking plow instead of the single shovel. After the seed is dropped by hand the furrow may be filled in several ways. Covering entirely with the hoe is too expensive. A little soil may be pulled over each piece with a hoe, however, and then the rest replaced by a spring tooth harrow. Instead of using the hoe, a plow or "lister" is sometimes used to turn the soil back into the furrow. If the person who drops the potatoes presses the pieces down into the furrow by stepping on them, it is not necessary to use the hoe or plow before the harrow in covering. The horse-hoe and the

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potato coverer are good tools to cover potatoes in furrows. When the horse-hoe is used the small shovels are removed and the "winged" shovels arranged to throw the soil toward the center.

Hand Planters. There are several good hand planters on the market. When hand planters are used the soil should be marked one way or in check rows, in advance of planting.

Horse Planters. There are also several horse planters to be had, and most of them give good satisfaction. No farmer who plants six or more acres each year can afford to be without a horse planter. They do the work not only more rapidly and cheaply, but more satisfactorily. Most of them are simple in their construction and are easy to handle. There are two general types of horse planters: 1st, the automatic feed, which is very satisfactory, requiring but one man to operate; 2nd, the hand feed type, which requires two men to operate but drops a potato in every hill. Where land is cheap and labor high, the first type is best, but where land is high the hand feed is the most satisfactory.

Depth to Plant

The depth to plant should depend upon the soil and variety, early, or late. Five inches is none too deep for late potatoes, on light mellow soils, but for early potatoes on any kind of soil or late potatoes on heavy soils, the depth should be decreased.

At the time for early planting the soil five inches from the surface is likely to be cold and wet. If cut potatoes are placed deep in such soil they either decay or

• 1. The first part of the text describes the general situation of the country and the people who live there. It mentions the climate, the land, the people and the history of the country. It also mentions the language and the religion of the people.

• 2. The second part of the text describes the social and economic situation of the country. It mentions the education, the health, the employment and the income of the people. It also mentions the infrastructure and the services of the country.

• 3. The third part of the text describes the political situation of the country. It mentions the government, the parliament and the elections. It also mentions the constitution and the laws of the country.

• 4. The fourth part of the text describes the cultural situation of the country. It mentions the art, the music, the literature and the traditions of the people. It also mentions the festivals and the holidays of the country.

• 5. The fifth part of the text describes the environmental situation of the country. It mentions the forests, the water and the air quality. It also mentions the climate change and the environmental protection of the country.

• 6. The sixth part of the text describes the international relations of the country. It mentions the diplomacy, the trade and the cooperation with other countries. It also mentions the international organizations and the global issues of the country.

• 7. The seventh part of the text describes the future prospects of the country. It mentions the development, the growth and the prosperity of the country. It also mentions the challenges and the opportunities of the country.

• 8. The eighth part of the text describes the conclusion of the text. It mentions the summary of the text and the main points of the text. It also mentions the key words and the references of the text.



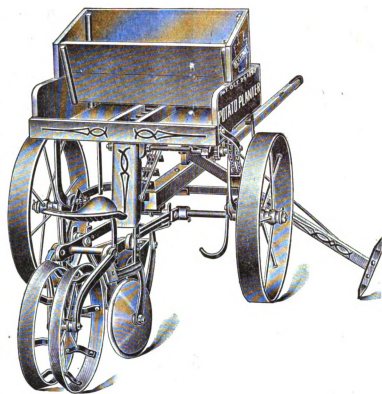
Hand Planters.



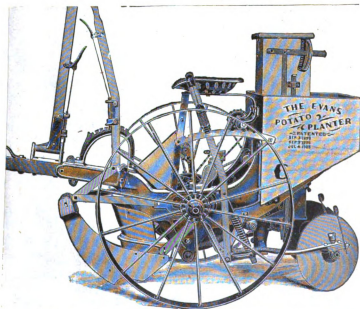
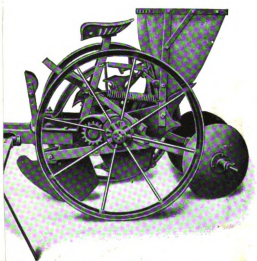
Bed of Knives



Potato Cutters.



Type of Hand Dropping Planter.



Automatic Planters.

come up slowly. To overcome this difficulty, in the western part of the State some growers plant only whole tubers. This is a good practice, provided the medium to small potatoes are selected from the best hills for seed.

If the soil is mellow and the pieces contain enough food to push the plants above ground, better results are obtained from deep planting. This is true because the tubers are underground stems developed from buds in the axils of the undeveloped leaves under ground. By increasing the leaf-bearing surface underground, the chance for a larger number of tubers per plant is increased. Other things being equal, deep planting will give the desired results. When potatoes are planted deep, the tubers are borne down into the soil farther than when shallow planting is practiced. This decreases the number of sunburned tubers but it increases to some extent the cost of digging.

Where farmers have difficulty in getting a good stand by deep planting in moist soil, the trouble can be overcome by placing the seed in a trench four or five inches deep and covering only one or two inches. In a week or ten days they can be more deeply covered by harrowing crosswise. This will allow the soil to warm and dry sufficiently to prevent decay, and it hastens growth.

S E E D

Amount of Seed

The amount of seed per acre depends upon the size of the seed and distance of planting. The amount used by different farmers in the State varies from 150 to 1000 pounds per acre. It is right that there should be quite a variation in the amount of seed used, because fertile land well supplied with moisture should receive more seed than poor soil lacking in moisture. On land where potatoes have the tendency to grow too large it is best either to plant the hills closer or to put in larger cuttings, both of which increase the amount of seed per acre.

Table of Pounds of Seed per Acre
at Different Distances,
When Pieces Weigh One Ounce Each.

<u>Inches between Rows</u>	<u>Inches between Hills in Row</u>	<u>Pounds per Acre</u>		<u>Inches between Rows</u>	<u>Inches between Hills in Row</u>	<u>Pounds per Acre</u>
24	12	1361	'	36	20	545
24	15	1089	'	36	24	454
24	18	908	'	36	36	303
24	20	823	'	42	10	934
24	24	681	'	42	12	778
30	10	1307	'	42	15	622
30	12	1089	'	42	18	519
30	15	871	'	42	20	467
30	18	726	'	48	10	817
30	20	654	'	48	12	681
36	10	1089	'	48	15	545
36	12	908	'	48	18	454
36	15	726	'	48	24	340
36	18	605	'	--	--	---

1. The first part of the document is a letter from the author to the reader, explaining the purpose of the study and the methods used. The author states that the study is a qualitative investigation into the experiences of young people who have been involved in the criminal justice system. The methods used are semi-structured interviews and focus groups. The author also mentions that the study is part of a larger project funded by the Home Office.

2. The second part of the document is a literature review, which discusses the existing research on the experiences of young people in the criminal justice system. The author identifies a gap in the literature, which is the need for more research on the experiences of young people who have been involved in the criminal justice system. The author also discusses the importance of understanding the experiences of young people in the criminal justice system, as this can help to inform policy and practice.

3. The third part of the document is the methodology, which describes the methods used in the study. The author explains that the study is a qualitative investigation, and that the methods used are semi-structured interviews and focus groups. The author also describes the sampling strategy, which is purposive sampling, and the data collection process, which involves conducting interviews and focus groups with young people who have been involved in the criminal justice system.

4. The fourth part of the document is the results, which presents the findings of the study. The author identifies several themes that emerged from the data, including the experiences of young people who have been involved in the criminal justice system, the impact of the criminal justice system on young people, and the need for more support for young people who have been involved in the criminal justice system. The author also discusses the implications of the findings for policy and practice.

5. The fifth part of the document is the conclusion, which summarizes the findings of the study and discusses the implications for policy and practice. The author concludes that the study has identified several themes that emerged from the data, and that these themes have implications for policy and practice. The author also discusses the limitations of the study and suggests areas for further research.

6. The sixth part of the document is a list of references, which includes the following references:

- 1. Home Office (2005) *Young People and the Criminal Justice System*. London: Home Office.
- 2. Ministry of Justice (2006) *Young People in the Criminal Justice System*. London: Ministry of Justice.
- 3. Smith, J. (2007) *The Experiences of Young People in the Criminal Justice System*. London: Routledge.
- 4. Brown, A. (2008) *The Impact of the Criminal Justice System on Young People*. London: Palgrave Macmillan.
- 5. White, C. (2009) *The Need for More Support for Young People who have been involved in the Criminal Justice System*. London: Palgrave Macmillan.

7. The seventh part of the document is a list of appendices, which includes the following appendices:

- 1. Appendix 1: Interview Schedule
- 2. Appendix 2: Focus Group Schedule
- 3. Appendix 3: Data Collection Process
- 4. Appendix 4: Ethical Approval

8. The eighth part of the document is a list of acknowledgements, which includes the following acknowledgements:

- 1. The author would like to thank the Home Office for funding the study.
- 2. The author would like to thank the young people who participated in the study.
- 3. The author would like to thank the research assistants who helped with the study.

9. The ninth part of the document is a list of declarations of interest, which includes the following declarations of interest:

- 1. The author has no conflicts of interest.

Note:--The foregoing table will aid the farmer to determine how large to cut each piece, when the amount of seed per acre and the distances apart are determined. For example, a farmer wishes to plant about 600 pounds per acre and have the hills thirty-six by eighteen inches apart. The table shows that each piece should weigh one ounce. If the distances and size of seed piece are determined, the amount of seed can be ascertained by the table.

Number of Eyes

Frequently people ask how many "eyes" to a piece give the best results. If a piece weighing two ounces has one good eye it may produce one to three plants, more or less branched, depending upon the variety. Another piece of the same size, having more eyes, may not produce any more plants. One bud may start earlier than the others and the food may be transferred to that bud. If the plants require quite a little food to push up to the light the other buds will not receive enough food to give them a start, and therefore there are no more plants from the piece with two or more eyes than from that of equal size with one eye. If the piece containing two or more eyes be larger than the other with one eye, then there will be more plants resulting from the former than from the latter.

Therefore, it does not make much difference how many eyes there are to a piece, provided the pieces are of equal size. At any rate, there is not enough difference in results to pay for the extra labor required to cut to a certain number of eyes.

TREATMENT OF SEED PREVIOUS TO PLANTING

When potatoes are stored in a damp warm place they send out long white sprouts which consume the plant food. These sprouts are tender and are rubbed off by handling, and as a result the seed is injured more or less, the amount depending upon the length of the sprouts. The growth of sprouts can be largely prevented by storing the tubers in a dry, cool place.

Sprouting

In communities where late frosts are not troublesome, early potatoes can be had a week or ten days earlier by allowing the potatoes to sprout in the light and then planting without rubbing off the sprouts. When potatoes sprout in the light, instead of getting weak, long, white sprouts we get short, broad, green sprouts with roots started, ready to penetrate the soil when they are planted. The sprouts have a good start when the soil is ready to receive them; therefore, the plants should be earlier. Larger yields as well as earlier tubers have been reported when this has been practiced. The increase in yield is due to the fact that there is often more tuber-bearing surface on plants resulting from seed sprouted in the light.

