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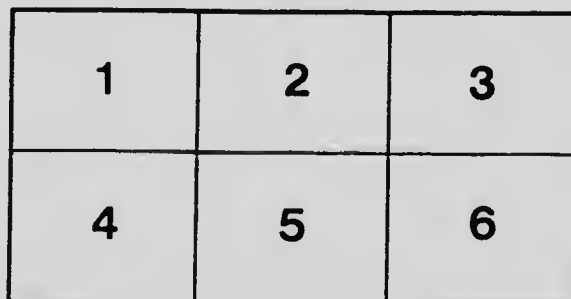
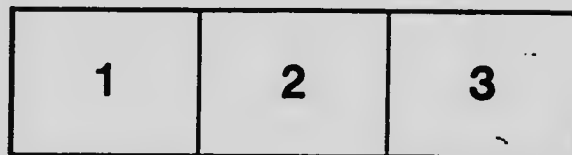
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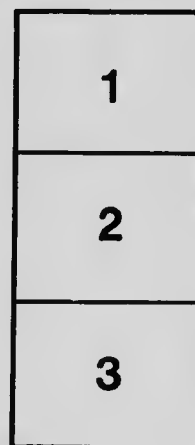
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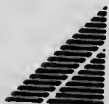
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Ontario Department of Agriculture

[Reprinted from the Annual Report of the
Ontario Vegetable Growers' Association, for 1908.]

Onions

BY A. McMEANS, O.A.C., GUELPH.

Early in the year 1908, the Executive of the Ontario Vegetable Growers' Association requested the Department of Agriculture to have an investigation made into the extent and nature of onion growing in Ontario, and a report prepared upon the same.

I was instructed by the Minister to do this work, and was authorized to visit the principal onion-producing States, to enquire into the methods there pursued. During the months of August and September, I visited the onion-growing sections in the States of Michigan, Indiana, Illinois, and Ohio.

I beg to submit herewith my report, which I trust will be of some help to the onion growers of this Province, in helping them in some measure to produce larger and better crops, and which will assist in increasing their profits in this important business.

The American onion markets are supplied as follows:—In April, Egyptian onions make their appearance, an average of over 83,000 bushels having been imported annually during the past five years. These are followed by the Bermuda, and the Texas crop of Bermuda onions, which are marketed in crates. The crop in the State of Texas last year was over 2,000 cars. The Southern Texas Truck Growers' Association control over 90 per cent. of the shipments. The Bermuda onion does not last long nor keep well, and is out of the market before the northern grown crop is ready, so they are followed by the Louisville, Ky., onion. A large section in that locality is devoted to this line. They are all grown from sets, and supply the markets for two or three weeks, until the northern crop comes in. This is harvested in August and September and marketed during fall and winter. The Spanish onions, both the Denias and Valencias, compete against the domestic onion of the northern States during the fall and winter. During the year 1908, 214,430 crates of Denias were imported.

The following information was furnished me by the Bureau of Statistics of the United States Department of Agriculture. The latest federal statistics of onion production in the United States are those relating

to the crop of 1908, and according to the census amounted to 11,790,974 bushels from an area of 47,983 acres, an average of about 266 bushels per acre. The principal producing states were as follows:—

State.	Acres.	Bushels.	State.	Acres.	Bushels.
New York.....	6,033	2,177,271	Connecticut.....	1,208	422,591
Ohio.....	5,067	1,677,442	Pennsylvania.....	1,506	347,806
Michigan.....	2,611	783,948	Wisconsin.....	1,230	331,662
Massachusetts.....	1,670	748,809	Kentucky.....	1,705	305,113
Illinois.....	2,563	546,681	Iowa.....	1,195	292,097
California.....	2,207	514,859	Missouri.....	1,383	259,272
Indiana.....	2,105	505,010			

The following also was furnished.

IMPORTS OF DOMESTIC ONIONS FROM, AND EXPORTS TO, CANADA.

Year ended June 30.	Imports.	Exports, domestic.
	Bushels.	Bushels.
1904.....	2,103	78,886
1905.....	2,137	118,920
1906.....	520	39,600
1907.....	641	81,585

SOIL. A profitable crop of onions can be grown on almost any soil provided that it is well drained and fertilized and has an abundance of humus in it. The land should be free from stones and rubbish, also from foul weeds and weed seeds, as any one of these will add to the expense account.

All of the onion-growing sections visited, with the exception of the Lake Ashtabula section in Ohio—which is one of the oldest, not the oldest, onion-growing sections in the States—were on muck with varying from two to thirty feet in depth, depending on the locality, with subsoils ranging from sand to clay loam.

MANURE. Many of the commercial onion growers on muck soils do not use manure at all, depending on commercial fertilizers for their crop, applying it at the rate of from 800 to 1,200 pounds per acre. Their chief objection to stable manure is that it contains too many weed seeds. Other growers like to apply manure about once every three years at the rate of about twenty tons per acre, believing that the bacteria which are at work in the manure give life to the inert vegetable matter that is in the soil.

They also supplement the manure with a commercial fertilizer composed of potash and phosphoric acid, about eight to ten per cent. of each. Other growers like to get the crop of onions off the ground by the first of September, sowing oats, which are plowed under late in the fall, for the purpose of adding humus to the soil.

The onion growers situated on upland apply manure when it can be secured profitably, at the rate of forty or fifty-two horse loads per acre. The general tendency is not to use so much stable manure, fifteen to twenty tons per acre being deemed sufficient, to which is added five hundred pounds of fertilizer.

Where stable manure is used, it is generally applied in the fall and plowed in, although some prefer to plow the land in the fall and apply well rotted manure in the spring, working it in with a disc harrow.



Hand Cultivating.

Where fall plowing is practised, the following is generally the rule: As early in the spring as the ground will carry a team, it is harrowed with a drag, which helps to dry the surface. A few days later it is disced and thoroughly pulverized. It is then harrowed. The fertilizer is then applied, usually with a drill, so as to get even distribution, after which the ground is again harrowed and planked, leaving a smooth, even surface, free from lumps and ready to receive the seed.

