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COMMERCIAL ONION CULTURE IN IDAHO

BY

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Commercial Onion Culture In Idaho

BY
C. C. VINCENT

INTRODUCTION

As indicated by the correspondence received by the Horticultural Department of the University of Idaho, interest in onion culture is increasing thruout the state. In both the irrigated and non-irrigated sections of Idaho, a large number of acres are devoted annually to the growing of onions from seed. The bulk of the commercial onion crop in the irrigated sections is grown at the present time in the vicinity of Filer, Buhl, Twin Falls, Rupert, Boise, Caldwell, Payette, Emmett, Lewiston, and Post Falls. In the non-irrigated sections, farmers around Grangeville, Kamiah, Moscow, Sandpoint, and Bonners Ferry are going into the business. Many other localities are also especially adapted to the growing of this special crop. In sections where the seasons are short and there is danger of frosts and rains in the early fall, onions cannot be grown satisfactorily. Under these conditions, it is extremely hard to mature the bulbs properly. They may be grown profitably in locations where the distance from the shipping point or the character of the roads would not permit the growing of more perishable products. Owners of small tracts have found it very profitable to grow this crop.

To supply those interested with first-hand information, an experiment in onion culture was started on the horticultural grounds at the University three years ago. The object was to test out the two most popular varieties of onions grown in the state and secure data on the methods of growing, yields, thinning, cultivation, harvesting, and marketing of the crop. This bulletin embodies the results secured during the last three years at the Experiment Station and the methods followed by the largest and most successful onion growers in the state.

LOCATION AND PLAN OF WORK.

The area selected for this work had been used previously for gardening purposes. It was typical, in soil and situation, of the numerous hills which comprise the Palouse country. The southern exposure selected permitted the earliest possible cultivation in the spring. The location was free from frost until late in the fall. Probably no location in this section is more favorably located in respect to freedom from frost, good soil, drainage, distance from market, and transportation than the area where this

work was conducted. To meet with success in the growing of onions, one should consider carefully the following points: Soil, climate, length of growing season, rainfall or facilities for irrigation, and proximity to a good market or shipping point. No irrigation is required in this section.

This experiment was planned and started in the spring of 1914. One-half acre of land was set aside for the purpose. The ground

Fig. I. Growing the Onion Crop at the Experiment Station

had been heavily manured and plowed the previous fall. In the spring, it was disced and placed in the best possible garden condition. The seed each year was planted as early as possible in the spring. As soon as the rows could be followed, hand cultivation was begun. The wheel hoes with the latest attachments were used for this purpose. To keep down the weeds, some hand weeding was necessary during the season. Careful records were kept of the various operations, so that the cost of production could be determined.

SOIL AND FERTILITY.

While the onion can adapt itself quite readily to different types of soil, it is evident that to secure the best results, a soil fairly loose and friable, rich in humus, retentive of moisture, and well drained, is desirable. It delights in sufficient moisture at all times, warm, sunshiny days, and cool nights. The onion, which is a shallow feeder, must have an abundant supply of available plant food near the surface. The muck soils of the middle west

are very desirable for the production of onions because they contain large quantities of organic matter.

The character of the soil has a great deal to do with the yield of onions. Heavy soils as well as those that crack and bake after irrigation should be avoided. It is exceedingly hard to prepare a proper seed bed on such soils. They are difficult to cultivate and a uniform stand of onions is hard to secure. The bulbs do not ripen properly in the heavy soils and the percentage of thick-necked onions or scallions is also greater. From observations made in various parts of the state, it is evident that any of the soils which have been found to produce agricultural crops satisfactory will also grow onions if properly fertilized.

The elements necessary to produce a crop of onions are nitrogen, phosphoric acid, and potash. The New York Experiment Station has found by analysis that Yellow Danver bulbs contain .225 per cent nitrogen, .086 per cent phosphoric acid, and .217 per cent potash. Professor C. G. Woodbury, in Circular No. 15 of the Indiana Experiment Station, estimates that a crop of 800 bushels of onions per acre would receive from the soil 100 pounds of nitrogen, about 35½ pounds of phosphoric acid and 97 pounds of potash. It is very evident then that onions require heavy annual application of fertilizers if best results are to be secured.