Examination of the short, green sprout will show a number of scales or rudimentary leaves, close together, and

it is from the axils of these scales that the tuber-bearing branches are produced. "If the tubers start growth in the dark, either indoors or below ground, the scales are found at longer intervals and there are correspondingly fewer places for the production of tuber-bearing branches." Other things being equal, increasing the tuber-bearing surface will increase the number of tubers.

Bright light or sunlight does not hurt potatoes for seed, so the best way to get the short green healthy sprouts is to spread the tubers out on the grass two or three weeks before planting, or if there is danger from frost, on a barn floor where they can get plenty of light. Some growers of early potatoes in the East have shallow boxes, made to hold one layer of tubers, and these flats can be placed in any well lighted place after they are filled.

Treatment for Scab

When the seed shows any trace of scab it should be treated with a solution of Formalin:

Formalin	1 pound
Water	30 gallons

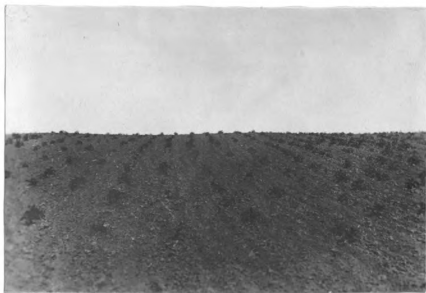
Soak the potatoes two hours in this solution before cutting. All sacks and other receptacles should be treated with the solution to protect the tubers from re-infection. Plant only on land free of the disease.

Causes for Poor Stand

Frequently only a part of the potatoes come up. This may be due to one or more of several unfavorable



Fifty Acres of Potatoes in "Palouse Country".



Poor Stand, due to planting too shallow in dry soil. This photograph was taken the same day as the above, in the same township.

conditions; viz., heated seed, chilled seed, diseased seed, planting too deep in wet, cold soil, and not planting at a uniform depth in dry soil.

I. Very often a poor stand is due to the seed and not to the soil conditions. Farmers frequently cut the seed a few days in advance of planting and put it into sacks or place in piles. When this is practiced the seed is sure to heat in a few hours and the per cent. of injured pieces is in proportion to the length of time that the seed is left in the piles or sacks. If the heating be very marked, the seed will show the effects of it, but if it is slight and of short duration it can readily escape the eye and the farmer thinks that he is planting perfect seed. The results, however, are not satisfactory. Even if the heating be slight, it is likely to affect the stand, because the fermentation, though slight, has started fungous growth, which may continue to develop after planting and so weaken the young plant that it is unable to reach the surface. Cut seed should never be allowed to remain in large piles or sacks over six hours.

Many farmers have good results by cutting the seed and spreading it out in a dry place for a week or more, to allow the cut portion to "sear over". Land plaster (Gypsum) is sometimes sifted on the cut potatoes. There is no serious objection to the above method, provided the seed does not shrivel too much and the soil is in good condition to receive it. However, results just as good can be secured by planting freshly cut seed.

II. Poor stands may be due to diseased seed. The

three diseases, Rhizoctonia (*Corticium vagum*.var.*solani*), Dry Rot (*Fusarium oxysporium*), and Brown Rot (*Bacillus solanacearum*), are found especially in irrigated sections and in the low lands west of the Cascade Mountains. These diseases live over from one season to another on the tubers and in the soil.

III. When cut seed is planted early in wet cold soil, a poor stand is often the result. (See page 13).

IV. The potato growers in Eastern Washington frequently fail to get a good stand by reason of late planting and a failure to get all the seed down to moist soil. A horse planter will usually give better results than hand planting, under these circumstances, because it places the seed at a uniform depth and the furrow is not exposed to the drying effects of the wind and sun. If the surface soil be dry and lumpy, the coverer on the planter rakes the dry clods onto the seed. This can be remedied by harrowing immediately after planting. Where the land is very lumpy the roller should be used, followed by the harrow.

If all the above conditions are avoided a good stand is assured.

H A R V E S T I N G

Where there is a market for early varieties, digging usually begins while the tops are green. Care should be exercised in digging and handling to avoid bruising. Late varieties should be fully ripe before digging, after which any convenient time will answer previous to very wet or severely frosty weather.

On account of the prevailing scarcity of help throughout the State, the problem of harvesting the crop is one which calls for the most careful consideration on the part of the grower. The potato digging machinery has been so perfected in recent years that there is no doubt in the writer's mind that it will pay every farmer who grows six or more acres a year to own some kind of horse digger. Two or three neighbors may purchase one together. There are growers who say that they would not think of growing potatoes without an elevator digger, any more than they would raise wheat without a binder or a header. There are, however, conditions under which hand digging is preferable.

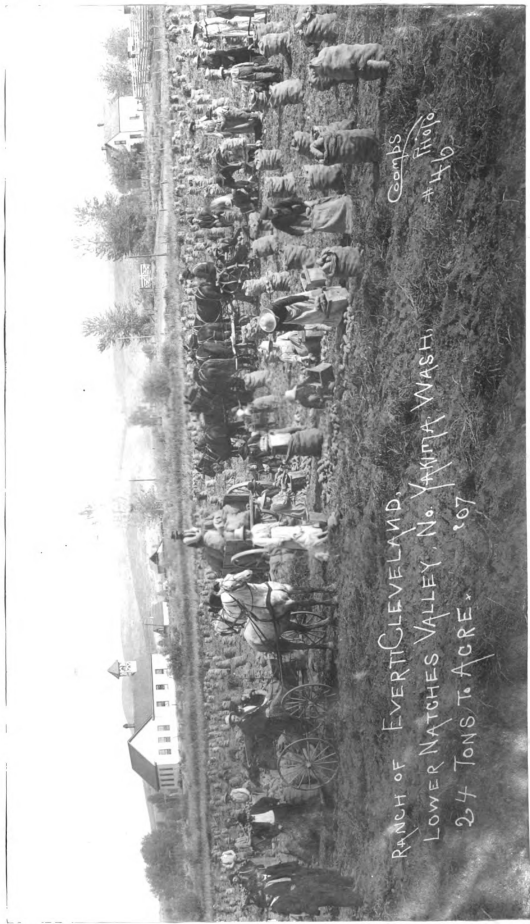
Methods of Harvesting

There are several methods of harvesting practiced in the State, which are described as follows:

By Hand. The potato fork and the potato hook are both used quite extensively for digging potatoes. Some farmers use the former exclusively and others the latter. Those who use the hooks prefer those with long handles and long tines. Most farmers throw the potatoes from two rows into one "windrow", which makes the work of picking up easier. Others pick up each hill as it is dug. Many of the Chinese and Japanese growers west of the Cascade Mountains prefer the latter method. Two men take three baskets, the first to receive the marketable tubers, the second the smooth tubers a little below salable size out of the best hills, for seed, and the third the balance. As soon as a basket is filled it is emptied into a sack. Many who practice this method claim that they can dig and pick up more and do it easier than they can the other way and the potatoes are never allowed to remain on the ground to be injured by the weather.

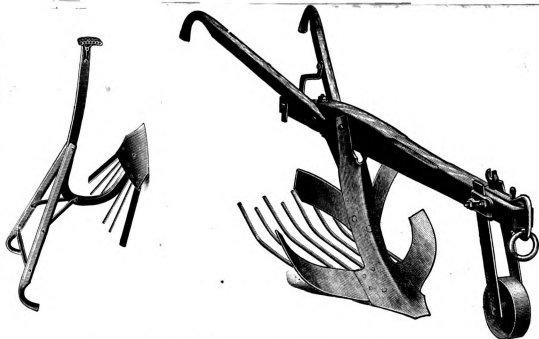
By Horse Diggers. A few farmers use the single shovel plow to bring the potatoes to the surface. It is not a satisfactory digger, as many of the potatoes are left in the ground, and this tool should not be used except when labor is high, potatoes cheap, and a better machine cannot be had. A common breaking plow is occasionally used but it has the same objection as the single shovel.

There are a number of horse diggers used in the State which give good results. The cheapest type is simply made, like a double mould-board plow with iron rods projecting backward from the mould-board, to help separate

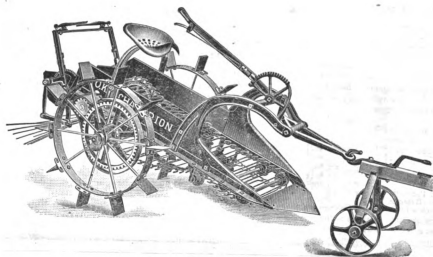


RANCH OF EVERT CLEVELAND.
LOWER NATCHES VALLEY No. 14111A WASH.
24 TONS TO ACRE. '07

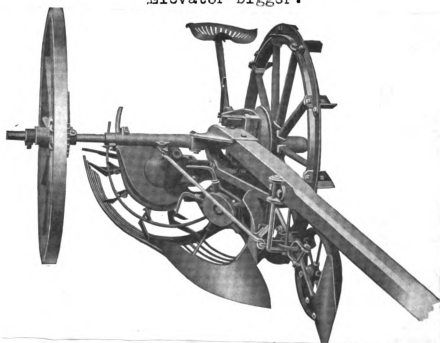
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Cheap Simple Types of Diggers.



Elevator Digger.



Rotary Digger.

the tubers from the soil. The so-called rotary digger separates the potatoes from the soil by a combination of rotary movements, inverting the hills and spreading the tubers laterally to the side of the machine. The third type is known as the elevator digger. This type has an endless chain of rods, etc., which carry the earth and potatoes backward and upward from the shovel. The endless chain shakes the soil out and the potatoes pass out over the back onto the soft ground. Some machines of this type have sacker or loader attachments. These attachments do not work very satisfactorily as there are always stones, sticks, clods or other undesirable things which go into the sacks. This objection may not hold when a grader is used. Four horses and one man can dig from four to six acres in ten hours with an elevator digger.

Local dealers can usually get any of the above machines, but in case they are not to be had locally the firms named on page 77 can furnish them.

Handling and Storing

Picking up. After the tubers are brought to the surface they should be handled as little as possible. Any extra handling not only is expensive but bruises the tender skin and injures the keeping quality. At present most of the Washington potato crop is handled in sacks. A few farmers are using the bushel crate.