SEED. A goodly number of the growers test their seed for germination and sow their seed accordingly, generally using from four to four and one-half pounds per acre on muck soils, and on upland from four and one-half to five pounds of seed per acre. The exception to the above is in the case of white seed, which is generally sown at the rate of about six pounds per acre. The desired type of white onion is a little larger than a hen's egg, hence the heavier seeding of white.

The Iron King seed drill is used almost exclusively. Some large fields of twenty to thirty acres are sown with drills, one man easily sowing an acre per day, the rows being from twelve to thirteen inches apart.



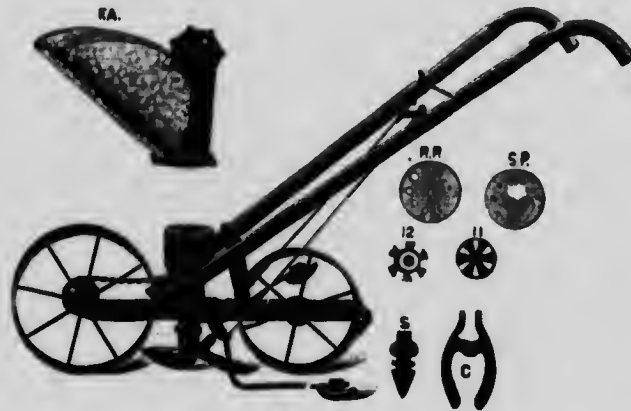
Cultivator



Cultivator.

Some of the very large growers use an ingenious arrangement of their own, attaching from five to seven drills together, and using a horse for motive power, having a boy to lead the horse and a man to watch and guide the drills.

WEEDING. The fight against weeds commences just as soon as the young onion plants appear above the ground. In fact, some of the growers do not wait for the plants to appear, but use a weeder about four feet in width built on the principle of the Breed or Hallock weeder. This weeder is attached to a wheel hoe and they go over the onion field across the rows just before the young plants appear. This tool serves a double purpose—it kills innumerable small weeds just starting and leaves a dust mulch on the soil, conserving moisture. This is followed by the wheel-hoe, which is generally used from five to eight times during the season, at a cost of about \$1 per acre for each hoeing. Both single and double-wheel-hoes are used. Planet Jr., Iron King, Iron Age, and other makes of implements are used, some preferring one and some another. Some growers, not satisfied with any one of the machines on the market, use one of their own construction.



Seed Drill.

In growing red or white stock, at the time of the last wheel-hoeing, the hoes in the implement are changed or taken out altogether and teeth substituted, so as to throw up some soil on the onion bulb to protect it from the rays of the sun, and by so doing secure a better colored onion. The small weeds in the rows of plants that have been left by the wheel-hoes are removed by hand. For this purpose, boys and men are chiefly employed, and the field is generally gone over three times in a season, at a cost of from \$10 to \$25 per acre for hand weeding.

HARVESTING. During the latter part of August or the early part September, depending on the locality, the onion tops start to die down as soon as tops are about half down and the root "lets go" of the soil harvesting commences.

The methods employed, especially on red and white stock, is to pull six or eight rows and place in a windrow. Two men or boys take three or four rows each, pulling the onions by the tops in handfuls and plac-

ing them in the windrow between them, in such a manner that the bulb of the onion rests on the soil, while the half-green tops cover the bulbs of the preceding bunch, the object being to keep the onions from the sun to preserve colour. It also serves to produce a milder onion. With the Yellow Globes, the same particular care is not used. After lying in the windrow four or five days, they are topped by hand, slatted crates holding about a bushel apiece having been previously distributed throughout the field. The onion toppers mostly use a pair of sheep shears, although some prefer to use a knife. After the onion is topped it is dropped into one of the slatted crates. When full, these are piled one on top of the other about



Sowing the Seed.

four high, and a bunch of the onion tops placed on the top crate to protect the onions in that crate from the sun. They are then left in the field to cure, or are removed from the field without piling and taken to open sheds to cure. The hand toppers are paid from two or three cents per bushel for topping, and they leave slightly more top on the onion than is the custom in Ontario.

When a machine is used for topping, the onions are left in the windrow a few days longer; they are then gathered up tops and all into crates, and these piled up in the field four high and in some cases ten or twelve in length, and covered with boards to protect them from the

weather, and left until all the crop is ready. Teams are then used to draw the crates of onions to the topping machine, which is set up near the storage house. The latest improved topper is mounted on trucks and in many cases is taken to the field and used there, moving from one pile of onions to another, as no time is lost in setting up the machine. These topping machines pinch the top of the onion off by means of a square cutter bar, in such a manner that the length of the stem remaining on the onion is in proportion to the size of it, and never is an onion topped too short. After passing down the rolls of the machine, the onion drops on a travelling slatted screen to remove all small ones, dirt, etc., then the onion drops on an endless travelling belt, where sorting takes place. All damaged, unsound, or "thick-neck" onions being removed by a man or boy stationed there for the purpose, the good onions dropping into crates at the end of the carriers.

These machines are built in three sizes, one, two and four rolls, each roll being supposed to be capable of topping forty to fifty bushels of onions per hour.



Crates of Onions Curing in Field.

The onions that have been topped by hand, after they are thoroughly cured and are ready to be moved to market or storage, are run over screens to remove all small ones and loose skin on the onion. The ideal screen (the one in use in Hardin County, Ohio) is 36 inches wide, 10 feet long with an apron of 14 inches and narrowing in to a mouth of 15 inches in width, 44 inches high at the top or high end of the screen, 37 inches high at the low end or mouth of the screen, and the sides are six inches in height. The screen proper is made of hardwood slats spaced one and a quarter inches apart. These have rounded tops so as not to damage the onions when passing over them. They are one and one-half inches deep, 7-8 inch wide at the top and 5-8 inch wide at the bottom, so that once an onion starts to go through it has a clear passage. The screen proper is removable and can have other sizes used in the same frame, as some growers use one and one-eighth inch and others one and one-quarter inch screens. For white onions a one-inch screen is nearly always used. It takes six men to properly operate the above, one man

to dump the onions on the screen, another to take them away, and two on each side to work the onions over the screen from one side to the other, always pushing them down towards the mouth of the screen, picking out all damaged and unsound ones. Six men will screen one thousand bushels in ten hours.

