THE CRANBERRY INDUSTRY
Its possibilities in Canada

By M. B. DAVIS, B.S.A.,
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A well kept bog showing main ditch with flood gate in distance. Photo by M. B. Davis.

The Cranberry Industry and its Possibilities in Canada

(By M. B. Davis, B.S.A., *Chief Assistant to the Dominion Horticulturist*)

The culture of cranberries, although not a widely established industry in the Dominion as yet, can be conducted with profit in many sections which at present know practically nothing of the growing and care of this crop. With the exception of the work done on a few bogs in Nova Scotia, Prince Edward Island, Quebec, and British Columbia, very little has been done in Canada to further the production of this crop, although there are, doubtless, many acres of unemployed land suitable for cranberry bogs.

Canada imports most of its cranberries from the United States. These cranberries could, it is believed, be grown in Canada at a profit, and at such a price that the home market could be kept for the Canadian berries.

As a very large portion of the crop imported from the States is grown on Cape Cod, it will be readily seen that the freight haul of the United States grower is very little less, if any, than that of a Canadian producer who desires to use the western markets.

It would appear, therefore, that there is an excellent opportunity in Canada for the planting of cranberry bogs, which means the utilization of lands which at present are lying idle.

THE CRANBERRY

The average person in speaking of cranberries will mention the "high bush' cranberry and the " low bush " cranberry. It is with the latter that this bulletin deals. The " high bush" cranberry is botanically known as *Viburnum Opulus*, and the well-known Snowball, so often used as an ornamental shrub, is a cultivated type of this species. The berries produced by this shrub are often used as a substitute for the common cranberry, but the latter commands a more ready market.

The common cranberry, that is, the cranberry that is offered for sale on the open market, and which is called the " low bush " cranberry, belongs to the genus *Vaccinium*. There are two common species indigenous to this country, viz., *Vaccinium Oxycoccus* and *Vaccinium macrocarpon*. It is the latter species which embraces the many varieties of cultivated cranberry grown on Cape Cod. *Vaccinium Oxycoccus* is a much smaller plant than *Vaccinium macrocarpon*. Its leaves are narrower, its runners much shorter, and the fruit much smaller and generally more ovate than *Vaccinium macrocarpon*. Another species of *Vaccinium* is exported from Newfoundland in considerable quantity, it growing there in the wild state. This species is commonly known in this country as the Partridge Berry, being the same as the Swedish Lingon Berry, and is botanically classed as *Vaccinium Vitis-Idœa* var. *minus*. Little is known of the possibilities of the cultivation of either *V. Oxycoccus* or *V. Vitus-Idœa*, although there seems no reason to doubt but that both may eventually find an important place in commercial horticulture. *V. macrocarpon*, however as before stated, has been under cultivation for many years, with the result that many commercial varieties have been introduced, and the fruit is now in widespread demand. It is with the culture of *Vaccinium macrocarpon* (the large or American cranberry) that the following pages will deal.

SELECTION OF THE CRANBERRY SITE

The selection of the site for the prospective cranberry bog is the first important consideration. Cranberry sites may be roughly divided into two classes: low bog and high bog sites. The former is, year in and year out, the more profitable site. The term "low bog" is used because, as the name implies, the bog is situated on low ground, thus enabling it to be flooded. The selection of a "low bog" site will first be dealt with.

The "low bog" site is, if well selected, the ideal situation for profitable cranberry culture. Four essential points must be considered. These four points are:—

1. Soil.
2. Location of sand.
3. Drainage.
4. Water privileges.

SOIL

Cranberries, when cultivated, do best under conditions closely approaching those they grow under in the wild state. That is, they prefer low land, which is moist, or swampy, soil composed of a muck or peat formation. A few inches of this muck or peat, however, will suffice and may frequently have a sub-soil formation of blue clay or sand. Again, bogs are often seen which are growing well on hard bottom, that is, the soil consists of sand alone, without the peat or muck on top. Such bogs will, of course, require more fertilizer than the muck or peaty bog, which does well for years on the plant food contained in the muck and peat formation. Frequently a clay swamp, when in a good damp location gives excellent results as a cranberry bog. Meadow land which has been brought under good cultivation, although possessing the necessary soil requisites, should not be used for cranberry culture, for such lands would be liable to prove too weedy, and furthermore other lands which are incapable of being used for general farm purposes to good advantage, will make just as good cranberry bogs.

SAND

Sand is a necessary article in cranberry production. Without it it is impossible to grow cranberries at a profit. Even the best soil and location, without access to a sand bank, is not capable of good results. Sand is the all-important element, the first great step towards success, in cranberry culture. Although a moisture or water-loving plant, the cranberry requires a few inches of well drained, well aerated soil on the surface, in order that it may do its best. Not only is sand necessary for this purpose, but, as will be shown later, it is useful in the control of moss, prevention against frost, etc. The close proximity of the bog to a good supply of coarse, gritty sand then is an essential point. Sand with clay mixed in is not good for this purpose. It must be clean sand, and, although a coarse sand is considered better, fine sand will give good results, if it is clear gritty sand. As sanding is an operation that will need to be carried on at frequent intervals, a goodly supply is needed, and to cut down the cost of handling, the bog should be located as closely as possible to the sand supply.