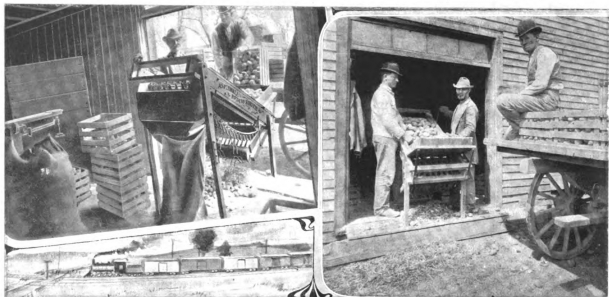
In picking up, some farmers scatter the sacks out along the rows where most convenient for the pickers, and

some require each picker to take a sack of sacks (about 20 in number) and when he gets his basket full (about one bushel), to take out one sack and throw the remainder ahead to where the next sack will be needed. He empties two baskets into the sack, which should completely fill it; and when he gets the third basket filled he finds himself at his sacks again, and so on until his sack of sacks is empty. The teamsters who are hauling from the field are supposed to drop these sacks at the most convenient places for the pickers. The sacks are settled well and sewed up tight, to minimize rubbing.

The average day's work for the common run of pickers is sixty sacks when the yield is good. Plenty of good pickers will pick ninety sacks per day when paid by the sack. I know of one farmer in the State who picked and sacked one hundred sacks in ten hours.

The writer believes that when sacks are less used for wheat, a large proportion of the farmers will use bushel crates for picking up the potatoes and that they will be shipped in bulk, instead of in sacks. The first cost of crates is very little more than for sacks, and if properly cared for they will last for years. They are handy to use in the field and are easily loaded onto a platform wagon.

Grading. The Washington grower should pay more attention to the matter of grading. The retailer wishes to display tubers uniform in size, shape and color, and he is



Potato Graders.

willing to pay extra to get them. A number of buyers and commission men were consulted on the subject, and all said that potatoes frequently come to them of all sizes, shapes and colors in one sack and they can pay only a low price for them. When proper care is given to the selection of seed and the rotation of crops, there is no trouble with mixed colors. The grading for size and shape can usually be done when the potatoes are picked up. If the laborer cannot be depended upon to do this, a grader should surely be used. There are several graders on the market which do satisfactory work.

For the high-class home market it pays to grade carefully and wash and pack early potatoes into boxes. The extra returns will more than pay the expense of putting them up in good condition.

Storing. Potatoes are successfully stored in several ways. One common method is to level off a space in a well-drained place and pile the potatoes on the surface in cone-shaped piles, eight or ten feet in diameter and three feet high, or in long piles six or eight feet wide. These pits are immediately covered with a little straw and enough soil to keep the straw on and the light and frost out. As the weather gets colder, more soil is thrown on. If the potatoes are covered deeply without ventilation soon after digging, they are likely to heat and decay. Ventilation for a week or ten days is sufficient, provided the weather remains cool.

Any cool, frost-proof cellar or root-house is suitable for the storage of potatoes. Most root-houses can be kept cool if proper ventilation is provided. If the storage is too warm early in the season, it can be remedied by opening the doors and ventilators at night and closing them in the morning.

POTATOES AS A SUBSTITUTE FOR SUMMER-FALLOW

Summer-fallowing is practiced to greater or less extent in every wheat-growing district in the State, and in some sections from one-fourth to one-half of the land is idle in this way every year. In the past, farmers have made good profits by the summer-fallow method, but the time is fast approaching when the farmers will have to stop this practice or go out of business. Cultivated crops, such as corn, peas, beans and potatoes, can be grown at a good profit on land now devoted to summer-fallow, and yet leave the soil in better condition for wheat than it is under the present methods of summer-fallowing.

Summer-fallowing is practiced to allow the plant food to become available, to improve the physical condition of the soil, to destroy weeds, etc. In soils devoid of vegetation, bacterial action takes place so rapidly that more plant food is liberated than is necessary for the succeeding wheat crop. This is especially true of nitrogen, the most expensive plant food. From three to six times as much nitrogen is liberated on summer-fallows as is necessary to mature the wheat crop. The excess available nitrogen either passes off into the air in the form of gas or is washed away. This is a

great loss, which will be noticeable in subsequent years.

Now, if a cultivated crop is grown on the land, the weeds are destroyed, the physical condition of the soil is improved, and the plant takes up the excess available plant food that would otherwise be lost if allowed to be in summer-fallow. When the potato crop is removed there is just as much or a little more moisture in the soil as there is in the average summer-fallow. Farmers reporting to me, who have practiced planting potatoes on wheat land, instead of summer-fallowing, have not mentioned any decrease in yields compared with the summer-fallow method. Therefore, all the objects sought by the summer-fallow are accomplished by the cultivated crop.

On account of the scarcity of labor, the wheat farmer in order to grow potatoes successfully to any great extent on summer-fallow land must have, or be able to get, in addition to his farm machinery, a good potato planter and a horse digger. He should also have a potato cutter and a one or two horse cultivator. With this extra equipment the farmer can utilize a part of the land now idle and make a good profit, with very little extra help. One wheat farmer says that the labor problem has been solved with him since he began to grow a large quantity of potatoes. As soon as his spring wheat is sown he starts his men to preparing the soil for and planting potatoes. By the time the early wheat is ready to harvest, the potatoes have received about all the necessary

cultivation. When the wheat harvest is over the digger is started in the potato field. Before all the potatoes are dug the wheat drill is started in where the potato digger commenced and by the time all the potatoes are harvested the patch is sown to fall wheat. The men are sure of continuous employment for a number of months and are therefore willing to stay for smaller wages than it would be possible to get help for just the harvest season.

It is not necessary to put on more labor in preparing the soil for potatoes on wheat land than it is for a good summer-fallow, though larger yields may be secured by doing so. A large percentage of cultivation can be done with the harrow, and if the soil is not too "foul" hoeing is not necessary. The difference between the receipts of the potato crop and the extra cost of production above the cost of summer-fallow is clear profit.

POTATOES UNDER IRRIGATION

Enormous yields of potatoes have been secured under irrigation, but the cultivation is attended with difficulties. No other crop is so much dependent upon the skillful use of artificial water. Winter irrigation is practiced successfully by some farmers. The fields are flooded before plowing and allowed to dry to a tillable condition. This treatment insures perfect condition of the soil for working and for the first growth of the plants. The ordinary methods of cultivation, as given, may then be followed, without further addition of water, until about the time the plants bloom. If the soil becomes dry before this stage of development is reached, water may be supplied. When the plants are in blossom the tubers are usually set, and it is then that an abundance of water is needed to give them good growth. After the water is once applied to the soil, it should not be allowed to become dry again until time for the crop to mature. If the soil is allowed to become dry at any time after the first application of water and a subsequent irrigation is then given, the tubers are sure to make a second growth and become knobby. Water should not be applied too late in the season, or the potatoes will not ripen properly. In all application of irrigation water,

care must be taken to avoid bringing it into direct contact with the growing tubers, as under such conditions the tendency to scab is increased.

If winter irrigation is not practiced, the first water should be applied immediately after the seed is planted. Irrigated potatoes should be hilled, and the water applied between the rows. In ordinary soil, water applied in the middle of rows three feet apart satisfies the requirements of the growing potatoes. The cultivator should follow each application of water.

"Sub-irrigated" lands, when not too wet or too strong with alkali, are most satisfactory for raising potatoes. There are some localities where soils receive just enough seepage from irrigation ditches or other water supplies to keep in moist, friable condition throughout the season. These, with frequent shallow cultivation, produce the finest, smoothest tubers, with the least trouble and expense. To produce uniform moisture conditions in the soil is the secret of successful irrigation, and this is the absolutely essential condition for the most profitable potato growing under irrigation.

V A R I E T Y

The reader should be impressed with the fact that there are strains of varieties, which differ in their characteristics--especially yield--as much or more than do named varieties. Many named varieties may possess more characteristics in common than do two strains of one named variety. Two men may purchase a perfectly uniform variety of potatoes from a third party. The first man practices the very best methods of culture and seed selection year after year; the second man does not select his seed properly and neglects his crop. In a few years, seed is purchased from both men. The seed from the former gives good satisfaction, but the seed from the latter is disappointing. The potatoes bear the same name but the former is superior to the latter. The mere change of seed from one farm or community to another farm or community is of no value. One man who grew 120 acres of potatoes in 1907 made a serious mistake. He had been growing the "Burbank" successfully but he heard of the large yields of a strain of the Burbank in another section of the State, so he bought, paying a good price, a number of sacks from that section without knowing their history. He planted them in a large field alongside of Burbank seed from his own farm. The soil conditions were

uniform and both received the same treatment. When the writer visited the patch in August, the poor stand and uneven size on the part seeded with imported seed were in marked contrast with the good even stand on the part seeded with home-grown seed. From outward appearance the marketable tubers from both parts of the field were identical, but the yield from the imported seed was much lower.

When selecting a variety one should take into consideration the following characteristics:

1. Season; new tubers early or late, mature early or late (See note below).
2. Yield.
3. Tubers.
 - (a) Size; large, medium or small.
 - (b) Shape; round, oblong, flattened, elongated, regular or irregular.
 - (c) Color.
 - (d) Eyes; large or small, deep or shallow, conspicuous or inconspicuous.
 - (e) Tendency to second growth or not.
4. Plant.
 - (a) Size.
 - (b) Freedom from disease.
 - (c) Tubers in hill; compact or scattered.

For late use, a good yielding variety having medium sized plants, with white, medium sized, regular tubers with small, shallow, inconspicuous eyes, is the most desirable. For early purposes, white tubers are not essential.

Note:--On account of the very great difference in

climatic conditions in various parts of the State, it is important to know just about how long it takes for a variety to produce salable tubers and also about how long it takes them to mature. In sections of the State where the growing season is short or where fall rains interfere with harvesting, farmers should select varieties that mature early.

Varieties Tested

A large number of varieties were tested in 1906, 1907 and 1908. A full description and behavior of the plants of all the varieties and their yields would be bunglesome, and because of that fact only a few are briefly described and placed in groups. In each group the varieties are placed in the order of preference--yield, shape, color, character of eyes, etc., being taken into consideration. All the varieties bear the correct name as near as the writer could determine.

Group 1. Varieties that produce new potatoes early and mature early in the season.

"Lewis". Mr. Lewis of Chehalis, Washington, sent in an unnamed variety for trial. It is very promising for early use. (Tested one year.) Marketable in seventy days. Plants medium size, spreading; foliage light green. Tubers medium to large; form rounded oblong; skin rough, finely netted, light pink; eyes small, medium number, well distributed, not conspicuous; flesh white.

The variety resembles the Early Ohio, but it is more prolific than any of the Ohios tested.

New Queen (Young & Halsted). Marketable in seventy-five days. Plants large, vigorous, moderately spreading. Tubers large; form oval flattened, regular; skin smooth, light pink; eyes medium in size, uniform character, a little

depressed and a little brighter pink than the skin. A very good variety for early market and promising for short season.

Peck's Early. (Flansburgh & Pierson). Marketable in seventy-eight days. Plants medium to large, vigorous, spreading. Tubers medium in size, variable; form round to oval slightly flattened, irregular; skin smooth, light pink; eyes few, medium size, well distributed, shallow, variable in character, not conspicuous. A few tubers have streaks of pink in the flesh. A very desirable early variety.