Barnyard manure contains all of the above elements in good proportion and appears to be extensively used as a fertilizer in many parts of the country. The onion ground at the university has received from 30 to 40 tons of manure each year. It was spread in the fall and turned under as soon as the ground could be plowed. If sufficient barnyard manure cannot be secured, sheep manure is an excellent substitute. Onion ground that has been manured heavily for a period of years is very durable and better yields are secured by using the same land for this crop several years in succession unless the soil has become infested with insects or infected by disease.

Commercial fertilizers are as yet not used to any great extent by onion growers in Idaho. However, for nearly all Idaho soils, it is believed that a fertilizer containing 3 per cent of nitrogen, 6 per cent of phosphoric acid, and from 8 to 10 per cent of potash, will be found beneficial.

PREPARATION OF LAND.

To obtain the best results in growing onions a thoro preparation of the soil is essential. The character and condition of the soil will determine largely the method to follow. Here at the

Station, the soil works much better for onion culture when plowed in the fall and allowed to remain rough during the winter. The majority of our commercial onion growers prefer fall plowing to spring plowing. When left in this condition, the soil absorbs the moisture which falls in the form of snow and rain during the winter months. The action of frost is beneficial in pulverizing coarse particles and this is quite essential to the proper preparation of soil for onions. Fall plowing kills out many of the weeds. Land plowed in the fall can also be cultivated earlier in the spring.

As soon as possible in the spring, the soil should receive a thoro discing and harrowing. It is also necessary at this time to use a clod crusher to break up the clods and pulverize the soil. Where irrigation is practiced it is necessary to leave the soil leveled for uniform irrigation.

ONION SEED.

It pays to secure good fresh seed. Seed should be purchased from commercial seed houses which make a specialty of handling good seed. Even if it does cost a little more, this will pay. Fresh seed germinates quickly, gives a uniform and even stand, and produces better and stronger plants. Buying cheap seed is poor economy because it means the production of more scallions, the lack of uniformity in the crop, and the securing of bulbs untrue to type.

As onion seed retains its vitality only a short time, old seed should not be planted. As an insurance against crop failure, it is always a good plan to test the seed before planting. Losses such as a poor stand, cost of seed, planting, etc., are partly obviated. By placing a few hundred seed between moist blotting paper and placing in a warm room for a few days, the vitality of the seed may be determined. The seed should germinate in from 7 to 9 days. If the seed is fresh and of good vitality, at least 90 per cent of the seed should germinate. A test of this kind is a fair index of what to expect of the seed when planted under field conditions.

PLANTING

As soon as the ground is properly prepared in the spring, the seed should be planted. In Idaho this brings the seeding time from the middle of March to the middle of April. It is highly desirable that the seed be in the ground as early as possible so that the bulbs can be properly established before the hot weather. A seed drill, such as the Planet Junior or the Iron Age can be

used to advantage in seeding. These drills sow one row at a time. The seed drill should be properly regulated before planting so that at least 2 to 3 seeds are dropping to the inch. Too heavy seeding means extra expense in thinning.

Fig. 2. Planting the Onion Seed.

In our experiments the seed was planted in rows 14 inches apart and from ¾-inch to 1 inch in depth. It requires from three to five pounds of seed to sow an acre. The distance between the rows in the irrigated sections will depend largely upon the system of irrigation practiced. Where flooding is practiced, the rows are from 12 to 16 inches apart. If the furrow system is used, the ground is plowed in ridges about thirty inches apart. Each ridge is then leveled on top and two rows of onions planted. This leaves the furrows for irrigation. Another common method is to make corrugations sixteen inches apart and plant on the flattened ridges. This leaves the rows on each ridge 12 inches apart. A very successful grower in the Lewiston Valley plants in rows eighteen inches apart. To reduce hand labor to a minimum, horse cultivation is used. Most of the thinning is done with a hoe.