DRAINAGE

Another important point to be considered is drainage. The bog should so lie that an outlet can be obtained for excess of water in the early spring, otherwise it might be impossible to have the bog free of water in sufficient time for the plants to blossom and set fruit. As the bog now being considered is a low

bog, the water from the surrounding highlands will of course, drain into the bog, so that an outlet to carry off this water is an essential point.

WATER PRIVILEGES

A bog possessing good water privileges, possesses the best insurance possible. If the water privileges are such that the bog can be flooded at any time during the season, the owner of such a bog is in a position to fight frost and drought to excellent advantage. Many low bogs, although in positions where they can be flooded in the fall of the year, are not where they can be reflooded by gravitation after the spring waters have been let off the bog. This is a distinct disadvantage, but one which in many cases can be cheaply overcome by the installation of a pumping plant, which will raise the water from a lower level in such quantities that the bog can be re-flooded in a few hours. These pumping plants are easily procured and are good investments, where water cannot be obtained by gravitation. Many bogs have the reflooding water lifted as high as twelve or fifteen feet, while a six-foot lift is very common, in fact there are very few bogs which have a gravity water supply at their disposal for re-flooding purposes. Such bogs are worth a great deal, for they are ideal for profit making. The selection of the bog site, then, from the standpoint of water supply is an important point and one that should be given much consideration. If it is impossible to locate near a constant gravity supply, locate at as low a level as possible, to make the lift reasonably short, in case it is deemed advisable to install a pumping plant. Every prospective cranberry grower should look into the cost of installing a pumping plant for his bog. The question of pumping outfits is discussed in another paragraph.

THE HIGH BOG

The high bog site is only resorted to when it is decided that it is impossible to locate in a low site. A high bog is one located on such high lands that it is impossible at any time of the year to flood it by gravitation, so that the bog has to go through the winter without any water as a protection. The drainage of such a bog is, of course, an easy matter, as the location is higher than the surrounding land, and also because but little drainage is required. The two important points to consider then are soil and sand. Both of these points were discussed under the selection of a low bog site, and the same recommendations hold good for the high bog.

PREPARATION OF THE LAND

Having selected the best available piece of land for the cranberry bog, it now remains to prepare the same for the reception of the plants or vines.

The first step necessary will be to ditch or drain the bog. This will require considerable judgment and a knowledge of the levels of the area. A marginal ditch opening into the outlet should first be dug. This marginal ditch is dug around the outside of the whole area and thus cares for the water from the surrounding high lands, and also serves as a barrier for weeds and many insect pests from surrounding lands. If the bog is wet, cross ditches will need to be dug across the bog. This should be done by digging one large or main ditch with laterals leading off from this. The closeness of these laterals will depend upon the amount of water to be drained from the bog. Many bogs have the ditches closer than is absolutely necessary from a drainage standpoint, but, on the other hand, the increased number of ditches renders the distribution of flooding water an easier and quicker task, for a bog which has but few cross ditches is liable to have the flood water pile up and do injury to the vines. Such

A well vined bog, showing main ditch with dam or outlet in distance. Photo by M. B. Davis.

PLATE No. 3.

Showing method of hacking bushes, stumps, etc.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 4.

Showing removal of turf and bush stumps.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 5.

Dyke building. Hauling turf to the dykes
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 6.

Showing the construction of a dyke.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

a bog is also slower to flood than if the water was well distributed through a system of ditches. At the time the ditches are dug, provision should also be made for the location of flood gates and drainage gates. Plate No. 1 shows a main ditch with the flood gate in the distance. The pump house is also shown in this picture. Fig. No. 2 on the other hand, shows a main ditch with the dam or drainage gates.

Having completed the drainage system, the bog by this time will be dry enough to permit of work at clearing. Of course, if the bog can be cleared before being drained, this would be the first operation and drainage the second, the order of these depending upon conditions. By clearing is meant removing trees, bushes, stumps, etc. The bush and old stumps are piled in heaps and burned on the bog. After all the bushes, trees , etc., are disposed of, the next operation is to pare the land. This consists of removing the top sod, by cutting it into strips and hauling it off in wheelbarrows, using planks for the barrows to run on. It is sometimes advisable, where the land will bear a horse, to cut the sod into strips by the means of a turf cutter, which is simply a long bar or plough arm with a colter attached. These strips may then be cut into small sections and lifted with a two-prong fork into the wheelbarrows. If the turf is not weedy, it may be turned over and allowed to remain where it is, thus reducing the cost of building the bog.

DYKING

The turf taken from the bog is then utilized in building the dykes. These vary in width, of course, depending upon the amount of water they will be required to hold back. It is often advisable to make the dykes wide enough to serve as a roadway around the bog. Dykes should be built wider at the bottom than at the top, and a properly constructed dyke has a trench dug below the centre and running lengthwise of the dyke. This trench is dug to hardpan and filled with gravel and sand, thus making a good connection with the underlying soil for holding water. The dyke should also be constructed a few feet outside the marginal ditch. At the time of erecting the dykes, provision should be made for the building of the flumes, which admit the flood waters and which also carry off drainage water. These may be built of wooden planks or concrete reinforced, the latter making a much more permanent job.