Pride of the South. (H. A. Dreer). This variety is known by several different names. (See synonyms page 52). This strain has given better results than the others. Plants medium in size with light green, large leaves. Tubers medium to small; form round, regular; skin finely netted, brownish to white with a few small pink blotches; eyes small, bright pink; flesh clear white. A handsome tuber.

"Lawrence". Professor C. W. Lawrence brought from Quincy, Washington, for trial an unnamed variety. (Tested one year). Marketable in eighty days. Plants large; leaves large, broad. Tubers medium size; form oval slightly flattened; skin smooth and netted, clear white; eyes small, well distributed, inconspicuous; flesh white.

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Irish Cobbler. (Vaughan's Seed Store). Marketable in eighty days. Plants medium size, vigorous, spreading. Tubers medium to small, uniform in size and shape; form round very little flattened; skin a little rough, clear white; eyes small, inconspicuous. A good short season variety.

Early Ohio. (L. L. Olds, Northrup, King & Company, Vaughan's Seed Store). Marketable in eighty days. Plants medium size, light green color. Tubers average small; form oval slightly flattened, regular; skin smooth, light brownish pink; eyes medium number, rather small, shallow. A very good quality potato. Good strains of this variety give good yields.

White Ohio. (Vaughan's Seed Store and H. Benthien). Marketable in seventy-five days. Plants medium to large, moderately spreading. Tubers medium in size, a little variable; form oval, slightly flattened, not always uniform; skin smooth, clear white; eyes variable in character, medium in size, light pink.

Six Weeks. (L. L. Olds and H. Benthien). Marketable in eighty-four days. Plants medium size, spreading. Tubers medium to small; form round and oval, slightly flattened, fairly regular; skin smooth with a few netted spots at one end, brownish pink; eyes pink, medium in size, shallow but somewhat variable in character. A few tubers have pink streaks in the flesh.

New Early Standard. (H. A. Dreer). Marketable in eighty-two days. Plants medium, vigorous, healthy, moderately spreading. Tubers medium in size, uniform; form round slightly flattened, regular; skin smooth, clear white; eyes medium in size, shallow and uniform in character. A very desirable early maturing variety.

King of Michigan. (Vaughan's Seed Store). Marketable tubers in eighty days. Plants medium to large, spreading. Tubers medium; form round to oval flattened, regular; skin coarsely netted, white; eyes small, shallow, inconspicuous. Good for short season.

King of the Earliest. (Farmer Seed Company). This variety resembles the Early Ohio in many respects. Flesh white with pink streaks.

New Century. (Kansas Seed Company). Marketable in eighty days. Plants medium size, moderately spreading. Tubers medium size, uniform; form round, regular; skin smooth, light pink; eyes medium in size. Flesh clear white. Resembles the Ohio. A good variety for short season.

White Star. (H. A. Dreer). Marketable in eighty-two days. Plants medium in size. Tubers small; form oval flattened, a little irregular; skin smooth, clear white; eyes medium to small, shallow; flesh clear white. Requires good soil and plenty of moisture.

Early Thoroughbred. (Flansburgh & Pierson and H. Benthien). Tubers marketable in eighty-five days. Ripened early in August, 1906, but the tops remained green until the middle of September in 1907. Plants medium sized and vigorous. Tubers resemble the Early Rose, but they are not so long as the Rose. The skin is netted, light pink; eyes medium to large and sunken. Occasionally a tuber has pink streaks through the flesh. Quality good.

New Climax. (Flansburgh & Pierson). Marketable in eighty days. Plants small to medium. Tubers small, uniform; form round, slightly flattened, regular; skin smooth, clear white; eyes small inconspicuous. If the tubers were larger this would be almost an ideal early maturing variety.

Early Rose. (Department). This variety has given variable yields on the Station grounds. A few farmers have reported good results with it. Marketable in eighty-five days. Plants medium size, vigorous. Tubers large, elongated flattened, regular; skin smooth, light pink; eyes vary in size and appearance. Flesh stained with pink.

Group 2. Varieties that produce new potatoes early and mature in early September.

Sweet Home. (Flansburgh & Pierson). Marketable in eighty-four days. Plants large, vigorous, spreading. Tubers large, very uniform in size and shape; form regular, oval flattened; skin very finely netted, clear white; eyes few, uniform, small, shallow; flesh clear white. A very promising variety for main crop, in semi-arid sections.

Champion of the World. (H. Benthien). A very desirable early variety. Marketable in eighty days. Plants large, spreading. Tubers medium to large; form oblong, flattened, regular; skin smooth, creamy white; eyes variable in size and depth. Tubers small in 1908.

Early Excelsior. (Young and Halsted). Marketable tubers in eighty-four days. Plants medium to large. Tubers medium to large; form oval flattened, regular; skin netted, pinkish yellow; eyes few, variable, medium to small, shallow, pink. A good summer variety for light soil.

Rural Red. (Kansas Seed Company). Marketable in eighty-four days. Plants large vigorous, spreading.

Tubers large, uniform; form oblong flattened, irregular; skin smooth, brownish pink; eyes medium to small, shallow, compound, variable; flesh white slightly tinged with pink. Quality is good but the pink in the flesh is objectionable.

Crine's Lightning. (L. L. Olds). Marketable tubers in eighty days. Plants twelve to fifteen inches tall, vigorous, spreading. Tubers large; form elongated oblong, flattened, slightly irregular; skin netted, pink striped with different shades of pink; eyes variable in depth. Not desirable for market, but it is a good quality potato for home use.

White Victor. (L. L. Olds). Marketable in eighty-seven days. Plants medium size. Tubers medium to large, uniform; form oval slightly flattened, regular; skin netted, dull white; eyes uniform, medium to small, shallow; flesh white. Good looking tubers. A good yielding variety under favorable conditions.

Early Hamilton. (Northrup, King & Company). Marketable tubers in eighty-three days. Plants vary from small to very large. Tubers medium in size; shape round, variable; skin slightly netted, yellowish white; eyes vary from medium to large, shallow inconspicuous. Good quality.

White Rose. (Kansas Seed Company). Marketable in seventy-eight days. Plants medium in size, moderately

spreading. Tubers fairly uniform, medium to large; form elongated, flattened, regular; skin smooth, white; eyes variable in character, but most of the tubers have medium sized, shallow eyes; flesh clear white.

Group 3. Varieties that produce new potatoes early but mature late.

Burpee's Extra Early. (H. Benthien). Marketable tubers in eighty days, but the plants did not ripen until the early part of October. Plants fourteen to eighteen inches tall, vigorous, moderately spreading. Tubers large and a little variable in size; form elongated oblong, flattened, fairly regular; skin smooth but a few are coarsely netted, mottled with white and pinkish yellow; eyes medium number, well distributed, quite shallow but variable in shape and depth.

Arcadia. (Farmer Seed Company). Marketable tubers in eighty-seven days, but the plants did not mature until the middle of October. Plants medium size. Tubers large, somewhat variable; form oblong, flattened, fairly regular; skin smooth, clear white; eyes few, small, shallow.

Bovee. (H. Benthien). Marketable tubers in seventy-eight to eighty-two days. Plants eighteen to twenty inches tall, vigorous, moderately spreading. Tubers medium to

large, inclined to be variable; form elongated oblong, slightly flattened, not regular; skin netted at the seed end, white, with a slight tinge of pink; eyes quite variable in size and depth. Not extra for market.

Early Jewel. (H. Benthien). Is subject to second growth.

Algoma. (L. L. May & Company). Marketable tubers in seventy-eight days. The tubers are inclined to be variable in size and shape.

Crown Jewel. (Johnson & Stokes). Marketable in eighty-four days. Ripe in October. Plants medium in size. Tubers large, uniform; form oval flattened, regular; skin smooth, white; eyes large, deep.

Group 4. Varieties that produce good marketable potatoes and ripen early in the fall. Promising for "Palouse Country" and some parts of the "Big Bend".

American Wonder. (H. Benthien). Plants large, vigorous, with many branches. Tubers large, uniform; form elongated oblong, quite regular; skin smooth, clear white; eyes medium in number and size, shallow; flesh creamy white. A good early maturing main crop potato.

White Lily. (Carl Engle, Coupeville, Wash.) This variety is grown very extensively on Whidby Island. The tubers resemble the Burbank but the plants mature earlier. Plants large, foliage light green. Tubers uniform, large; form elongated oval, somewhat flattened, regular; skin finely netted, clear white; eyes medium number, well distributed, medium to small, shallow, inconspicuous.

Carman No. 1. (H. Benthien). A very desirable, fairly early maturing main crop potato, especially for light soils. Plants medium in size. Tubers medium to large, fairly uniform; form oval flattened, regular; skin a little russeted, white; eyes few, well distributed, small, shallow; flesh clear white.

Pink Eyed Seedling. (C. B. Breed) (Tested one year). Plants medium in size, spreading. Tubers medium size, very regular and uniform; form oval flattened; skin netted,

white; eyes few, well distributed, inconspicuous; flesh white. The tubers appear well.

Green Mountain. (Young & Halsted). A few farmers in Eastern Washington report favorable results with this variety. In 1907 the tops were all dead the 5th of October. Plants large. Tubers large; form round and oblong slightly flattened, a little irregular and variable; skin a little coarsely netted, white; eyes medium in number, well distributed, medium size and somewhat variable in character. Very good in quality.

New Burbank. (John A. Salzer). For our climatic and soil conditions this variety is superior to the Burbank. Plants are a little smaller than the Burbank plants but otherwise they appear the same. Tubers medium to large, uniform; form elongated oblong, regular; skin smooth, a few fairly netted, clear white; eyes medium in number, well distributed, shallow and uniform in character. Matures latter part of September.

Netted Gem. (L. L. May & Company). Plants medium to large, uneven. Tubers large; form elongated, spindle; skin rough, yellowish, with russet netting; eyes medium number, well distributed, inconspicuous; flesh white. A fair yielding, good quality variety, especially good for home use and baking purposes.

Sir Walter Raleigh. (Vaughan's Seed Store). A very good variety of the Rural type. It matures fairly early and is less liable to become hollow than the Rural New Yorker. Plants medium sized. Tubers uniform, large; form flattened oblong to round, regular; skin finely netted, clear white; eyes few, well distributed, medium size, shallow, inconspicuous.

Vermont Gold Coin. (Burpee). This is a very promising main crop potato. Although it gives a large yield it does not require a very long season to mature. Plants very large, vigorous. Tubers uniformly large; form oval and slightly flattened oblong, regular; skin finely netted, yellowish white; eyes few, well distributed, medium size, shallow.

Washington Wonder. (C. B. Breed) (Tested one year). Plants medium to large, compact, dark green foliage. Tubers medium size; form oval flattened; skin smooth, white; eyes few, small, inconspicuous; flesh white. The tubers present a good appearance and a fair yield was obtained.