The transplanting method known as the "new onion culture" consists in growing the onions in a green house or hot bed, and then transplanting the seedlings to the field when weather conditions permit in the spring. While this method has been advocated in some of the southern states and the highly specialized districts of the east, very few Idaho growers are using it at present. The method has not proven entirely satisfactory as yet here at the Experiment Station. If growers in the state wish to try out this system, complete instructions may be found in the book entitled "New Onion Culture," published by the Orange Judd Company, New York.

CULTIVATION AND WEEDING.

Intensive cultivation, some hand weeding, and thinning are essential in producing a good crop of onions. As the onion is a shallow rooted plant, frequent and shallow cultivation is necessary. The operation should begin as soon as the plants appear and the rows can be followed. Cultivation can be continued until

the bulbs are fairly well grown and the tops interfere with working among them. As there is a large amount of hand labor connected with the growing of a commercial crop of onions, wheel hoes of various kinds are used. The single and double wheeled types which have several kinds of hoes, cutters, and special attachments, can be provided to meet the needs of the grower and the types of soil.

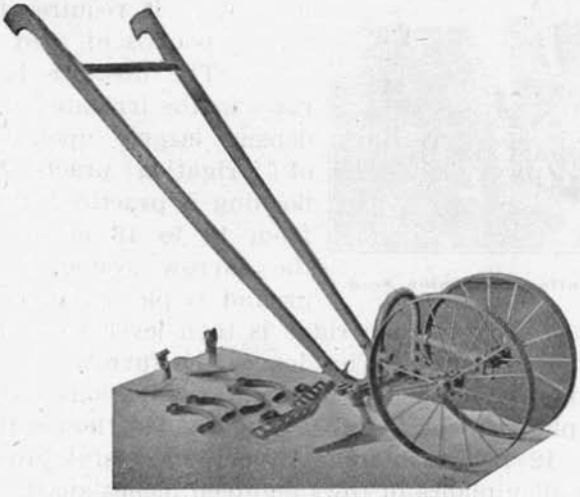

Fig. 6. Wheel Hoe and Attachments

The hand weeding of onions should begin soon after the first cultivation. It is important always to keep ahead of the weeds. Unless the weeding is done promptly the onion plants will become weak and spindling. Furthermore, if the weeds get too large before they are removed, several of the onions are apt to be pulled out with them and the roots of others seriously disturbed. Keeping down the weeds is one of the most important operations connected with the growing of onions, as well as one of the most costly. During the early stages of growth as many as three or four hand weedings may be necessary.

As soon as the plants are large enough to work, or at the time of the first weeding, the onions should be thinned. In our experimental work at the Experiment Station, the onions were thinned to three inches apart. Very little thinning is done in some of the irrigated sections of the state, especially where only three pounds of seed is used to plant an acre.

IRRIGATION

In order to produce a crop of onions in the arid regions of the state, irrigation is necessary. During the early stages of growth

onions require an abundance of moisture. Specific directions cannot be given as to the number of applications and the amount of water to use on account of the variation of the soil and climatic conditions. Sandy soils will require more water than the heavier soils. The systems that have been used successfully in the state are overhead sprinkling, furrow, and flooding. Some growers flood the soil and work it over with a disc and harrow before the seed is sown. Others prefer to make the first application of water immediately after planting. Whichever method is used, the essential point is to keep the soil moist during the early part of the summer. After each irrigation the soil should be thoroly cultivated. This conserves the moisture and keeps the soil loose around the bulbs. Close attention should be given to moisture content of the soil at all times, having sufficient moisture to grow the crop, but not too much, as this results in the formation of scallions and spongy bulbs. The water should be withheld toward the end of the growing season in order to allow the bulbs to ripen.