Some of the large growers have curing sheds and cribs, so that the onions can be cured under cover, away from the sun, rain and weather. These curing sheds are just open with a roof over them, and the crates are piled up in them in such a manner as to have a good circulation of air.

A description of a shed that was erected this summer will serve to show the type and cost of the same: Size of shed 48 feet wide, 96 feet



Onion Topper.

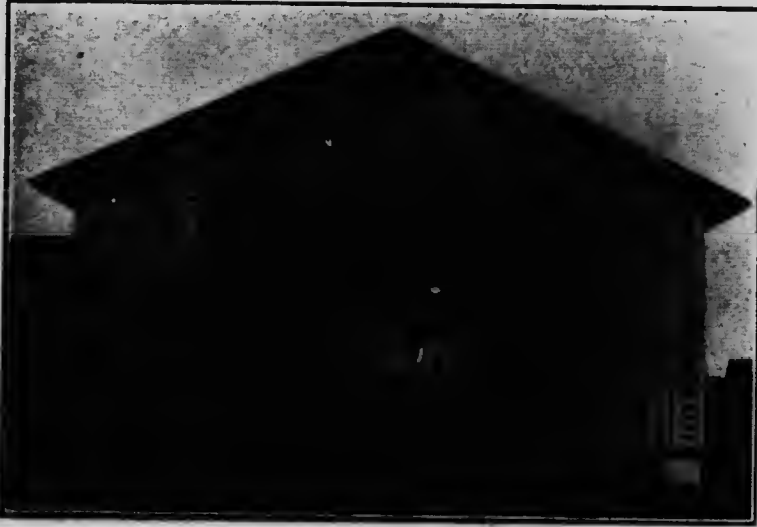
long, covered with Carey roofing, two 2 x 8 inch plank, bolted together used for posts, set in cement piers two feet square, four rows of posts used in width, the two outside rows being set four feet inside the eaves, the next row twelve feet from the outside row, leaving a sixteen foot space in the centre so that two teams can pass; the posts running lengthwise of this shed being spaced twelve feet apart. Cost of shed \$700.

A description of the crib that is approved as best will suffice. The crib proper is 26 feet in width and with a two-foot eave projecting over, a five foot crib on each side, with a driveway down the centre between the two cribs 16 feet in width. Six-inch studding is used spaced two feet apart and tied together seven feet from the floor. 1 x 4 inch slats with an inch space between them are used for sides and ends. 1½ x 4 inch slats are used for flooring, with an inch space between them. Hinged doors, 22 x 30 inches for filling, are six feet apart along the sides of the crib, and the ones on the inside are five feet from the bottom and those on the outside seven feet from the bottom of the crib. The upper part

of the crib is filled from the inside by emptying the onions over the top, as the cribs are ten feet in height. The crib is set up from the ground at least one foot. It has slides on the inside just at the bottom for the purpose of ease of emptying.

The crib which I have just described is 150 feet in length and is covered with Carey roofing, and cost \$800 three years ago. It holds eight thousand bushels of onions in the cribs proper, leaving the sixteen foot driveway for the storing of onions in crates.

The big advantage of the crib is that it does away with a number of crates. The big growers who have cribs do not find it necessary to have a crate for every bushel of onions grown. Some of the large shippers have crates that they rent out to the small growers. Should the small



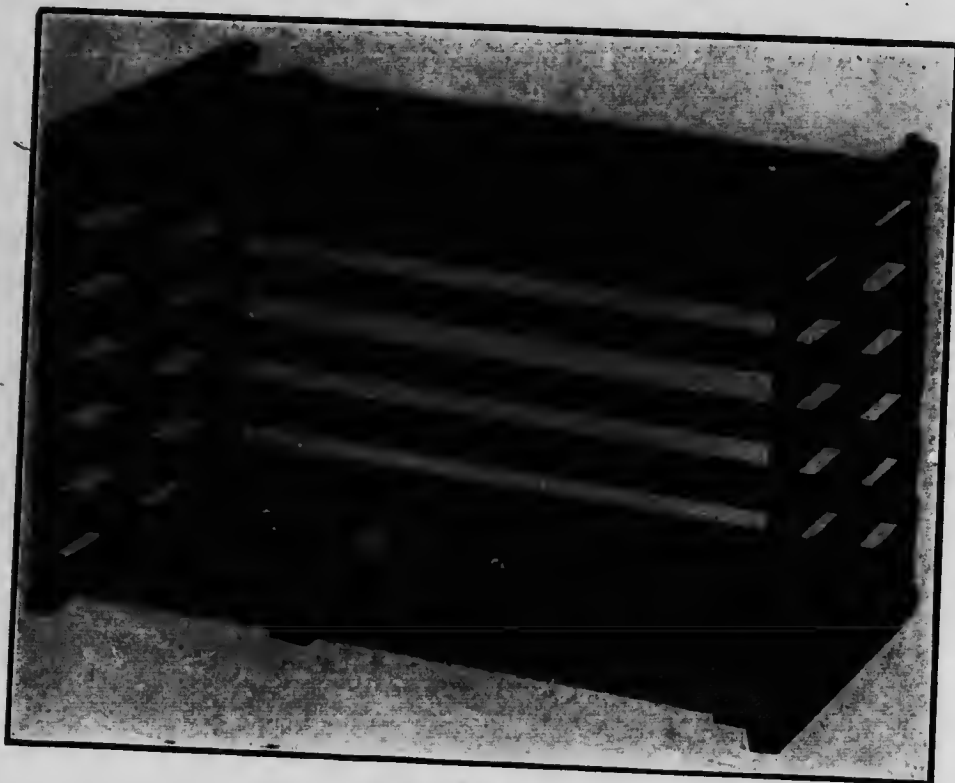
Curing Crib.

grower sell to them, no charge is made for the use of them. Should he sell to some other buyer, the grower pays two cents for their use.