At the time of clearing the bog and dyking it, attention should be paid to the levels. A bog which is uneven or hilly takes a great deal more water to flood it than a level bog, for the water has to be high enough in the depressions to overflow the higher portions. This will necessitate a higher dyke and more expense in flooding, as well as increased time in reflooding operations. Instances may occur, of course, when it would be very expensive to level off the bog at all. In such cases it may be that the bog, if at all large could be divided into several smaller ones by means of dykes, and each smaller bog thus made to approach a level. This would facilitate flooding, for the water could be led through flumes to the various small bogs.

Having completed the ditching and levelling and removal of the debris, the next operation consists of sanding. For this, planks are laid across the bog to the sand pit, the sand carried out on to the bog in wheelbarrows and dumped in small piles, the planks being shifted as soon as one strip is completed. Immediately following the wheelbarrows are men with shovels and levelling rakes, who level off the sand heaps. In this manner three or four inches of good sand is placed over the whole bog. Instead of using planks and wheelbarrows, platforms about ten or twelve feet wide and six long may be used, on which a team can be driven. These platforms are laid across the bog and the wagon load of sand spread on both sides, after which the sections are turned end over end to another portion of the bog, and the operation repeated. Again other growers use a pole railway, the rails being built in sections, but unless the haul is very long, the wheelbarrow method appears to be the most practical.

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PLATE No. 7.

At the sand pit.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 8.

Levelling the sand heaps.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 9.

Showing a marking machine in use.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

PLATE No. 10.

Dibbling in the vines.
Courtesy A. D. Makepeace and Co., Wareham, Mass.

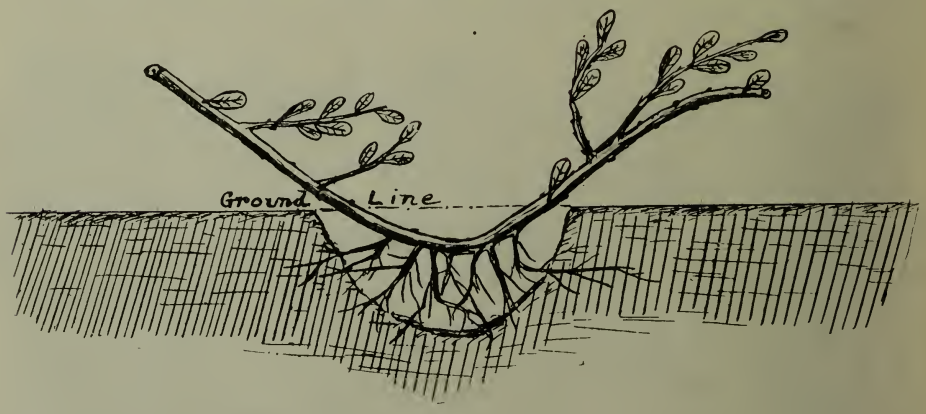
Following the sanding comes the operation of marking the bog for the planting, which should be done in the spring of the year. For the purpose of marking, a machine such as is here illustrated, is used.

This machine makes the lines the desired distances apart and the marking is done both ways, so that the vines are planted at the intersections of the cross lines. The distance is generally one foot apart each way.

PLANTING

For planting, the long trailing vines of the cranberry are used. They are generally cut from around the edges of the ditches and dykes of older bogs. These vines are placed in large baskets, of which each planter takes one and a dibble, and crawling on hands and knees, commences to dibble in the vines. Generally two vines are placed in a hole. This is accomplished by picking up the vines in one hand, placing them flat upon the ground so that they lie across the intersection, and pressing them into the soil with the dibble at this point, at the same time firming the soil with the hand which was holding the vines.

SHOWING ONE METHOD OF PLANTING VINES. Illustration No. 11



SHOWING NOVA SCOTIA METHOD OF PLANTING VINES. Illustration No. 12

This leaves the ends of the vines sticking up and the U-shaped part in the ground The accompanying illustrations will illustrate this point more clearly.

In addition to this system of planting, there is another one used by the Nova Scotia Growers quite extensively. It consists of marking the bog one way only, putting the rows one foot apart, and in some cases as far as eighteen

inches apart, long vines are then used, and are planted by pressing them down into the sand at intervals of every few inches, thus making one continuous row of vines. This is illustrated in Fig. No. 12.

Both systems are good, although the Nova Scotia growers claim that by their system a bog is vined over more quickly.

This brings the bog to its completion. It is now ready for its annual care. Before discussing that, however, a few words must be said concerning the high bog, for so far the treatment has been for low bogs. On the high bog the operations are the same as on the low, except that no dykes are needed, fewer ditches are required, and no preparation for reflooding is made, since it is impossible to obtain water.

TREATING THE NEW BOG

After the planting or vine setting has been successfully completed, if the bog has reflooding privileges, it should be re-flooded immediately. The ditches should be filled and the water held close to the surface for a couple of days. This will give the vines a start in their new home. After this the water should be drawn off to the bottom of the ditches. Unless a very severe drought sets in, this will be all the reflooding necessary the first season. Throughout the season attention should be given to weeds and all these removed to give the vines as much chance as possible. Weeding the cranberry bog is as important as weeding any other crop.

WINTER FLOODING.