VARIETIES

The soil conditions and market requirements must be considered in growing onions commercially in Idaho. At the present time, the varieties that can adapt themselves to a wide range of soils, meet the market requirements and command the best prices are

Fig. 4. Irrigation of Onions in the Lewiston Orchards.

the Red Wethersfield and Yellow Danver. These varieties have excellent keeping qualities, are adapted to storage and shipping and are very productive. The eastern markets prefer the yellow sorts and the middle west the red. In both markets the globular shaped bulbs are preferred. The Prizetaker, Australian Brown, and White Portugal are also being grown to a certain extent in the state.

RESULTS

For three years, careful notes were taken at the Experiment Station on the yields of the Red Wethersfield and Yellow Danver varieties. These varieties were selected to make the tests because they represent the most popular red and yellow types grown in the state at the present time. The results secured in both cases have been entirely satisfactory. The tabulated results are as follows:

TABLE 1. Yield of Onions from Seed in Open Ground.

Variety	Yield in Pounds One-fourth Acre			Computed No. Bushels Per Acre			Avr. Yield
	1914	1915	1916	1914	1915	1916	
Red Wethersfield	3585	6168	7604	251.58	432.84	533.61	406.01
Yellow Danver	3687	5582	6893	258.73	391.71	483.71	378.05

A three year average at the Experiment Station gave for the Red Wethersfield 406.01 bushels per acre, and for the Yellow Danver 378.05 bushels per acre. As will be noted, there has been a gradual increase in yield for both varieties during the past three years. This is a common occurrence in onion culture and is probably due to the fact that the ground with heavy fertilization each year, continually improves in physical condition and fertility. It is much easier to keep the ground in proper condition for profitable onion culture, by continuous cropping than it is to bring a new piece of ground up to the high state of fertility demanded by the crop.

In 1916 two other varieties were grown, Prizetaker, yielding 287.85 bushels and the Australian Brown, yielding 181.50 bushels per acre. Both yields were considerably under those secured from the Red Wethersfield and Yellow Danver, a circumstance explained in part at least by the lower state of fertility of the ground on which they were grown. The factors that influence the yield per acre are preparation of the soil, care of the field, fertility, freedom from weed seed, and the rainfall.

In the irrigated sections of the state, where the water can be controlled, larger yields are secured. The yields per acre with

good care run from 800 to 1000 bushels per acre. This last year Mr. C. I. Dudley, of Filer, Idaho, harvested 877.19 bushels of Red Wethersfield onions per acre.

COST OF GROWING

While onions are expensive to grow, they are nevertheless among the best paying crops. The actual cost of production, however, depends largely upon the personality of the grower. The cost of producing an acre of onions based on the records kept at the Experiment Station on the one-half acre plats for a three year period, is as follows:

Fig. 5. C. I. Dudley's Onion Crop, Filer, Idaho.

Cost of Producing an Acre of Onions.

Preparation of ground	$ 6.00
Hauling manure	12.00
Cost of seed	6.00
Drilling in seed	2.50
Weeding and thinning	15.50
Cultivation	7.50
Pulling	6.00
Topping	14.50
Sorting and sacking	7.50
Sacks	12.00
Hauling	8.00
Total	$97.50

All man labor necessary to care for the crop and harvest it was paid at the rate of $2.50 per day; man-and-team labor $4.00 per day. The manure was hauled from the University barns to the field. One should not try to reduce the cost of growing by neglecting important operations such as weeding, thinning, and cultivation. The cost, however, is indeed a variable item. Some growers could reduce the expense of growing by employing careful boys to do some of the work. There is no reason why boys should not be employed to help with the weeding, thinning, cultivation, and topping. The area of land that one man can care for conveniently is relatively small, possibly four or five acres. After everything is considered, the profits to be realized will depend largely upon yield and skill in growing as well as upon prices and marketing facilities.

INSECTS AND DISEASES.