MARKETING. The red and yellow onions are marketed in different ways. Some are shipped in bulk, that is, loose in the car, some in one hundred pound, and some in one hundred and forty pound sacks, it all depending upon the markets to which they are consigned. Some are still shipped in barrels with fifteen inch heads holding about two bushels, but the barrels are going out of use on account of cost. The white onions are smaller than the red or yellow varieties, the size desired being slightly larger than hen's eggs. They are graded up as fancy stock and are shipped in Cummer crates. These are a slatted folding crate built on the same principle as the slatted egg crates used by the farmers of Ontario. They hold a bushel of onions, and cost laid down from \$14 to \$15 per hundred.

White onions are much harder to grow, cure, and store, and always command a higher price, especially in New York City, the price this year being from fifty to one hundred per cent. higher than red or yellow stock.

STORING. The warehouses used for storing onions are frost-proof buildings with provision made for ventilation. All persons who store onions agree that the buildings should be frost proof, but most of them hold different views regarding the means of ventilation and methods of piling the crates.



Folding Crate.

Neumann & Co., commission merchants, of Indianapolis, Ind., have an onion storage at Kimmel, Ind., 40 x 60 feet and 16 feet high inside, built on the following plan: Two thicknesses of inch lumber with building paper between them, then a 2 x 4 inch studding, then a board and paper lining, then 2 x 6 inch studding, another boarding, paper and matched sheeting on the inside, making altogether five thicknesses of boards, three of paper and two air spaces, one four inch and one six inches. The ceiling is of matched lumber, and has large trap doors which are opened in mild and closed in cold weather. The warm air finds an outlet through

these traps, and then out through doors in the gable ends of the building. The building has a cement floor and six inch tiles through the walls just above the floor line. These are placed about eight feet apart, and are used for the admittance of fresh air. They are closed down during cold weather. This building cost \$3,000, and will hold 14,000 bushels of onions. The method of storing last year was as follows: An eighteen inch space was left around the entire building for the purpose of looking after the tile ventilators. The onions were all in slatted crates, and three rows of crates were placed together, the rows running across the building. They were piled sixteen crates high, a space of four inches being left between every three rows. This method of storage proved entirely satisfactory, as the loss by shrinkage was only about three per cent.

At Kendalville, Ind., there is a storage house 40 x 143 feet, two storeys high, the ground or lower storey eleven feet high, the upper storey fourteen feet high. This house is built of cement blocks, with a lining of insulated paper inside, then a 2 x 4 inch studding, another lining of



A Method of Storing.

paper and finished on the inside with matched sheeting. It is built into the side of a gravel bank. On one side the upper storey only is exposed, while on the other side all of the building is visible. It has a side track running along the lower side, and the onions can be trucked right into the car from the lower storey, as the floor of the car and the floor of the storage house are on a level. When loading a car from the upper storey, the onions in sacks slide down a chute into the car. This house was built in 1907 and cost \$5,700, and has proved very satisfactory.

In Hardin County, Ohio, the storage house that is in general use differs somewhat in construction from most of those in other localities; a description of one will serve for all, as about the only difference to be found is in size. Forty feet wide, one hundred and ten feet long, sixteen feet from floor to ceiling, walls built as follows: four thicknesses of sheeting, four of felt paper and two air spaces, one of these being eight, the other being two inches. A basement six feet deep is under the entire building, the walls being built of stone, and two feet thick.

12 x 12 inch oak sills set on 2 x 6 foot stone piers, two rows of piers used and 3 x 12 inch joists spaced 18 inches apart from centre to centre, slatted flooring 1½ x 4 inches is used with an inch space between each piece of flooring. Eight ventilators on each side and two on each end, one foot square, are in the basement, a short distance below the floor line. Large trap-door ventilators in the ceiling, with doors in the gable ends over the ceiling, also a ventilator one foot deep and ten feet long just under the ceiling at each gable. The idea of ventilation in these houses is admittance of fresh air in the basement, finding its way through the slatted floor, up through the crates and onions, through the trap doors in the ceiling and out through the ventilators at the gable ends, and



Onion Storage House.

theoretically, at least, seems to be the ideal method of ventilation. The owner handles 150,000 bushels annually. This storage will hold about 40,000 bushels, not including the basement. The entire cost of operating, including storage, cribs, screening and loading, based on a six years' average, is about \$2,000 per year. The shrinkage on stock in the above last year was, on yellow 5 per cent., on red 5½ per cent., and on white 12 per cent. Three years ago the shrinkage on red was 2 per cent., and on yellow 2½ per cent.

Horr-Warner Co., the largest growers of domestic onions in America, if not in the world, this year had five hundred and forty acres under cultivation. They have facilities for storing over 160,000 bushels of onions. The capacity of their different houses varies from 8,000 to 19,000

bushels each. They think that they get better results from a number of medium sized houses than from a few large ones.

In the ventilation of storage houses, one point was strongly fixed, and that is, not to have any of the ventilators go directly out through the roof. This has been tried and found unsatisfactory, as frost would gather on the sides of the ventilator. Should mild weather set in, the frost would melt and run down on the onions with damaging effect.

Should an order be received after the onions are in storage, say a month or so, the onions are again put over the screen to remove all loose peelings and to be sure that nothing is shipped but good, clean, bright stock. All the big shippers say that good market appearance helps to sell the goods.