In the fall, after freezing commences, attention must be paid to the winter flooding. The young bog. should not be flooded for winter until the ground begins to freeze solid enough to cause some heaving. Care must be taken also not to delay the winter flood too long, or heaving of the vines may take place, with consequent serious results. The winter flowage should cover the vines to a depth of several inches, and is left on the bog until early spring. On the young bog it is removed during April. Care must be exercised, during quick thaws and spring freshets, to allow all the surplus water to drain off the bog, otherwise when the ice breaks up, the freshet may cause the ice to rise and tear up some of the vines, which are frozen in it. This will not occur on a well-drained bog, if care is exercised.

During the first three years, the bog is treated as above mentioned, some attention being given to weeds. It must be remembered that many of the weeds which first appear are killed by the winter flowage, so that by acquainting himself with the various weeds present, the grower will soon learn how to control them in the cheapest manner. When the bog has reached its fourth year, it should be ready to bear, and the treatment of the bearing bog will differ from that given a young bog. The winter flowage of the bearing bog should be delayed until early winter, delaying it as long as possible without risking the danger of any severe winter killing. The time of removing the water in the spring will depend upon the conditions. If fruit worm is not present, the winter flowage should be removed as early as possible, but if fruit worm is present this flowage should be held until the latter part of May in Eastern Canada. The bog should be reflooded again during the first part of June, this second reflooding clearing it of fire worm and other pests that may be present. It generally should remain on the bog for about two days. Like other plants, the cranberry is better if watered at night, so that this flowage should be put on and removed during the night time.

PROTECTION AGAINST FROST

The grower who is in a position to reflow his bog during the latter part of May and early part of June has little to worry about from spring frosts. Spring frosts often cause a failure of the crop, or an early fall frost may ruin a crop of nearly mature berries. There is no better protection against these frost ravages than water, and it is not necessary to cover the vines completely. Enough water should be put on the bog to cover the sand to a depth of two or three inches. This is sufficient to maintain a temperature above freezing, as the water radiates its heat into the air. Bogs should not be flooded during blossoming or after blossoming. The greatest amount of frost injury is done when the young buds are expanding. Frost injury at this period often escapes the notice of the grower, who may wonder why his bog has not blossomed that year. During September and October it will often be found necessary to flood again as a prevention against fall frosts. Vines and fruit in the fall will, of course, stand a certain amount of frost, and it is not advisable to flood except when absolutely necessary. Slight frosts can often be prevented by simply filling the ditches, without flooding the bog at all. During both spring and fall, re-flooding for frost protection purposes should not be resorted to without good reason, and in connection with this point, the grower is advised to keep in touch with the nearest Meteorological bureau and obtain from them the probabilities each day. It is, of course, inadvisable to rely solely upon this source of information, so that the grower will necessarily have to be alert on nights when frosts threaten, and learn to acquaint himself with weather peculiarities.

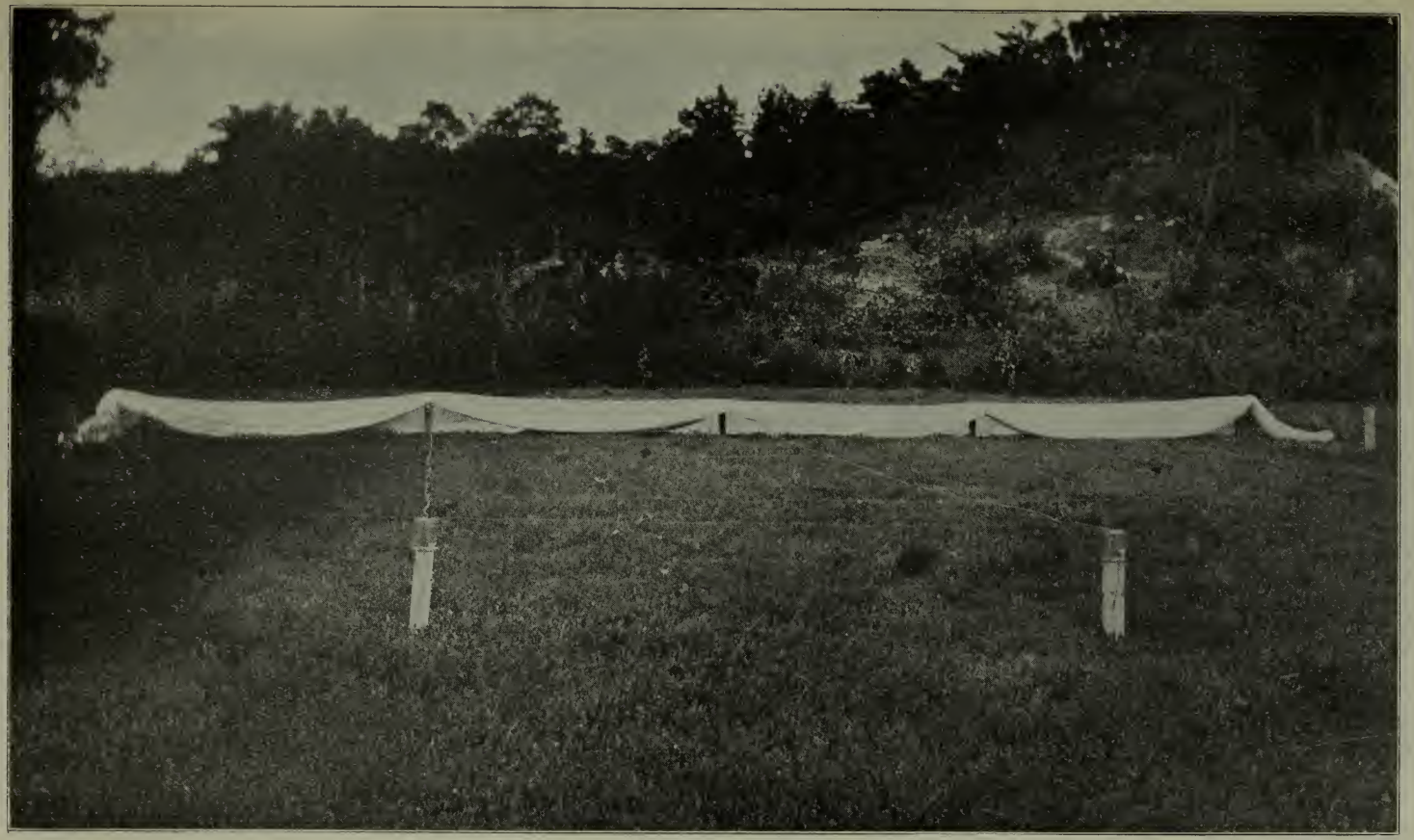
On bogs where it is impossible to reflood for frost protection, an ordinary frost can be combatted by the use of tobacco shade cloth. This material is moderately cheap, and, with proper care, will last a long time. In the accompanying illustrations the method of using this cloth is shown. The photos were taken on the State Experimental bog of Massachusetts at Wareham, and the method of suspending the cloth originated with that Station.