Group 5. Heavy yielding varieties that mature late in the season. Require a long season, good soil and a large amount of moisture.

New Late White Nebraska. (Vaughan's Seed Store).

Plants medium to large, dark green. Tubers medium size; form oval flattened; skin smooth, white; eyes few, well distributed, shallow, inconspicuous; flesh white. A handsome potato.

Burbank. (H. Benthien). At present the Burbank is grown in the State more than any other variety. In a few sections it is all that could be desired for late variety, especially on light soil, but it does not give good satisfaction in other sections. It frequently does not mature well and it has a strong tendency to make a second growth, (produce knobby tubers). Some strains of the variety are better than others.

Plants large to very large. Tubers large; form elongated, flattened, not always regular; skin smooth, clear white; eyes medium in number, well distributed, medium size, somewhat variable in character.

Governor Folk. (John A. Salzer). A heavy yielding potato, but it requires a very long season. Plants large, vigorous, spreading. Tubers large, fairly uniform size; form round, flattened slightly elongated; skin finely netted white; eyes few, well distributed, varying from small to large, but most of them are shallow.

Peerless. (James Wood) (Tested one year). Plants large, spreading, dark green foliage. Tubers medium size; form oblong flattened; skin finely netted, white; eyes variable, some deep but most of them are shallow; flesh white.

Ross Favorite. (H. Benthien). A good market variety, but it requires a long season. It resembles the Rural New Yorker No. 2. Plants variable in size, vigorous, moderately spreading. Tubers uniformly large; form variable, short, oval; skin finely netted, dull white; eyes few, well distributed, shallow, but a little variable in character.

Rural New Yorker No. 2. (Northrup, King & Company and H. Benthien). One of the best-known late varieties. It is remarkable for its smooth, white, short, flattened, oblong tubers. It has a tendency to grow too large and hollow in some sections of the State, on rich soil, when the hills are too far apart or not enough seed used per acre. It requires a long season.

Snowflake Jr. (Currie Bros. Company). Plants large, vigorous. Tubers medium to large, uniform; form flattened round, very regular; skin finely netted, clear white; eyes few, well distributed, medium size, shallow. A handsome tuber. Requires a long season.

Carman No. 3. (Northrup, King & Company). This is a good variety on account of its size, shape, color and shallow eyes. The Rural type. Plants medium in size. Tubers uniformly large; form round to oblong, flattened, regular; skin finely netted, clear white; eyes few, well distributed, medium size, shallow.

White Beauty. (Professor S. B. Green). A very promising variety, but it requires a long season. Plants medium size, spreading. Tubers large; form flattened round, quite regular; skin smooth, clear white; eyes few, well distributed, medium size, shallow, inconspicuous.

White Mammoth. (Flansburgh & Pierson). It resembles the Rural New Yorker, but does not have the tendency to grow too large or become hollow. Plants medium to large. Tubers very uniform, large; form slightly flattened oval, regular; skin smooth, clear white; eyes few, well distributed, small, shallow; flesh clear white.

North Pole Easterly. (H. Benthien). Plants very large, vigorous, moderately spreading. Tubers large; form slightly flattened long, but variable; skin finely netted, clear white; eyes very variable in character, but a large number of them are medium in size and shallow.

Harvest King. (Flansburgh & Pierson). Requires long

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season. Plants medium to small, spreading. Tubers large, uniform; form slightly flattened round to oblong, fairly regular; skin finely netted, white; eyes few, well distributed, medium to small, shallow but somewhat variable in character.

Great Divide. (Burpee and H. Benthien). Plants large. Tubers uniformly large; form elongated oblong, but not flattened, regular; skin finely netted, clear white; eyes many, well distributed, medium size, shallow but a little variable in character.

North Pole Stinnett. (H. Benthien). Plants large, spreading. Tubers large; form much elongated, irregular; skin finely netted, yellowish white; eyes few, well distributed, medium size, moderately deep. Some second growth.

Group 6. Heavy yielding varieties, undesirable for market purposes, but advantageously grown for stock feed. A few are good for market purposes in unfavorable seasons.

Johnson's Seedling. (H. Benthien). Plants very large. Tubers very large, variable in size and shape; skin pink, rough; eyes large, prominent. Subject to second growth.

Purple and Gold. (H. Benthien). There are two kinds of tubers in this variety and neither strain is desirable for market purposes, but they give heavy yields.

Pingree. (Northrup, King & Company). This is a very prolific variety but the tubers vary too much in size and shape to be desirable for market purposes. Plants very large. Tubers large, irregular; form flattened oval to oblong; skin finely netted, clear white; eyes few, shallow and variable in character. Gave good results in 1908.

Red Jacket. (Kansas Seed Company). Not good for market purposes on account of the very large irregular, rough, pink tubers with red tinged flesh.

Empress of India. (H. Benthien). A good yielding potato but it is not desirable for market on account of its light purple skin.

Synonyms, some of which are described above.

Bliss Triumph (H. A. Dreer), Bliss Red Triumph (Wm. Henry Maule), and Red River Early Triumph (L. L. Olds), are from all appearances exactly the same variety. Too small to be of much value.

Early Ohio (L. L. Olds), Extra Early Ohio (Northrup, King & Company), Improved Early Ohio (Vaughan's Seed Store), Ohio Junior (Prof. S. B. Green), Red River Acme (L. L. Olds), and Red River Early Ohio (L. L. Olds), are from all outward appearances of the plants and tubers the same. Early Triumph (Joseph Harris Company), Harleinger (H. Benthien), and White Star (H. A. Dreer), resemble the above varieties in many respects.

Early Rose (Department and H. Benthien), Prolific Rose (Farquhar & Company), are much alike.

Early White Triumph (Iowa Seed Company), Norton Beauty (J. M. Thorburn & Company), Pride of the South (H. A. Dreer), Quick Lunch (Uncle Gideon) (Burpee), and White Triumph (Vaughan's Seed Store), are from all appearances the same variety. Junior Pride (H. Benthien) is the same as the above in all characteristics, with one exception. The sprouts on the latter are tinged with pink and the sprouts on the former are not colored.

Red River White Ohio (L. L. Olds) and White Ohio (Farmers Seed Company and Vaughan's Seed Store) are exactly the same.

The tubers of Rose of the North (Iowa Seed Company) are a little lighter colored than are Seedling of Early Rose (H. Benthien), but otherwise the plants and tubers are exactly the same.

Discarded Varieties - Not worthy of description.

<u>Variety</u>	<u>Source of Seed</u>
Asparagus	H. Benthien
Banner	Professor S. B. Green
Bartlett	"
Bliss Triumph	H. A. Dreer
Bliss Red Triumph	Wm. Henry Maule
Blue Victor	H. Benthien
Bonanza	A. A. Berry Seed Co.
Breed's Seedling	C. B. Breed
Burbank's Seedling	H. A. Dreer
Champion	H. Benthien
Chnoays	"
Clinton	L. L. Olds
Columbian	Professor S. B. Green
Commercial	L. L. Olds

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<u>Variety</u>	<u>Source of Seed</u>
Considerable Seed	Professor S. B. Green
Delaware	Kansas Seed Co.
Earliest	John A. Salzer
Early Andes	Professor S. B. Green
" Market	L. L. Olds
" May	O. A. E. Baldwin
" Michigan	Kansas Seed Company
" Minnesota Rose	Farmer Seed Co.
" Norther	H. Benthien
" Pinkeye	Flansburgh & Pierson
" Pioneer	Professor S. B. Green
" Puritan	H. Benthien
" Regent	"
" Snowball	Flansburgh & Pierson
" Triumph	Joseph Harris Co.
" Vermont	H. Benthien
" White Harvest	John A. Salzer
" White Triumph	Iowa Seed Company
" Wisconsin	John A. Salzer
Empire State	O. A. E. Baldwin and H. Benthien
Extra Early Eureka	" and L. L. Olds
Freeman	Wm. Henry Maule and H. Benthien
Garnechills	James Wood
Garnet Chily	H. Benthien
Good Time	John A. Salzer

<u>Variety</u>	<u>Source of Seed</u>
Gorohachi	Japan
Gov. La Follette	John A. Salzer
Harleinger	H. Benthien
Hew's Early	Vaughan's Seed Store
Hundred Fold	H. Benthien
Ionia Seedling	L. L. Olds
Irish Belle	O. A. E. Baldwin
Junior Pride	H. Benthien
Junior Pride of the South	"
Kennewick	"
Kokhaido	Japan
Late Rose	James Wood
Leopard	C. B. Breed
Lincoln	Professor S. B. Green
Long Red Horn	H. Benthien
Livingston	O. A. E. Baldwin
Maggie Murphy	H. Benthien
Main Crop No. 2	Professor S. B. Green
Manistee	L. L. Olds
Mann's Enormous	Vaughan's Seed Store
Martins Horn	H. Benthien
Medium	Professor S. B. Green
Milwaukee	Currie Bros. Co.
Mountain Prizetaker	L. L. Olds
Noroton Beauty	J. M. Thorburn & Co.
North Pole	H. Benthien
Ohio Junior	Professor S. B. Green

<u>Variety</u>	<u>Source of Seed</u>
Okame	Japan
Fat's Choice	L. L. Olds
Pearl of Cannon Valley	Farmer Seed Co.
Planet	O. A. E. Baldwin
Potentate	Flansburgh & Pierson
President McKinley	Professor S. B. Green
Prosperity	Kansas Seed Co.
Prolific Rose	Farquhar & Co.
Pure Gold	Professor S. B. Green
Phoebus	Central Russia and U. S. Dept. Agrl.
Quick Lunch (Uncle Gideon)	W. A. Burpee
Red River Acme	L. L. Olds
Red River Early Triumph	"
Reliance	H. Benthien
Rose of the North	Iowa Seed Co.
Rust Proof Bullets	Professor S. B. Green
Scab Proof	John A. Salzer
Seedling of Early Rose	H. Benthien
State of Maine	H. A. Dreer
Silver Coin	C. B. Breed
Snohomish	"
Suck's Dwarf	Horticultural Dept.
Sunlight	John A. Salzer
Superior	W. A. Burpee
Supreme	H. Benthien
Tannenyophen	"

<u>Variety</u>	<u>Source of Seed</u>
Temple	H. Benthien
Up-to-Date	Professor S. B. Green
Uncle Sam	Peter Henderson
Vignosa	John A. Salzer
Viol	Central Russia and U. S. Dep't Agrl.
Violet Mammoth	Farmer Seed Co.
Vornehm	L. L. Olds
Washington	Flansburgh & Pierson
Washington Early	S. P. Felt, Mt.Vernon, Wash.
Waltmann	Central Russia and U. S. Dept. Agrl.
White Elephant	H. Benthien
White Triumph	Vaughan's Seed Store
Wilson's First Choice	H. Benthien
Windsor Castle	"
Wonderful	Professor S. B. Green

S E E D S E L E C T I O N

Introduction

Farmers do not think of selecting the poor animals for sires and dams, nor do they plant their unmarketable grain; but many plant potatoes which are of no value except for stock feed. Then the question is asked, "Why do varieties run out?" There are almost as many theories advanced and remedies given for this running out as there are growers. A few of the remedies given are: Plant when the moon is "right": Always plant large tubers: Never plant "seed ends": Always leave one or two eyes to a piece: Exchange seed; etc. None of the above remedies will prevent the varieties from running out. Varieties run out when the seed is not properly selected from year to year. The place to select seed is in the field.