GROWING SEED: Many of the large growers of domestic onions grow their own seed. For this purpose the bulbs should be selected very carefully, both as regards shape, color and size. The best time to make the selection is when the onions are going over the screen. By having a crate at one side of it the extra choice bulbs can be picked out and dropped into it, and can be stored separately until spring. In Michigan and Ohio the seed is grown on upland, never on muck soil. Good rich clay or sandy loam is used, and the bulbs are planted in rows about three feet apart and about six inches apart in the row. This admits of horse cultivation and ease in working. About one hundred and twenty-five bushels of bulbs are used in planting an acre; the crop varies according to season, from one pound to upwards of four pounds of seed from each bushel of bulbs planted. Care is exercised in gathering the seed bulbs. The field is gone over sometimes four or five times, cutting off those that are ready, about two inches of the stock being removed with the seed ball. They are generally gathered in bags or sacks, and are taken to the seed drying house where they are spread out on shelves. These shelves are generally about one foot apart and the bottoms are made of one-half inch wire netting. Doors and windows are kept open on bright days to admit free circulation of air to aid in the drying of the seed. After the balls are thoroughly dry, the seed is beaten out with a stick while the balls are still on the shelves, the wire netting on the bottom of the shelves allowing the seed to fall on the floor. Others use a flail as a means of separating the seed. It is then gathered up and run through a mill to clean it and blow off the light stuff. After it is cleaned it is placed in barrels or tubs and water poured over it until all the good seed is entirely immersed, all the light and poor seed that floats being discarded. It is then thoroughly dried as quickly as possible. If it remains damp for any length of time it will mould or germinate, thus spoiling a large percentage. The big drawbacks to onion seed growing are high winds, and danger of blight during the time the seed ball is filli.

PICKLING ONIONS. Soil of same general nature as will grow a good crop of domestic onions can be used for growing pickling ones, with the possible exception of soil of a clayey nature. This kind should be avoided

on account of the difficulty of harvesting. The soil need not be quite as rich as for a crop of market onions. In a field of four acres in Ohio, six to eight tons of manure were applied per acre, the land having been plowed in narrow strips in the fall at a cost of about \$10 per acre. In the spring it was harrowed and one thousand pounds per acre of complete fertilizer 2-8-8, costing \$26 per ton, was added. It was again harrowed and planked. Total cost of spring preparation and fertilizer, \$15 per acre. Thirty-two pounds of seed, furnished by the pickling factory and costing \$1.42 per pound, was sown per acre in rows ten inches apart. Cost of seed and seeding was \$46.70. Wheel-hoed four times at an estimated cost of \$8 per acre. Hand weeding was done three times, and part was gone over four times, at an estimated cost of \$15 per acre. Pulled by hand into windrows, piled thin and in such a manner that the tops cover the bulbs as much as possible to prevent sunburn or scald. After drying some days they were crated by hand and hauled promptly to the topping machine at an estimated cost of \$12 per acre.

It is said that twenty cents per bushel has been paid for topping and sorting by hand. Possibly fifteen cents per bushel will pay for topping and sorting by machine. Crop averaged five hundred and four bushels per acre, making cost of topping and sorting \$75.60 per acre. Cost of delivery to salting station, \$6. Total cost of growing, harvesting, and delivery, including value of land, estimated at \$100 per acre, \$198.30.

Total receipts per acre, \$351.93, divided as follows—158 bushels 20 pounds of small, under $\frac{3}{4}$ of an inch in diameter, at \$1.25 per bushel of 50 pounds, \$198; 219 bushels 27 pounds medium, over $\frac{3}{4}$ of an inch and under $1\frac{1}{4}$ inch in diameter, at 50 cents per bushel, \$109.77; 126 bushels 6 pounds large, over $1\frac{1}{4}$ inch in diameter, at 35 cents per bushel, \$44.16. The cost is figured at what it was estimated it cost to grow the crop; an odd item may be a trifle low.

The growing of Dutch sets requires more skill and experience than the growing of either domestic or pickling onions. The soil and preparation is about the same as for a crop of the latter. The Planet Junior Drill with the set attachment is the machine I have seen used, sowing a row about two inches in width. Should you wish to grow only a small patch, you can open some drills about two inches in width and a foot apart. For sowing the seed a small tin can of a diameter of about two inches can be used. Punch a number of small holes in the bottom, slightly larger than the seed, but not large enough for two seeds to pass through the same hole at once. By filling the can with seed, and lightly shaking it along the open drill, it will sow quickly and evenly. Cover the seed in the drill with fine soil from one-half to one inch in depth, depending on your soil, the light covering for heavy soil and the deep covering for light soil. One ounce will sow about forty feet of a drill.

The varieties used for growing sets are Yellow Flat Danvers, Yellow Dutch or Strasburg, Australian Brown, White Portugal or Silverskin, Extra Early Red, and Red Wethersfield.

In the vicinity of Chicago, which is the largest set producing section in America, the rows are one foot apart and from sixty to seventy-five pounds of seed are used per acre.

The cultivation and weeding are practically the same as for market onions. When the onions are ready to be harvested, some people use steel hooks to loosen the sets from the soil. Others use an attachment consisting of short steel blades about two inches in length. Two of these blades are used on a double wheel hoe, and the points of the blades are kept about an inch apart. The machine is pushed along by hand, with the blades deep enough in the soil so as not to hurt the onion. The onions are then picked up, with one hand grasping as many as it can conveniently hold, and as near the bulb as possible, and the other hand is then used to twist off the tops. They are then deposited in round half-bushel baskets, and when the basket is full it is taken and emptied into trays. These are three feet by four feet in size, with sides made from one inch lumber, and are three inches high, the ends of lumber of the same thickness and four inches high. They also have a four-inch piece across the bottom to give them stability. The bottoms are slatted and are made from four foot lath with a space of one-quarter to three-eighths of an inch between. Each tray holds one and one-half bushels.

These trays, when filled with onions, are piled up one on top of another in the following manner—twenty-one at the high end, twenty in the centre, and nineteen at the low end. Some boards or strips of waterproof paper are placed over the tops of the piled crates to protect the sets from the weather, and it is then known as a house. The four inch end of the trays when piled leaves an inch space at the sides of the tray for the purpose of allowing the air to enter and dry the small bulbs.

After they are thoroughly dried, they are then taken to a Clipper cleaning machine and run through that, removing all the dried top remaining on the onion as well as any dried or loose peeling. It also sorts the sets as they pass over a screen, all over three-fourths of an inch in diameter being considered too large for sets and are used for pickling onions. The sets, after coming from the machine, are boxed or barreled for delivery, or are put in storage. If put in storage for winter or spring delivery, they are placed back on the same trays and these are piled up in the storage house, which is a frost-proof building. They should be kept as dry and cool as possible, but must not be allowed to freeze.