The cloth is obtained from the factory in bolts fifty feet in width, and is then cut into fifty-foot strips. A piece of rope is sewed around the edges of the square of cloth and it is then ready to suspend over the bog.

The cloth, as shown in plate No. 13, is suspended about one foot above ground on wires, which are strung on wooden stakes, placed twelve and a half feet apart around the fifty-foot square. To avoid any sharp edges on which the cloth would catch, the tops of the stakes have round tin cans inserted over them and the wires are held in position by staples which are driven through the can and into the stake. To avoid any loose ends of wire, the wire is then carried down the side of the stake to which it is stapled and the loose end stuck in the ground. Arranged in this manner it is a very easy matter to rapidly cover an acre of bog by simply hauling the cloth, as shown in Plate 13, over the wires to the position illustrated in Plate 14. Two men are required to accomplish the operation, each taking hold of one side of the cloth. The stakes and wire frame are, of course, permanent fixtures for the bog, while the cloth is removed each fall and properly stored over winter.

RE-SANDING

A bearing bog should be re-sanded at least every other year, and it seems that the fall, after picking time, is the best period of the year for this purpose. At this season the least amount of injury is done to the vines, unless, of course, the sand be spread on the ice during the winter. Bogs left for some time, without being re-sanded, get in very poor condition, for sand serves many purposes. It gives the runners a better opportunity to root by fastening them down, it forms a better medium for the roots to grow in than would the peat, for it is



Showing wires on which cloth is suspended.

Photo by M. B. Davis.

Showing cloth hauled over wires ready to keep off frost.

Photo by M. B. Davis.

capable of better aeration; it is a protection against frost, as it absorbs considerable heat during the day, which it radiates at night, and it helps materially in the control of weeds and moss. Re-sanding is also necessary from time to time to supply new soil for the roots, otherwise they may become soil bound to a certain degree.

FERTILIZING

On most bogs no attention need be paid to the question of fertilizer. Generally there is sufficient plant food in a bog to supply the vines, and, with a healthy growth of vines, fruit should result. There are instances, however, where it may be necessary to resort to the use of a little nitrate of soda to promote vine growth. Bogs needing such treatment would be those planted on hard bottom, that is where very little peat is present to supply any nitrogeneous matter for the plants' use.

PRUNING

In cases where the vines become undesirably thick, it may be advisable to practise pruning to a limited extent. This is accomplished with a pruning rake, shown in fig. No. 15, which is used to thin out the vine runners. This practice is not to be recommended, except in cases of a very thick, matted vine growth.

PICKING AND CARING FOR THE CROP.

The time when picking is commenced will vary much with the varieties grown. Like all other fruits, there are early and late varieties among cranberries, so that the picking season extends over quite a period. In Cape Cod it generally runs from September 1 to well in October, whereas in Nova Scotia it rarely starts before the middle of September and has to be rushed along rapidly to avoid fall frosts. The berries should be allowed to colour on the vine as much as possible, for a well-coloured berry will bring a much better price than a poorly-coloured one. For picking purposes a scoop is used. The scoops vary in width considerably and are illustrated in plate 16.