If the variety is a good one to start with, any farmer with the proper knowledge can maintain its productiveness and quality with comparatively little time and expense, and the careful farmer can increase its productiveness and improve its quality. There are few plants under cultivation that are more susceptible to variation than the potato. The more a plant varies the greater is the chance for improvement with proper methods

the first of these is the fact that the system is not a simple one, but a complex one, in which the various parts are interrelated and interdependent. The second is that the system is not a static one, but a dynamic one, in which the various parts are constantly changing and evolving. The third is that the system is not a closed one, but an open one, in which the various parts are constantly interacting with the environment. The fourth is that the system is not a linear one, but a non-linear one, in which the various parts are constantly interacting with each other in a non-linear fashion. The fifth is that the system is not a deterministic one, but a probabilistic one, in which the various parts are constantly interacting with each other in a probabilistic fashion. The sixth is that the system is not a simple one, but a complex one, in which the various parts are interrelated and interdependent. The seventh is that the system is not a static one, but a dynamic one, in which the various parts are constantly changing and evolving. The eighth is that the system is not a closed one, but an open one, in which the various parts are constantly interacting with the environment. The ninth is that the system is not a linear one, but a non-linear one, in which the various parts are constantly interacting with each other in a non-linear fashion. The tenth is that the system is not a deterministic one, but a probabilistic one, in which the various parts are constantly interacting with each other in a probabilistic fashion.

of selection, as is also the corresponding tendency to deteriorate when poor methods are practiced. As we dig potatoes or look at them in the bin, we cannot but note the remarkable lack of similarity, or the tendency to variation, that is exhibited. It is a noticeable fact that some hills will have a large number of tubers, uniform in size and shape, while other hills grown under the same conditions will have a few ill-shaped tubers or one large tuber and a few small ones. (See cut). A tuber from the vigorous, productive plants though it may be the only small tuber in the hill, because it started late and did not have time to develop full size, would possess and transmit the characteristics of its worthy parent. So also the only large tuber from the poor hill, in which it alone attained marketable size, would inherit the tendencies of its parent. We see then that inspection of the individual tuber alone will not enable us to judge whether or not it inherits desirable characteristics. So the farmer when selecting from the bin or pit cannot tell anything about the parentage of the large or small potatoes. If he selects all large tubers from the bin the large potatoes from poor hills will be selected, as well as those from good hills, and the small tubers with good hereditary tendencies will be rejected. (See cut). To know the hereditary tendencies, we must know the characteristics of the hill and the vigor of the plant. The whole plant, then, and not the single tuber, must be taken as the unit for selection. The place to do this is in the field, where the whole plant can be examined.

Farmers frequently ask, Which is best for seed, large or small potatoes? The small tubers from the good hills can be taken without any ill results, provided they are not smaller than the cut pieces. When the time for field selection is passed and the potatoes for seed must be taken from the bin or pit, it is best to select the medium sized tubers.

Seed Selection Experiments

To study the inherited tendencies in hills, two or more hills of several varieties were selected in 1906 and the tubers from each hill were planted separately in 1907. The following Table I gives weight of tubers in selected hills, a short statement of condition of tubers, yield per acre, and a short statement of condition of crop in 1907. The habits of the plants were also studied quite carefully.

TABLE I.

Results of Individual Hills

The most productive hills are not always the best hills. No. 1, No. 2 and a few cases of No. 3, consecutively, are hills from the same variety.

<u>Hills Selected 1906.</u>			<u>Results 1907.</u>		
<u>No.</u>	<u>Lbs.</u>		<u>Bushels</u> <u>Marketable</u>	<u>Small</u>	<u>Tubers and Remarks on Same</u>
<u>1</u>	<u>6#</u>	<u>Tubers uniform in size and shape</u>	<u>202.8</u>	<u>38.3</u>	<u>Fair to good.</u>
2	3-1/2#	Tubers uneven in size, fair shape	172.8	86.5	Tubers inferior to No. 1.
1	3#	Tubers irregular in size and shape	363.0	45.4	Fair, uniform. Not as good
2	1#	Tubers uniform in size and shape	589.1	60.5	" " " " as No. 3.
1	10-14/16#	Tubers all medium sized, uniform shape	125.3	43.2	Fair, irregular.
2	4-1/2#	Tubers irregular in size	17.9	34.6	Small, irregular.
1	6-5/16#	Tubers fair size and shape	215.1	53.8	
2	2-14/16#	Tubers all small	165.0	49.5	
1	8-1/2#	Tubers both large and small	235.7	54.5	Irregular in size and shape.
2	3-1/2#	" " " "	275.0	44.0	Not as good as No. 1.
1	6-1/3#	Tubers fair size and shape	257.1	28.8	Fair to good.

Hills Selected 1906.

Results 1907.

No.	Lbs.	Hills Selected 1906.	Bushels Marketable	Small Tubers	Remarks on Small Tubers
2	1-1/2#	Tubers fair size and shape	114.9	78.7	Fair to good.
1	13-3/4#	Tubers very irregular in size and shape	152.0	110.4	Very irregular in size and shape.
2	10-1/4#	Tubers fairly uniform in size and shape	349.1	63.5	More uniform than No. 1.
3	2-1/2#	One large ill-shaped tuber, one medium, and five small ones	108.0	47.6	All small and uneven in size.
1	6-1/2#	Tubers quite uniform in size and shape	354.9	52.4	Some hills not as good as others.
2	2#	Tubers not even in size	267.5	82.8	A great difference in hills.
1	7-1/2#	One very large tuber, rest variable	178.5	42.3	Greater difference in hills than No. 1.
2	5-14/16#	A few good tubers, the balance irregular in size	219.6	67.2	Hills quite variable.
3	10-1/4#	Tubers regular in size	220.9	60.5	Great difference in hills, tubers irregular.
1	8-1/4#	One very large tuber, the rest small	73.6	68.7	All small.
2	7-1/2#	Some good tubers, a few small	156.1	50.7	Better tubers than No. 1.
3	4-1/4#	Tubers fair	118.2	66.0	Tubers fair.
1	5-1/2#	Tubers below medium size	115.3	63.4	All rather small.
2	3-1/2#	One very large tuber, rest small	137.5	60.5	From very large to very small.
1	6-3/4#		381.6	76.5	A little small but good.
2	4-1/2#		408.4	81.8	" " " "
1	4#		218.8	44.2	Tubers fair.
2	1-1/3#		194.4	69.2	A great difference in hills and tubers.

Hills Selected 1906.

Results 1907.

No.	Not Weighed		Bushels Marketable	Tubers and Remarks on Same	
				Small	Very good.
1	Large	Tubers medium size, a few small	338.8	66.5	Very good.
2	Medium	Tubers large and small	605.0	40.3	Exceptionally good.
1	Large	Tubers uneven in size	299.6	51.8	Tubers uneven in size.
2	Medium	Tubers even in size	400.0	19.0	Tubers fairly uniform.
1	Large	Tubers not even in size, a few very small	345.7	47.5	Hills variable, tubers irregular.
2	Medium	Not as many tubers as in No. 1, but more uniform	199.6	66.5	Hills uniform, tubers fair.

The study experiments teach that the heaviest-yielding hills are not always the best for seed, and that to select hills for seed intelligently the number of plants in a hill must be taken into consideration. This was done when the hills were selected for the 1908 crop.

In 1908 two plots each of twelve varieties of potatoes were planted. One plot of each variety was planted with seed selected from the best hills. Large and small of the hills were planted. The other plot was planted with seed selected from the medium to poor hills. A large percent of the tubers from the medium to poor hills would usually be taken by the farmer if the tubers were taken from the bin for seed. As near as was possible, the two plots of each variety had the same kind of soil and treatment.

The results are given in the following Table II:

TABLE II.

Product from Good Hills		Pounds per Acre per Market-able			Pounds per Acre per Market-able			Remarks
1	Carman No. 1	9 good hills - 48#	8003	:	1558	:	:	More uniform than No. 3.
2	" "	16 med. to poor hills - 60#	:	:	:	:	7277	1695
1	Carman No. 3	9 good hills - 46#	10039	:	1788	:	:	
2	" "	32 med. to poor hills - 54#	:	:	:	:	7968	2478
1	Dewey	10 good hills - 57#	12855	:	3106	:	:	Plants more uniform in appearance than No. 2. Foliage lighter colored than No. 1. Tops larger and more uniform than No. 2; also tubers.
2	" "	16 med. to poor hills - 35#	:	:	:	:	6409	1522
1	Gov. Folk	13 good hills - 67#	8176	:	1073	:	:	
2	" "	11 med. to poor hills - 70#	:	:	:	:	7302	1546
1	Harvest King	5 good hills - 32#	4780	:	1522	:	:	
2	" "	14 medium hills - 62#	:	:	:	:	4108	1840
1	Ninety Fold	3 good hills - 12#	5884	:	4178	:	:	
2	" "	8 medium hills - 17#	:	:	:	:	4463	3151

Variety - White Wonder. See page 65.



Seed

Pile to right, selected hills.

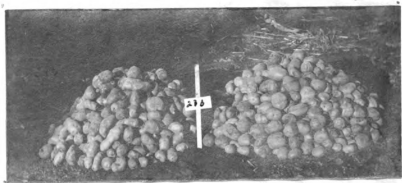
Pile to left, medium to poor hills.



Plants

Two rows to left of line, from selected hills.

Two rows to right of line, from medium to poor hills.



Resulting Tubers

Pile to right, from selected hills.

Pile to left, from medium to poor hills.

The crop from the good hills not only was about one-third larger, but the tubers were more uniform in size and appearance than those from the medium to poor hills.

The medium and medium to poor hills, taken as a whole, were not as good as the careful farmer would take for seed from the bin, but he would be sure to get very little better. It has been the writer's purpose to select, for several years, the good hills for seed from the offsprings of the good hills, and the medium to poor hills for seed from the offsprings of the medium to poor hills, to show the accumulative effect of repeatedly selecting good hills; also to prove that potatoes "run out" by constantly taking for seed large and small tubers from the poor hills.

The varieties given in Table II are to be used to continue the experiment. This has been done for two years with three varieties and the results are given in the following Table III:

TABLE III.