Some of the operators in sets in the Chicago district contract with small growers to grow sets for them. The contractor furnishes the seed and the trays for curing the sets, and pays the growers seventy to eighty-five cents per bushel for growing. This must be close to the cost of production, as the contractors have hard work to increase their acreage, and in some cases to induce the grower to continue to grow sets for them.

One large firm there grows about 250 acres of sets annually, using four Planet Junior drills attached together, and drawn by a horse, for sowing their seed. They also grow forty or fifty acres of seed to furnish their supply for the following year.

A good crop of sets yields from three hundred to four hundred bushels per acre.

In Ontario, and, in fact, Canada, the onion set district is practically confined to Huron County, with the village of Hensall the chief centre. The methods used here differ somewhat from those in the Chicago district. The contractors sell the seed to the grower of the sets and buy the sets from the growers in the fall, the price paid this year being four cents per pound. The contractor has his own seed drills and sows the seed for the grower. The method of harvesting is somewhat different also, three rows being pulled and placed in a windrow (no tops removed from the bulb) and left to dry in the sun until such time as the top will rub off when going through the cleaning machine.



Harvesting Onion Sets.

For winter storage they are placed in trays and stored in much the same manner as previously described.

The standard weight for onion sets is forty pounds per bushel in the fall and thirty-two pounds per bushel in the spring, the shrinkage being about twenty per cent.

The estimated onion set production for Ontario is about 300,000 pounds, an increase of over fifty per cent. in the past five years. The Canadian market is from coast to coast, onion sets having been shipped from Hensall to the Yukon.

ONION PRODUCTION IN ONTARIO.

The onion markets of Canada are supplied as follows: In the month of April, Egyptian onions make their appearance and large quantities of

them are sold, especially in the Maritime Provinces and Quebec; a few cars come into Ontario. These are followed by Bermudas, which are not good keepers, and are off the market by the time our own onions are ready. The strongest competitors we have in our markets are the Spanish onions. These come into direct competition with our onions, both in regard to season and price. There are two varieties which come from Spain, Denias, which are the very large Spanish onion, and which are shipped in crates holding about forty pounds; and Valencias, shipped in cases holding approximately one hundred and twenty-five pounds. The price of Valencias varies from four shillings a case upwards, with perhaps an average price of five to six shillings per case, f.o.b., Liverpool.

Owing to the high duty on onions coming into the United States, (forty cents per bushel, compared to the Canadian duty of thirty per cent. *ad valorem*) the consumption of foreign onions per capita is higher in Canada than it is in the United States, and the high American duty practically prohibits Canadian onions from going into that country.

If it were possible for the growers in the shipping districts to form an association to look after the proper distribution of the crop, so as to properly supply the different markets, it would be a step in the right direction. It would also be of material advantage and profit to themselves in the distribution of their crop. In some of the districts there seems to be a dread of over production. This should not be the case, and the sooner the growers get over that idea the better it will be for them. At present we are not supplying our own markets, but import American onions to the extent of over 78,000 bushels annually over our export trade, and these figures are based on a four years' average, as can be seen by referring to the table on page 2. When in Montreal last fall, in an interview with Mr. O'Shea, the Dominion appraiser of fruits and vegetables, regarding the importation of American onions into our markets, the question was asked, how many cars of American onions come into our markets, and to base his estimates on a five years' average? His reply was that he could not tell exactly, but a conservative estimate was an average of twenty-five cars annually.

In supplying the markets of the several Provinces with Ontario onions, the following was learned through correspondence with brokers and commission merchants in the large markets. The Nova Scotia markets will take about thirty-five car loads, containing 14,000 sacks of seven-and-a-half pounds each. About twenty carloads go into St. John, N.B., and about fifteen into the Province outside of the city. The Province of Quebec will take about twenty-five cars annually; Prince Edward Island about six or seven cars of Ontario onions. In Newfoundland, Canadian onions are not a large factor, the market being divided between American and Spanish grown ones. The large firms there have an extensive trade with Portugal and Spain, sending out cargoes of fish, bringing back in their own vessels large quantities of Spanish onions at a trifling freight cost. Newfoundland imports about \$10,000 worth of onions annually, of which Canada sends about \$1,000 worth. Winnipeg and Manitoba import about

twenty-five cars of onions annually. These are almost all brought from Minnesota, as, owing to cheaper freight rates, they can be imported from the United States, duty paid, cheaper than they can be brought in from Ontario, owing to the high freight rates from this Province, the freight rates on onions from Ontario points to Winnipeg being 49 cents per one hundred pounds all rail, and 44 cents per one hundred pounds rail and boat. If the growers in Ontario made proper representation of the situation to the railroads, this might be remedied and a good market for our onions developed in the West.

The variety of onions demanded in the different markets varies, and it would be well for our growers to give some study to it. The Provinces of New Brunswick and Nova Scotia demand a yellow onion. Quebec favors almost exclusively a red onion. Manitoba uses about sixty per cent. of red and the balance yellow. The markets of Ontario want the yellow. The Province of Ontario itself has a large market to supply.



Fertilizer Sower.

The large cities are mostly supplied by the local growers in the vicinity, but immense quantities are shipped to the North Shore of Lake Superior and Georgian Bay. It is estimated that this year it took twenty-five cars to supply these markets. The supply of onions to New Ontario will ever be on the increase.

The wholesale price of onions varies. The average price in Toronto markets per bag of $1\frac{1}{2}$ bushels, 75 pounds, October 1st, was 98 cents; December 1st, \$1.18; February 1st, \$1.26; April 1st, \$1.55. In Montreal markets on October 1st, \$1.14; December 1st, \$1.48; February 1st, \$1.55; April 1st, \$1.63. The above figures are based on the prices quoted for onions on the first of the respective months for the years 1903 to 1908 inclusive.