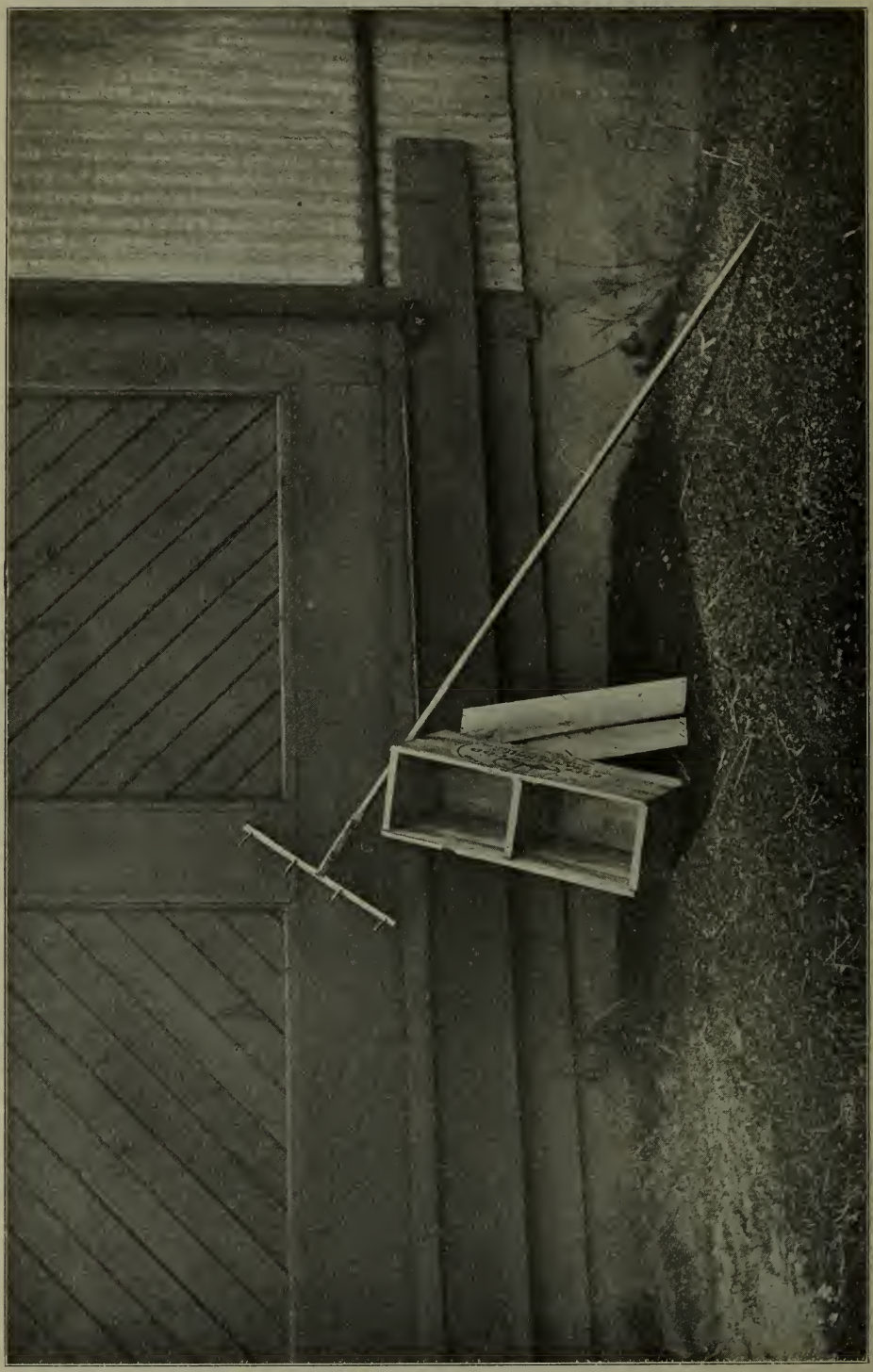
The thin portions and edges of the bog are picked by hand and this is generally done before the scoop picking commences. To keep the pickers in line and give them some guide, strings are put down, thus dividing the bog into narrow sections. These strings act as guides and prevent the pickers leaving patches of unpicked berries. This system is illustrated in plate 17.

As cranberries should not be handled or stored while wet, picking should not commence until after the dew has thoroughly dried off the vines. Likewise, picking operations should not be conducted during wet weather. If reflooding has to be resorted to during the picking season, on account of frosts, no picking can be done the day following the reflood. After picking for the day is well under way, some men will be necessary to take the berries in boxes and wheel them off the bog to the highland whence they are hauled to the screenhouse. The type of box used for this purpose is illustrated in figs. 16 and 18. The berries are stored in these boxes in the screenhouse until they can be graded and barreled for the market. The screenhouse is simply an outbuilding, which is capable of being made frost-proof, and which is supplied with good light in the room where the screening is done.

The berries are first run through a separator, similar to the one shown in plate 19.

This separator is provided with a fan for removing the chaff, and also with several bounding boards which take out the rotten and light berries. If the berries are free from fruit worm injury, they may be immediately packed after they come from the separator, but if fruit worm injury is present they will have to be put over the screens. These screens vary in shape, but simply consist of

PLATE No. 15.



Showing a pruning rake, also a bushel cranberry box used for marketing fancy berries in small packages. Photo by M. B. Davis.

Showing scoops used in picking, cranberry barrel and storing crates. Photo by M. B. Davis.

Cranberry pickers at work. **Note strings put down to guide pickers.** Photo by M. B. Davis.

Showing cranberries being hauled to the screenhouse in the bushel crate referred to in text. Photo by M. B. Davis.

PLATE No. 19.

A Cranberry Separator.

Photo by M. B. Davis.

Interior of a screenhouse, showing screens in position.

Photo by M. B. Davis.

long troughs painted white, down which the berries roll into a barrel at the end. One or more operators stand along these troughs and pick over the berries as they roll by, removing all those affected by fruit worm and permitting only the sound berries to go to the barrels. The interior of a screenhouse, showing these screens, is shown in plate 20. The berries are then packed in barrels, a cranberry barrel holding about eighty-five quarts of berries. The berries should be well packed and pressed tightly in the barrel, for loosely packed barrels command a poor price on the market, for the rattling around in the barrel causes much damage to the fruit.