Second Year's Selected Seed and Results

		<u>Selected</u>		<u>Pounds</u>		<u>Pounds</u>	
		<u>per Acre</u>	<u>per Acre</u>	<u>per Acre</u>	<u>per Acre</u>	<u>per Acre</u>	<u>per Acre</u>
		<u>Marketable</u>	<u>Unmarketable</u>	<u>Marketable</u>	<u>Unmarketable</u>	<u>Marketable</u>	<u>Unmarketable</u>
1	Beauty of Hebron	Good Hills	13694	2419			
2	" "	Common Seed			6832	5124	
1	Carman No. 3	Good Hills	8286	1814			
2	" "	Medium to Poor Hills			3462	2233	
1	Gov. Folk	Good Hills	6300	1369			
2	" "	Medium to Poor Hills			3457	1732	
A v e r a g e			9426	1867	4583	3029	

Average gain of marketable potatoes per acre.....4843 pounds.

What to Look for When Selecting Hills

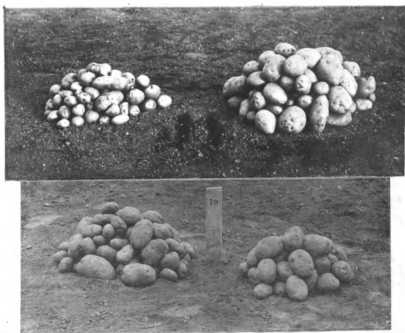
When selecting potatoes in the field the farmer must have an ideal hill in mind for each variety and adhere strictly to that ideal when selecting. If one selects only large-yielding hills without taking other things into consideration, he will not attain the highest success. (See Table I).

The following things should be taken into consideration:

1. The number of plants to a hill. It is not fair to compare a hill having two or more plants with another with one plant. It is better to compare hills having an equal number of plants and select the best. When a large piece having two or more eyes is placed in a hill, there are likely to be more plants springing from it than from a neighboring hill which received a smaller seed piece. (See page 16). The hill with many plants has just the same amount of space, plant food, and moisture that its neighbor has; therefore, it may not be able to develop all the tubers to marketable size, but only a small proportion of them. If all the many tubers in such a hill are uniform in shape and size and color, though they be a little under marketable size, they are better for seed than the neighboring hill having one plant bearing one or two large tubers and other small, ill-shaped ones.

2. The yield. Other things being equal, the largest

In all cases the piles to the right are selected hills. Those to the left are medium to poor hills.



Showing some very good tubers in medium to poor hills, which would be taken in case large tubers were selected from the bin.



7 good hills = 22 lbs.
18 poor hills = 5 lbs.

To illustrate great difference in products of hills grown under the same conditions.

yielding hills should be selected.

3. The shape. We have varieties of all imaginable shapes, but the shape most desired by most markets is a slightly flattened round, oval, or oblong tuber. The tubers selected should have the variety characteristics.

Many claim that the tendency of tubers to become pointed or drawn out at the seed or stem end indicates lack of vigor. Mr. C. E. Flint of Blaine, Washington, says: "I have used the following plan for a few years and am sure it pays. I am careful to select only tubers that are full at the ends. I have followed this method with the "Rose", starting with seed that was about worthless. I have this year three rows thirty rods long, which yielded at the rate of five hundred bushels per acre".

Methods of Selection Used by Farmers

Several successful growers west of the Cascade Mountains practice taking the tubers just below the marketable size from the good hills. (See page 22). When the crop is dug by hand this is a very good method.

Others who dig by hand throw two rows together and when a good hill is found throw all the tubers in the opposite direction, to be picked up separately for seed. The latter method is preferable, except when cut seed is accompanied by danger of decay, because one can select closer, since fewer hills will be required; and there is likely to be a tendency, when the former method is practiced, to take medium-sized tubers from hills that do not have ideal characteristics.

Many farmers in this State and in Michigan are practicing the above methods and they all say that they never expect to go back to the old method of taking seed from the general crop in the bin. One farmer in Michigan told the writer that he had practiced the latter method for four years and the fourth year the seed selected in the field averaged fifty bushels per acre more than the bin selected seed.

Neither one of the above methods can be practiced where labor is high and a horse digger is used, but practically the same results can be secured by the following method:

Selecting Seed in Field When Horse Diggers Are Used

For the sake of convenience ten acres is adopted as the area a man grows each year and harvests by means of a horse digger.

1. The first selection is made at large in this ten acre plot, a field large enough to afford abundant opportunity for choice of plants. Each hill in the field should be somewhat carefully examined, special attention being given to the vigor, freedom from disease, habit of the plant, etc., and a few of those which appear to be distinctly superior to the general crop are marked with small sticks.

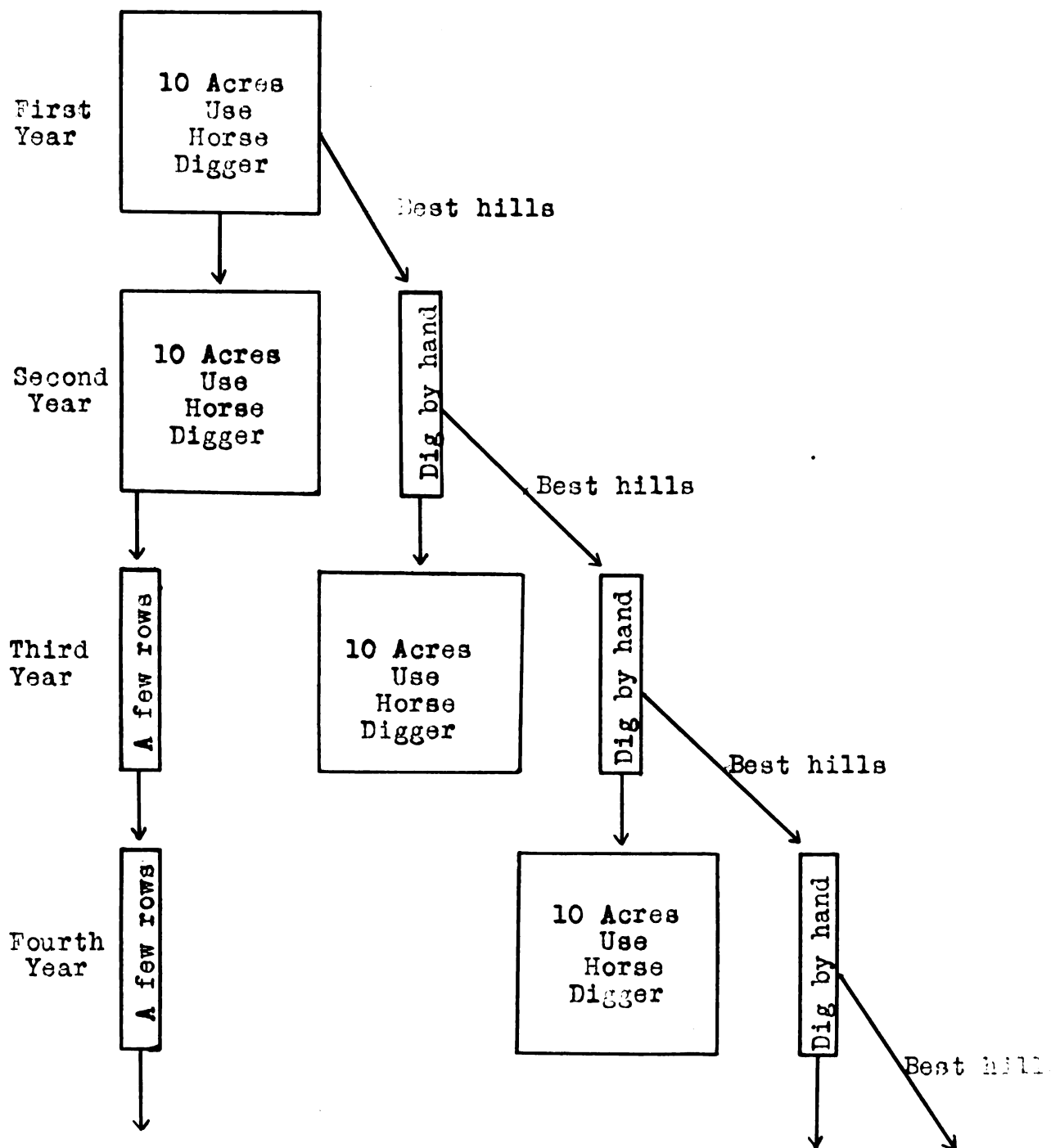
2. Before the main crop is dug with the digger, each marked hill is dug separately by hand. Those hills coming up to the standard are taken for seed and all others thrown out. (See page 69).

3. Second year seed from the selected hills is planted alongside of the regular selected seed and given the same treatment. It is best to dig this plot of selected seed by hand and select the best hills, to continue the line selection, and take the balance of the tubers, large and small, to plant the main crop the third year.

Until the farmer definitely settles in his own mind the importance of selection, by differences in yield, he should plant at least a few rows of ordinary selected seed in the same field and give both the same cultural attention.

This process of selection may be illustrated by the accompanying diagram.

Diagram Illustrating Process of Selection or
"Line Selection".



The accumulative effect of selection is kept in mind.

If the farmer has been digging by hand and wishes to get a digger, he may use one of the methods described above while he practices digging by hand. He will then have good selected seed to start with when this method is to be practiced. Other things being equal, the closer the selection is performed the first year, the better the results that will be obtained in subsequent years. If the farmer is an expert at picking out the best hills before they are dug, the small plot may also be dug with the digger, after the best hills are taken out to continue the line of selection, thereby reducing the hand digging to a minimum. Only after long experience can a person become an expert at telling from the appearance of the plant what is likely to be in a hill. Plants should be vigorous and healthy, but on account of the great number of varieties it is impossible to give a rule to be followed in all cases.

S E E D F I R M S

A list of the names and addresses of seed firms and individuals who furnished seed to be tested.

Baldwin, O. A. E.	Brigham, Michigan
Berry, A. A. Seed Co.	Clarinda, Iowa
Breed, C. B.	Bothell, Wash.
Burpee, W. Atlee & Co.	Philadelphia, Pa.
Benthien, Henry	Fife, Pierce Co., Wash.
Currie Bros. Co.	Milwaukee, Wis.
Dreer, H. A.	Philadelphia, Pa.
Engle, Carl	Coupeville, Wash.
Farmer Seed Co.	Faribault, Minn.
Farquhar, R. & J. & Co.	Boston, Mass.
Felt, S. P.	Mt. Vernon, Wash.
Flansburgh & Pierson	Leslie, Michigan.
Green, Prof. S. B.	Minneapolis, Minn.
Harris, Joseph Co.	Coldwater, N. Y.
Henderson, Peter & Co.	New York City
Iowa Seed Co.	Des Moines, Iowa.
Johnson & Stokes	Philadelphia, Pa.
Lawrence, C. W.	Pullman, Wash.
Lewis	Chehalis, Wash.
Kansas Seed Co.	

Maule, Wm. Henry

May, L. L. & Co.

Northrup, King & Co.

Olds, L. L.

Salzer, John A.