Using the same prices for the same months, we find that the average price for the crop of any one year, that is, the price onions were quoted at on October 1st and December 1st of the year the crop was grown in, and the price on February 1st and April 1st of the following years, was as follows:—Toronto market, crop of 1902, 75 cents; 1903, \$1.40; 1904, \$1.70; 1905, \$1.20; 1906, \$1.30; 1907, \$1.11; 1908, 80 cents. Montreal market for the same years beginning with the crop of 1902, 90 cents, \$1.80, \$1.77, \$1.32, \$1.75, \$1.25 and \$1.40 respectively. Onions on Montreal market to-day (February 1st) are quoted at \$4 per barrel.

[The above figures cover the past six years from 1903 to 1908, inclusive, the lowest period being for the crop of 1902, when prices averaged seventy-five cents per bag in Toronto market, and ninety cents per bag in Montreal. Seventy-five cents per bag was also the average price the last fall in Toronto. The highest prices reached during the above term of years was in the month of April, 1905, when the price was from \$2 to \$2.25 per seventy-five pound bag, both in Montreal and Toronto markets.

As will be seen by the statistics of the onion industry of Ontario, found elsewhere in this report, the Scotland district in Brant County, the Leamington district in Essex County, and the Clarkson district in Peel County are the largest shipping districts. The Leamington district is the only one I know of where onions are grown on muck soil, the other districts growing them on soil that varies from sandy loam to clay loam.

[The methods used in the preparation of soil, seeding, and growing, do not vary much from those used in the United States, which are described in the early part of this bulletin. The main difference lies in the methods used in curing and harvesting. The Ontario method used is to wait until the tops die down thoroughly before pulling the crop. They are then pulled and put in windrows, being spread out thinly and exposed to the sun. After lying some days they are topped by hand, and two of the windrows are thrown into one during the act of topping, that is, when topping, the onion is picked up and topped and deposited on the other side of the topper on to the cleaned ground. They are then left there for some time, generally until ready to be sacked and delivered to the car.

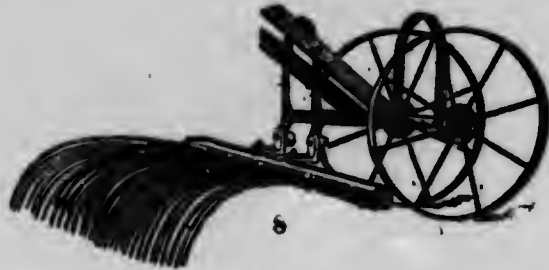
In sacking, baskets are generally used in gathering, which are emptied directly into sacks and a number of sacks placed together. Scales with the weight set at seventy-six pounds are then brought along. These scales are usually placed on a piece of broad board with a piece of rope attached for drawing the scales along from one pile of sacks to another. The bags are placed on the scales separately and weighed, some sacks being found too heavy and some too light. They are all balanced up to weigh seventy-six pounds, one pound being allowed for the bag and seventy-five pounds for the onions. Sufficient care is not exercised by the majority of the growers in gathering the onions. This applies both in regards to having the onions clean and in sorting out the small ones, "thick necks," and injured onions. When it is left to the individual to sort out the onions

and leave the small ones, no two individuals will select the same, whereas the screen treats every one alike.

This fall, upon my return from the American onion districts, I visited the Scotland and Leamington sections and advocated the use of the screen for sorting, with the result that a number of the growers made and used screens for sorting their onions. In conversation with them later in the season, they all claim superiority for the screen and are strong advocates for its use in the future.

In the growing sections of Ontario no provisions have been made for storage and sending the onions to market during the winter months, the storage being done by dealers and commission merchants, who hold them over in sacks, generally storing them in cellars, and it is not a desirable way of storing onions for future sales.

It will be seen from the foregoing table of average prices, that the price of onions rises about in proportion to the length of time they are held after harvesting and leaving the hands of the grower. In my experience and memory of onion prices, covering twenty-five years, we had two



Hallock Weeder.

crops (one of which was the crop of 1902) in which prices did not rise above the price set at harvesting; the balance of the time, it would have been a paying proposition to have stored at least a portion of the crop.

GENERAL CONCLUSIONS. From a study of the foregoing it will be seen that to place the growing of onions on a good sound basis, the following points are worthy of consideration...

A study of the different markets, and the varieties demanded by them.
Good seed.

A study of soils and fertilizers, for the improvement of the crop, and increased yields.

A study of the insect pests and fungous diseases attacking the onion and the best means of combatting them.

The adoption of better methods in curing and harvesting, so as to place them on the market better in appearance, color, and condition.

The use of screens in the preparation of onions for market.

The formation of an association for the purpose of distributing the crop, so as to supply the different markets, and to avoid overloading or glutting any one market. This Association could also work for better freight rates, and the development of new markets, especially the Western Provinces.

Local associations in the growing sections will aid materially in the production of better crops, the gathering of statistics and information relating to the growing and disposal of the crop, and the distribution of that information through its members and otherwise.

Co-operative associations in the larger onion sections should be of material advantage to the growers. Under capable management they could buy their seeds, fertilizers, machinery, etc., and dispose of the same to their members cheaper than they could be secured individually, erect storage and shipping houses, and dispose of the entire crop of the growers in any one section through their manager, who could devote his time to the selling end of the business, advertise and extend their markets; in fact, do everything to help the sale and consumption of onions. Local experimental work could also be done to better advantage under an association than individually.

Experiment with growing onion seed in Ontario, with a view to producing our own needs in onion seed, if it can be done economically.

FUNGOUS AND INSECT PESTS.

Onion blight, or mildew, is a common disease of onions in Ontario. The fungus usually appears on one side of the leaf, about midway between its tip and base, from which it spreads rapidly through the entire leaf, causing it to wither and die. It usually makes its appearance after the bottoms have attained considerable size, and causes a premature dying, or ripening of the crop.