ENEMIES.

Like all other crops the cranberry has its enemies, both insects and fungous diseases taking their toll. As little is known concerning the control of fungous diseases of the cranberry, attention will here be given to the control of the most important insect pests.

The fruit worm.—One of the most important cranberry pests is the fruit worm. This insect, in its larval state, eats its way into the berry, and late in the season those berries which have been affected by the fruit worm will collapse in many cases, while others will remain solid, only to go bad while in storage. The work of the worm is readily distinguished by a casual observer, so cannot be mistaken or overlooked. To control this pest, the winter flowage should be held late in May. As it would be bad practice to follow this plan every year, it is well to make it a habit to hold the water late every other season, when the worm is present. This has proved a very good remedy for this pest.

The flowed bog fire-worm received its name from the fact that its work resembles that of a fire. This pest has been known to do much injury in Nova Scotia, and where a supply of water is not available for reflowage, it is very difficult to control this pest. On bogs that can be reflowed, it is easily controlled by an annual June reflowage, about the end of the first week in that month. If the bog is so located that it is impossible, to reflood, spraying with arsenate of lead is recommended.

The dry bog fireworm can be successfully controlled by one spraying of arsenate of lead, when the insect is in the young larval state and before it has done much damage. If the spray could be applied just as the insect was hatching, it would be sure to catch them in the young stage.

Another insect causing much trouble on some bogs is the tipworm. This insect attacks the newly-formed buds at the tip of the new shoots, and in this manner can greatly reduce the next season's crop of berries. The Cape Cod growers find that if resanding is done every other year, this insect rarely, if ever, becomes a serious menace.

The last insect pest that will be here spoken of is the girdler. This insect works in a sort of circle and a bog will often be seen with circles of dead vines in it; this is the work of the girdler. The control for this pest is to reflow after picking is over. On bogs that cannot be reflowed the only remedy is to keep them well sanded.

VARIETIES.

As no test has ever been made in Canada of varieties of cranberries, it is impossible to make recommendations in this regard. In Nova Scotia a native berry resembling very closely the Late Howe variety of Cape Cod is used for cultivation. In the latter locality many varieties are used the earliest being the Early Black, which is very widely grown. In districts having a short season it would seem that the Early Black should be tried. Although widely grown, this variety cannot be classed as a high-class quality berry. Another berry of great prominence is the Late Howe. This berry is of poor table quality, but, like the

Early Black, is well-known. It is a good keeper and makes a good vine growth. Among the better quality berries the writer was struck with the Perry Red, which is a large, dark-red berry of very handsome appearance and of excellent quality. One of the most prolific berries is a new variety called Vose's Pride. This variety has the objection, however, of being somewhat pear-shaped, but is well-coloured, of good quality, and as stated above, very prolific. For Canada it would seem that early varieties were the best to plant, as, in most sections, the season is rather shorter than in Cape Cod. Until some data on varieties for this country are at hand, growers would do well to utilize our native berries, which are found in all parts of the country, and some of which are really first-class stock.

In planting a single bog area, one variety only should be used, that is, do not plant two varieties which will both be bounded by the same dyke. The reason for this precaution is that different varieties have fungous diseases and insect troubles peculiar to themselves, so that to have a variety of troubles on one bog would merely complicate the management of that area.

PUMPING OUTFITS.

When installing a pumping plant for reflowage purposes, always get a larger capacity pump and engine than will actually do the work. Never tax an outfit to its utmost or it will soon refuse to do its work properly. If possible, purchase the plant from a firm that has had previous experience in installing pumping plants for cranberry bogs. If the lift is under six feet, the ordinary propeller pump is probably the cheapest and most efficient, but if the lift is greater, the rotary pump will have to be installed.

In estimating the capacity of pump required, it should be borne in mind that the capacity must be great enough to flood the bog in question in six or seven hours' time to a sufficient depth to protect against frost. The following table will, probably, be of benefit in estimating the amount of water required:—

Approximate time to flood One Acre—in Hours and Minutes.

Depth in inches per acre.	Gallons on each acre.	Time Required, with Quantity of Water available to flow each minute.					
		100 gals. per m.	500 gals. per m.	1,000 gals. per m.	5,000 gals. per m.	10,000 gals. per m.	20,000 gals. per m.
1 in.....	27,154	4 h.	54 m.	27 m.	5½ m.	2 m. 40s.	1 m. 20s.
2 "	54,309	9 h.	1¾ h.	55 m.	11 m.	5 m. 30s.	2 m. 45s.
3 "	81,463	13½ h.	2¾ h.	1¼ h.	16 m.	8 m.	4 m.
4 "	108,617	18 h.	3½ h.	1¾ h.	22 m.	11 m.	5½ m.
5 "	135,771	22½ h.	4½ h.	2¼ h.	28 m.	14 m.	7 m.
6 "	162,926	27 h.	5½ h.	2¾ h.	33 m.	16½ m.	8¼ m.
7 "	190,080	31½ h.	6½ h.	3¼ h.	38 m.	19 m.	9½ m.
8 "	217,234	36 h.	7½ h.	3¾ h.	44 m.	22 m.	11 m.
9 "	244,389	40½ h.	8 h.	4¼ h.	49 m.	25 m.	12½ m.
10 "	271,542	45 h.	9 h.	4¾ h.	54 m.	27 m.	13½ m.
11 "	298,697	49½ h.	10 h.	5¼ h.	60 m.	30 m.	15 m.
12 "	325,851	54 h.	11 h.	5¾ h.	1 h. 6 m.	33 m.	16½ m.
18 "	488,777	8½ h.	16 h.	8 h.	1 h. 38 m.	49 m.	24½ m.
24 "	651,703	108½ h.	22 h.	11 h.	2 h. 10 m.	1 h. 5 m.	32½ m.