Wood, James

Vaughan's Seed Store

U. S. Dept. of Agriculture

Young & Halsted

Philadelphia, Pa.

St. Paul, Minn.

Minneapolis, Minn.

Madison, Wis.

La Crosse, Wis.

Bristol, Wash.

Chicago, Ill.

Washington, D. C.

Troy, N. Y.

POTATO MACHINERY COMPANIES

As a rule the local dealers handle potato machinery, but in case they do not the companies named below make special potato tools and will gladly furnish them to any farmer.

Aspinwall Mfg. Co.	Jackson, Mich.
Bakeman, W. E.	Snohomish, Wash.
Bateman Mfg. Co.	Greenloch, N. J.
Champion Potato Mach. Co.	Hammond, Ind.
Dowden Mfg. Co.	Prairie City, Iowa.
Hallock, D. Y. & Sons	York, Pa.
Hoover-Prout Co.	Avery, Ohio.
Le Roy Plow Co.	Le Roy, N. Y.
Platt, H. J.	Sterling, Ill.
Schofield & Co.	Freeport, Ill.
Superior Drill Co.	Springfield, Ohio.

POTATO WASHING

It is a rule the local potato washers should observe, and they do not the companies named below make potato roots and will gladly furnish them to any

Johnson, Mich.	Johnson, Mich. Co.
Greenwich, N. Y.	Greenwich, N. Y. Co.
Hammond, Ind.	Hammond Potato Wash Co.
Pratt City, Iowa	Pratt City, Iowa Co.
York, Pa.	York, Pa. Co.
Avery, Ohio	Avery, Ohio Co.
La Roy, N. Y.	La Roy, N. Y. Co.
Stirling, Ill.	Stirling, Ill. Co.
Freeport, Ill.	Freeport, Ill. Co.
Springfield, Ohio	Springfield, Ohio Co.

S U M M A R Y

1. Large areas of the State have climatic conditions particularly adapted to the growth of potatoes. The soil in these districts, if properly handled, is of such a character that it will hold enough of the winter and spring precipitation to mature a large crop of tubers without the help of rain during the summer season. The dry atmosphere is unfavorable for the development of the worst diseases of the potato. The Colorado beetle (Potato bug) is not found in this State. The long bright days of summer are particularly favorable for the formation of starch, which is the main solid constituent of the potato.

2. A deep, friable, mellow loam, rich in humus and well drained, is the ideal soil for potatoes. Heavier soils may give good yields, provided manure is well incorporated into it or green crops are plowed under. For the best results the physical condition of the soil should be perfect.

3. Barnyard manure is the best fertilizer and may be applied in large quantities, provided it is well composted and worked into the soil.

4. Potato land should be plowed in the fall, left rough all winter, and harrowed thoroughly as soon as dry enough in the spring. Deep plowing is more satisfactory than shallow plowing. When spring plowing is practiced the harrow should immediately follow the plow.

5. Harrow thoroughly right after the potatoes are planted and at intervals of a week or ten days until the plants are from two to five inches high. Maintain a dry surface mulch with cultivator.

6. Level culture throughout the season is best. Hilling should not be practiced except on very wet, low land. The sunburning of potatoes can be avoided by planting deep and placing the hills close together.

7. The dry soil mulch is just as good and much cheaper than a straw or litter mulch.

8. The time of planting should be governed largely by the climate and object for which the crop is grown. Potatoes should be planted at a time which will bring the blossoming period when there is ample moisture. When new potatoes

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time of planting ... should be covered ...
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d when there is ...

are desired early they should be planted as early in the spring as the soil will permit, on light, warm soil. When late potatoes are desired they may be planted as late as the middle of June, provided the supply of moisture is continuous and ample, but in sections where the summer rainfall is slight the earlier all crops of potatoes are planted the better.

9. There are several methods of planting potatoes. On a small scale the most satisfactory method is to drop and press the seed in the bottoms of furrows made by a plow or single shovel and cover them with a plow, single shovel, or harrow. The horse planter is satisfactory when large areas are planted.

10. The amount of seed to use and distance apart should depend upon the fertility of the land and supply of moisture. Rich soil with a continuous and ample supply of moisture should receive more seed and the hills should be closer together than on soil lacking one or both of the above characteristics.

11. The size of the seed piece should be uniform, regardless of the number of eyes.

12. The depth to plant depends upon the texture of the soil and whether early or late potatoes are desired. Five

planted early they should be watered and covered with
as the soil will permit, on light, warm soils. When
potatoes are desired they may be planted as late as
the 15th of June, provided the supply of manure is
sufficient, but in sections where the weather is
rather light the earlier all crops of potatoes are planted
later.

There are several methods of planting potatoes. The
most satisfactory method is to drop and
the seed in the bottom of a furrow made by a plow or
shovel and cover them with a plow, ridge shovel,
row. The horse planter is satisfactory when furrows
are planted.

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characteristics.

The size of the seed piece should be uniform, regard-
less of the number of eyes.

The depth to plant depends upon the texture of the
soil and whether early or late potatoes are desired. Five

inches is none too deep for the late crop, on light, mellow soils, but three or four inches is better for very early potatoes. Five inches is too deep on very heavy or very moist soil.

13. New potatoes can be got earlier by allowing the seed to sprout in strong light before planting.

14. A poor stand may be due (1) to the heating of seed after cutting, if sacked or piled up for more than six hours; (2) to diseased seed; (3) to planting early in wet, cold soil; (4) to chilled seed; and (5) to late planting on soil that has dried out. (See pages 19-20).

15. There are several methods of harvesting practiced in the State. Digging by hand on small areas is most satisfactory, but for large areas the horse digger is almost indispensable. (See page 21).

16. More attention should be given to the proper grading of the tubers. Well graded potatoes bring a larger price than poorly graded ones. New early potatoes should be washed and packed into boxes for the best markets.

17. Potatoes are easy to keep in this State. They will keep in pits on well drained land if covered sufficiently to keep frost out, or in any frost-proof, cool, moist, but

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at soil.

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atoes are easy to keep in this State. They will
give on well drained land if covered sufficiently
treat out, or in any frost-proof, cool, moist, but

not wet storage. (See page 25.)

18. The potato is one of the best crops to grow as a substitute for summer-fallow. The weeds are killed and the soil is left in the best condition for wheat.

19. Enormous yields of potatoes can be secured under irrigation, provided the moisture in the soil is uniform and continuous.

20. All samples of seed of a given variety are not of equal value. A person should have an ideal in mind when selecting a variety. (See page 32).

21. The following varieties produce new potatoes early and mature early in the season:—"Lewis", New Queen, Peck's Early, Pride of the South, "Lawrence", Irish Cobbler, Early Ohio, White Ohio, Six Weeks, New Early Standard, King of Michigan, New Century, White Star, Early Thoroughbred, New Climax, and Early Rose.

22. The following varieties produce new potatoes early and mature in early September: Sweet Home, Champion of the World, Early Excelsior, Rural Red, Crine's Lightning, White Victor, Early Hamilton and White Rose.

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Y. Pride of the South, "Lawrence", "Prize",
ry Ohio, White Ohio, Six weeks, New Early
ing of Michigan, New Century, White Star,
upheld, New Climax, and Early Rose.

following varieties produce new potatoes early
in early season: Sweet home, Champion of
Early excelsior, Rural Red, Grimes's Lightning,
ry Early Hamilton and White Rose.

23. The following varieties produce new potatoes early but mature late: Burpee's Extra Early, Arcadia, Bovee, Early Jewel, Algoma, and Crown Jewel.

24. The following varieties produce good marketable tubers and ripen early in the fall:--American Wonder, White Lily, Carman No. 1, Pink Eyed Seedling, Green Mountain, New Burbank, Netted Gem, Sir Walter Raleigh, Vermont Gold Coin, and Washington Wonder.

25. The following varieties yield a large crop but mature late:--New Late White Nebraska, Burbank, Gov. Folk, Peerless, Ross Favorite, Rural New Yorker No. 2, Snowflake Jr., Carman No. 3, White Beauty, White Mammoth, North Pole Easterly, Harvest King, Great Divide, and North Pole Stimmitt.

26. The following varieties are undesirable for market purposes, but advantageously grown for stock feed:--Johnson's Seedling, Purple and Gold, Pingree, Red Jacket, and Empress of India.

27. Potato seed should be selected in the field. (See page 58).

Following varieties are listed in the order of their
late: Purple, white, and yellow, and
Albino, and Green.

Following varieties are listed in the order of their
ripen early in the season:--
German No. 1, Pink, and Green, and
Netted, and the latter are in the
Washington section.

Following varieties yield a large crop, and are
late white, and yellow, and green, and
the, and New York, and the, and
Beauty, white, and the, and
the, Great Divide, and North Pole, and the.

Following varieties are undisturbed for market
at advantage, from for stock feed:--
Purple and white, and the, and the, and the.

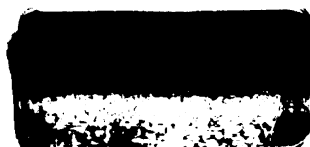
See page 10 for varieties in the field. (See page

A C K N O W L E D G M E N T S

In closing, the writer wishes to acknowledge the assistance rendered by many farmers throughout the State, too numerous to permit mention of individual names; also the kindnesses of the members of the Agricultural Department of the Washington State College and other members of the faculty, in aiding the experiments.

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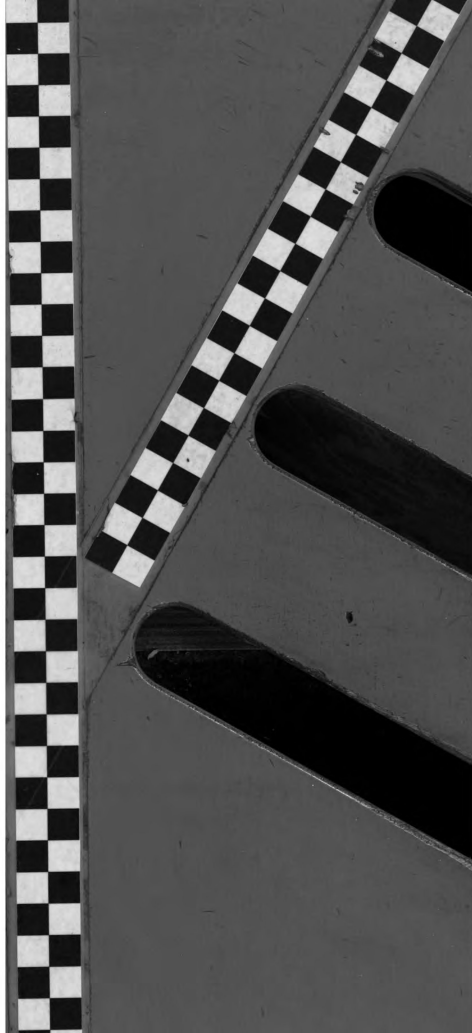
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