TREATMENT. Clean culture, the removal of all refuse or litter from the soil as soon as the crop is harvested. Spray with Bordeaux mixture, using a "sticker" made as follows: Resin, two pounds; sal soda crystals, one pound; water, one gallon. Boil till a clear brown color, usually taking one to one and one-half hours. Use an iron kettle. Dilute above amount with thirty gallons of Bordeaux mixture for use on cabbage or onions. Spray with Resin-Bordeaux made as follows: Melt five pounds of resin with one pint of fish oil over fire, cool slightly, add one pound soda lye with stirring; and five gallons of water and boil until the mixture will dissolve in cold water. Use two gallons of the mixture with forty gallons of Bordeaux.

SMUT OR BLACK SPORE. This is most troublesome on white onions, and, when it becomes very bad, makes them almost unsaleable. Soak the seed for one hour in formalin solution: Formalin (40 per cent.) one ounce to two gallons of water.

THRIPS. These are very minute insects, about one twenty-fifth of an inch in length, of a pale yellow color. They generally occur in very large numbers, and the injury is visible in the form of small yellow spots on the leaf, increasing in size until the tips of the leaves become yellow or brown. This greatly reduces the vitality of the leaf, and hence its efficiency as a bulb-builder.

TREATMENT. A good heavy rain washes off and destroys considerable numbers of them. They can also be kept in check or destroyed by spraying with kerosene emulsion, used at the rate of one part of emulsion to ten parts of water.

ONION MAGGOT. The adult is a small fly, about half the size of the common house fly. The eggs are laid on the young plants early in the spring, and hatch in a few days, when the larvæ burrow into the bulbs. When full grown they pass into the soil and become pupæ, and the adult fly emerges some days later.

PREVENTIVE MEASURES AND REMEDIES. A quick acting fertilizer in conjunction with planting at the right time. Crude carbolic emulsion, sprinkled along the rows over the plants once a week. Making a furrow along the row of plants, in which is distributed a light dressing of nitrate of soda, and replacing the earth, helps on some soils. Some growers mix a small quantity of radish or turnip seed with their onion seed before sowing, and claim to get good results. Others sprinkle their onion seed slightly with kerosene or turpentine, believing that the smell of the same acts as a repellent to the fly from laying her eggs. Finely powdered tobacco dust sprinkled on the plants has been used as a preventive with some success.

CUT WORMS. The use of poisoned bait placed through the garden will be found effective, this can be made as follows: bran, 50 pounds; molasses, 2 quarts; Paris green, 1 pound; and enough water to make a thick mash.

VARIETIES OF ONIONS.

Yellow Danvers (1) also known as Flat and Round Danvers, a round onion of good size; thin yellow skin, flesh white, fine grained, firm and of excellent quality; it ripens early, usually a week or ten days earlier than yellow Globe Danvers; a good keeper, largely used for growing sets.

Yellow Globe Danvers (5) is a selected strain of the preceding variety; the bulbs are thicker through, but not perfectly globe shaped like the Southport Yellow Globe; flesh and quality the same as Yellow Danvers.

Southport Yellow Globe (7) is of large size, perfectly globe shaped, skin yellow, flesh white and of good quality; a good keeper. It matures about a week later than Globe Danvers; a very profitable onion to grow.

Prizetaker (9). The best of the large mild onions; usually used for transplanting; skin light yellow straw color, flesh white and very mild; not a good keeper.

Australian Brown (4). A round flat onion, matures early; skin dark brown, flesh white and very firm; a good keeper. Onions of this variety have been known to keep a year.

Golden Globe (6). A globe shaped onion with light straw colored skin, flesh white and mild; probably the earliest maturing globe shaped onion.

Early Flat Red (2) of flattened form, not so thick through as the Wethersfield; matures early and will often form bulbs on a cold soil where other varieties fail; a good keeper, used largely for growing sets.

Red Wethersfield (3). Grows to a large size, rather flat in shape, skin deep purplish red; flesh purplish white, moderate grain, flavor rather stronger than the yellow onion; a good keeper.

Southport Red Globe (8). A handsome onion of perfect globe shape, grows to a large size; skin deep red, flesh fine grained, mild and tender; a good keeper and deserving of general cultivation.

Southport White Globe. Resembles the Southport Red Globe in shape; both skin and flesh are pure white, fine grained; mild flavor, good keeper. This variety commands the highest market price, but requires more careful handling than the red or yellow varieties.

Barletta, used very largely for pickling, is a round white onion of handsome appearance.

THE EXTENT OF THE ONION INDUSTRY IN ONTARIO.

Below will be found acreage and yield of onions of 18 counties of this Province, as accurate as is possible to obtain by correspondence. There were shipped from Scotland station 94 cars of onions, from Leamington, 68 cars, from Brantford, 14 cars. These shipments cover the 1908 crop and are from the beginning of the shipping season to February 1st, 1909.

County.	Acreage	Average yield per acre. Bushels.	Total yield. Bushels.	Variety and per- centage of each.
Brant.....	185	350	64,750	90 Y., 10 R.
Essex.....	100	400	40,000	55 Y., 45 R.
Carleton.....	90	400	36,000	50 Y., 25 R., 25 W.
York.....	60	375	22,500	95 Y., 5 W.
Peel.....	60	350	21,000	88 Y., 12 W.
Norfolk.....	35	375	13,125	85 Y., 15 R.
Simcoe.....	35	300	10,500	90 Y., 10 R.
Lambton.....	20	275	5,500	90 Y., 10 R.
Frontenac.....	20	150	3,000	75 Y., 25 R.
Haldimand.....	15	300	4,500	50 Y., 50 R.
Lennox.....	10	300	3,000	50 Y., 50 R.
Wellington.....	9	250	2,250	90 Y., 10 R.
Huron.....	8	300	2,400	85 Y., 15 R.
Oxford.....	7	400	2,800	80 Y., 20 R.
Grey.....	6	300	1,800	90 Y., 10 R.
Hastings.....	6	285	1,710	50 Y., 50 R.
Elgin.....	4	315	1,260	85 Y., 10 R., 5 W.
Ontario.....	3	200	600	100 Y.
Total.....	673	312	236,695	Y. denotes yellow, R. red & W. white.

Of the average yield per acre, 77.7 per cent. were yellow, 19.7 per cent. red, and 2.6 per cent. white.