To find time to flood a bog to a given depth, it being assumed that the ditches are full and the water over the roots of plants (evaporation and seepage not considered), multiply time given in column under gallons per minute and opposite the depth in inches, by the acres to be flowed.

Knowing the area to be flooded, the capacity of the pump to be purchased will be decided on the amount of time that can be allowed the outfit to flood the bog to a certain depth. For instance, given a bog of three acres, with the water

ten feet below the bog, what capacity of pump is required to flood this bog to a depth of three inches, inside of, say, seven hours. By examining the table, it is found that a pump having the capacity of 500 gallons a minute will flood one acre three inches deep in two and three-quarter hours, or three acres in seven hours and a quarter. That is to say, the owner of such a bog should demand of the manufacturers of the pump that they sell him a pump and engine capable of delivering five hundred gallons of water a minute from a level ten feet below the point of delivery.

COST OF CONSTRUCTING A BOG

Very little data are at hand regarding the cost of constructing a bog from the rough. A sixteen-acre bog in Nova Scotia was purchased, cleared, turfed, ditched, sanded, dyked and planted for the sum of $4,500. As this bog had a gravity supply of water close at hand, the cost was somewhat less than if a pumping outfit had been installed. On the other hand, a considerable amount of forest growth was on the piece, so that the cost of clearing was a large proportion of the total cost. Although the cost of construction is comparitively large, the profits from bogs are quite in proportion to the cost, when they are properly handled. Forty to fifty barrels an acre is often obtained, and thirty barrels is an average. As these sell anywhere from five to seven dollars a barrel, and as the cost of maintenance is small, a good bog is capable of returning a handsome profit to its owners.

GEOGRAPHICAL DISTRIBUTION OF THE CRANBERRY

As previously mentioned in this bulletin, the cultivation of cranberries has never been widespread in Canada, so that there is no information at hand concerning the districts in which this crop can be successfully grown. The limiting factors have been discussed in previous paragraphs, but as a further aid to those who contemplate the culture of cranberries, a few notes on the geographical distribution of the different species are here appended.

If the prospective grower ascertains that the cranberry is present in his district in the wild state and is thriving under his conditions, he may be certain that the cultivation of this plant can be carried on successfully in his locality.

The following is taken from Macoun's Catalogue of Canadian Plants:—

> "*Vaccinium Oxycoccus,* Linn.—Sphagnous swamps around the sub-arctic zone from Newfoundland to the Pacific and south to the Canadian boundary."
>
> "*Vaccinium macrocarpon,* Ait.—Bogs, and especially on the margins of ponds and small lakelets, in the soft mud. Newfoundland, Anticosti, Nova Scotia, New Brunswick, thence westward throughout Quebec and Ontario to Thunder Bay (Macoun). Throughout Canada to the Saskatchewan (Richardson). Ungava Bay and Mackenzie River (McGill Herb.)."

Mr. J. M. Macoun has written the following on the distribution of *V. Vitis-Idœa,* which is previously spoken of in these pages as the Partridge berry and Lingon berry, and which is known in New Brunswick by the common name of Wolfberry:—

> "Along the Gaspé coast and the north shore of the gulf of St. Lawrence, the fishermen's families gather this fruit in large quantities for their own use or for sale, calling it the "Low bush" cranberry, and throughout the whole of northern Canada, hunters and trappers, as well as native Indians, have frequently to depend upon it for food when game

and fish are scarce. Deemed of no value in the warmer parts of Canada, and pronounced by Gray to be acid and bitter and scarcely edible, it seems when in its home in the cold rocky woods of the north, or along the shores of Hudson bay or the Arctic ocean, to derive size and flavour from the very conditions that dwarf and kill its less hardy competitors."

ACKNOWLEDGMENTS

The recommendations laid down in the foregoing pages are based on investigations of the cranberry industry in Nova Scotia and Cape Cod, made during the summer and fall of 1915.

The author wishes therefore, to take this opportunity to thank all those growers and cranberry agents, both in Cape Cod and Nova Scotia, who so kindly placed their time and information at his disposal. He also wishes especially to thank Mr. J. S. Bishop, of Auburn, N.S., who spent much time and trouble in showing the author over his locality. Mr. Bishop also accompanied the writer on his Cape Cod trip, and it was largely due to his previous acquaintance with that part of the country, as well as with the cranberry industry, that the author was enabled to gain such a good insight into Cape Cod methods and conditions.

In closing, especial mention must be made of the exceedingly hospitable treatment extended by the Cape Cod growers, who so readily spent much time, and went to considerable trouble, to show their bogs and methods of handling the same.

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