While the onion, like other crops, is subject to the ravages of various pests, very few are bothering the growers in the state at present. In the older onion districts of the east such diseases as blight, smut, and downy mildew are causing considerable concern. The thrip, cut worm and onion maggot also are quite bad. Our growers should be on the lookout for pests of this kind and if they make their appearance, write the Experiment Station for methods of control.

HARVESTING AND MARKETING.

Just as soon as the necks begin to shrivel and the leaves to turn yellow it is time to harvest the crop. To hasten the ripening process and to insure a uniform ripening of the bulbs, the tops should be broken down in August. This process is sometimes spoken of as barreling. The weight of the barrel will break down the tops without injuring the bulbs. This was necessary each year in the experimental work at the University.

The bulbs should be allowed to mature thoroly in the field before harvesting. The crop in Idaho ripens any time from early September to the middle of October, depending upon the season. To loosen the bulbs, especially if the soil is dry and hard, a U-shaped piece of steel may be attached to a wheel hoe and passed under the bulbs. A one horse plow or a cultivator with a knife attachment may also be used for this purpose.

The plants are then pulled and six to eight rows thrown in windrows with the bulbs all one way. They are left for a few days, or until the curing process is complete, then topped either by twisting or by cutting with ordinary sheep shears. The top is removed about one-half inch above the bulb.

Fig. 6. Breaking Down the Tops to Secure a Uniform Ripening of the Bulbs

To cure uniformly it may be necessary to turn the bulbs a few times with wooden rakes. Some of the larger growers in the east are using topping machines quite successfully. The thick necked plants or scallions do not keep well and should not be stored or marketed with the good onions. In some sections of the state where there is any danger of rain about the time the bulbs are ready to harvest, it may be necessary to cure the onions under cover. The bulbs are placed in slatted crates and stacked in open sheds. In Idaho the onions are usually sorted and sacked in the fields. Not many of the growers use a sorting rack. When one is used, the bulbs are poured on the rack and the scallions and poorer ones culled out. The smaller ones drop thru slats that are spaced 1¼ to 1½ inches apart.

The onions are usually marketed in bags holding on an average of 100 pounds. A large percentage of the onions grown in the state are sold and shipped directly from the field. Very few onions are stored by the growers. Only those that are well ripened and thoroly cured should be placed in storage. The important factors to consider in a good storage house are good ventliation, uniformity of temperature, and freedom from moisture. The onions should not be allowed to freeze.

SEED PRODUCTION

If the grower desires to do so, a high type of seed may be procured by growing it at home. As we have in many sections of the state a climate that is free from extremes of temperature and rainfall, fine onion seed can be produced profitably. To secure an improved strain of seed, the grower should select at harvest-

ing time mother bulbs that conform to the general shape, form and color of the ideal type he desires. By planting these selected bulbs separate from the general crop, an improved strain of onion seed can be secured in a few years. This practice is recommended where the grower understands the fundamental principles of plant improvement and gives it his careful attention.

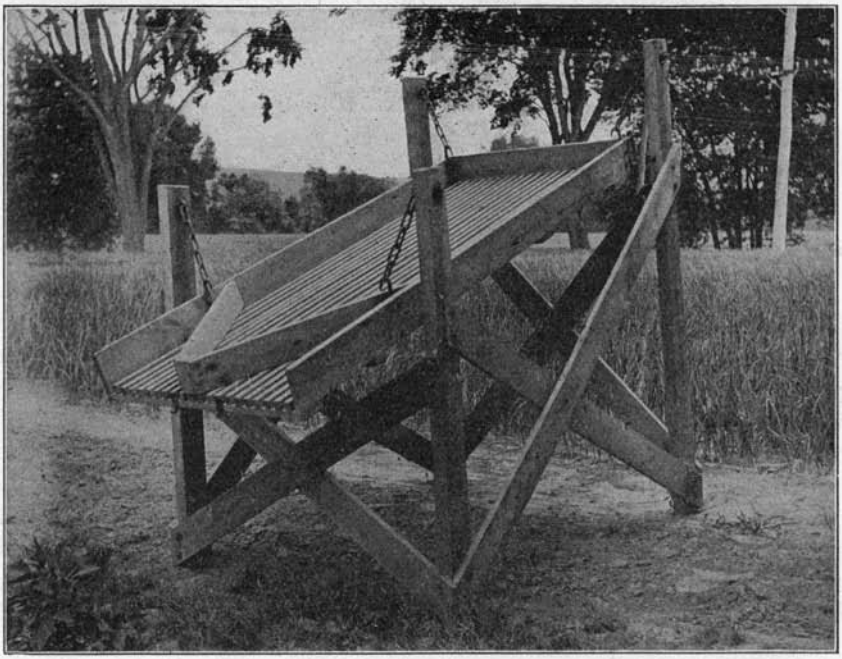

Fig. 7. A Home-made Sorting Rack. (Courtesy Michigan Agr. College).

After the land has been plowed to a good depth and placed in the best possible condition for the bulbs, it is furrowed off in rows three feet apart. The bulbs are then planted four inches apart in the row. When covered the bulbs should be entirely below the surface of the soil. It will require from 150 to 200 bushels of selected bulbs to plant an acre. At frequent intervals thruout the summer, shallow cultivation should be given. This conserves the moisture, keeps down the weeds, and helps to draw the soil around the seed bulbs.

The time to harvest the crop is when the seed heads are mature and begin to turn yellow. At this time the seed should have reached the dough stage. The crop should also be harvested before the first formed seeds in the heads begin to shatter. As the crop doesn't ripen uniformly, several cuttings are

Fig. 8. Planting Onion Bulbs for the Seed Crop

necessary. The heads are cut from the stalks by hand, with only a small portion of the stem attached. Where there is no danger of rain the seed may be cured in the field. The heads are spread out on sheets of canvas or cloth on the ground. As soon as the seed is thoroly dry, it is threshed out and cleaned by running thru a fanning mill.

The yield is dependent upon several factors. The preparation of the land, richness of the soil, general care of the bed, size of bulbs, distance apart, influence largely the yield per acre. Here at the Station on one-eighth acre of ground we harvested 80 pounds of seed. In many localities where onions are grown extensively, four hundred pounds per acre is considered a fair yield.

SUMMARY.

1. Onions can be successfully grown in Idaho.
2. The soil best adapted to onion culture in Idaho is one fairly loose and friable, rich in humus, retentive of moisture and well drained.
3. To secure best results with onions, annual applications of well rotted manure are necessary.
4. Thoro preparation of the soil is essential.
5. Only good fresh seed of good vitality should be planted. Planting cheap seed is poor economy.
6. The seed should be planted as early in the spring as possible, so that the bulbs can become properly established before hot weather.

Fig. 9. Seed Production a Profitable Undertaking in Sections of Idaho

7. It requires from three to five pounds of seed to plant an acre.

8. To produce a good crop of onions, intensive cultivation, some hand weeding and thinning are essential.

9. During the early stages of growth, onions require an abundance of moisture, hence the necessity for making light and frequent irrigations.

10. The Red Wethersfield and Yellow Danvers are the leading varieties thus far grown in the state.

11. The average yield per acre for the years 1914, 1915 and 1916 at the Experiment Station for Red Wethersfield was 406.01 bushels; Yellow Danvers 378.05 bushels. In the irrigated sections of the state the yields run as high as 800 to 1000 bushels per acre.

12. Onions will give better results if grown successively upon the same ground than if new land is used each year.

13. The average cost of producing an acre of onions at the Experiment Station was $97.50.

14. The onions grown in the state are practically free from insect pests and diseases.

15. Onions will mature more evenly if their tops are broken over at ripening time.

16. The Idaho onion crop is usually marketed in 100 pound bags.

17. In many sections of the state, ideal conditions exist for the production of onion seed. At the Station on one-eighth acre of ground, 80 pounds of seed were produced in 1916.