Orchard drainage

R.G. Cahill

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Waterlogging due to impeded drainage made this site quite impossible for fruit trees in its original state. The following pictures show how it was drained in preparation for planting.

**ORCHARD DRAINAGE**

By R. G. CAHILL, Horticultural Instructor, Bridgetown

UNDERGROUND drainage of orchard land is an essential feature of fruitgrowing which is overlooked by many orchardists. Soils should be adequately drained to cope with all winter rains.

Even in years of sub-normal rainfall many orchards in the south-west of Western Australia suffer from adverse effects of water-logging with resultant root damage. Well drained soils allow better root development over a greater volume of soil, giving a larger root zone from which to draw moisture during summer.

The symptoms of water-logging can often be easily recognised. In other instances where it may not be directly obvious, only a slow decline of the trees will result. Bad drainage is often seen in the poor weed growth in orchards.

Apple trees may show delayed foliation in the spring and later yellow and sparse leaves lacking normal tree vigour. Such trees are first likely to appear in isolated patches on, or at the foot of, slopes which may appear well drained.

This is due to an uneven depth of heavy clay subsoil, or rock formation approaching nearer the surface at some points.
than others. Water penetrating to this layer will move along its surface and collect in ponds behind the ridges.

To effect drainage, channels must be cut through these clay or rock bars. Results of this are clearly visible in the accompanying pictures. The presence and location of the bars is readily determined by forcing a probe made of a 5/16 in. steel rod into the ground at likely spots when the ground is wet.

It must be made quite clear that drainage of the soil only removes excess water and does not take away water which would have provided summer moisture for tree growth. When rain falls on the ground it wets the soil to field capacity, after which further water will drain away in the drainage system. The remaining moisture is only removed by root absorption or evaporation. Bad drainage causes a depletion of oxygen in the soil with subsequent ill effects on root growth and hence on tree vigour.

There are a number of methods in use for draining orchards.

The use of jarrah saplings—two placed in the drain bottom with a third placed on top—has proved quite effective. There is little need to remove the bark and the sapling tops can be used to lay over the top of the saplings prior to filling with earth. The box type drain made from slabs of timber has also done good service in many orchards and endured for years.

But as drainage is something which only wants to be done once in the lifetime of an orchard, the best service will be obtained from the use of agricultural
4.—Cleaning the drain out to 3 ft. 9 in. deep before laying 4 in. terra cotta drainage tiles. Terra cotta pipes appear to be the best. Use of cement pipes should be approached with caution because soil often has a corrosive action on cement.

The pipes should be carefully placed in the dug drain leaving a 1/16 in. gap between pipes to allow water entry. Over each gap is placed a shovel full of coarse blue metal or washed gravel. This gives good water penetration while stopping clay or soil from clogging pipes.

In the Bridgetown and Boyup Brook districts poor drainage occurs mainly as odd patches in an orchard and a central drain through these parts drained to the most convenient point is usually sufficient. If the area to be drained is large, spur drains connecting with the main drain can be used.

When considering the number and depth of drains, the soil type and the area to be drained must be the governing factors. Where impermeable clay subsoil occurs close to the surface little lateral movement of water is obtained and close drains will be required. In some circumstances a drain every second row may be needed. In this type of soil the subsoil is usually within two feet of the surface and a drainage depth of 2 ft. 6 in. to 3 ft. is desirable. On lighter loam soils where side movement of water can be assured

5.—Drainage completed: Drains laid up and down the slope 84 ft. apart removed surplus water and the land is being prepared for planting. In heavier soil drains at more frequent intervals would probably be required.
less drains would be needed to drain the area. In such soils the clay subsoil is usually deeper and drains could with advantage be dug to four feet.

If the orchardist cannot see his way clear to install underground drains in the first year of the young trees' life it is strongly advised that open drains either dug by hand or formed by a single furrow plough be used to drain off as much excess water as possible.

Too many weak sections both in old and young orchards can be traced to bad drainage. Remember that by rectifying this trouble early you will make your trees repay you early.

A FEW NOTES ON THE CENTRIFUGAL PUMP

By GEORGE GAUNTLETT, Assistant Officer in Charge, Irrigation

Pumps first appeared in Western countries about the beginning of the 17th century when a suction pump was installed on the River Seine to lift water for the citizens of Paris.

The modern centrifugal pumps are of quite recent origin. They began to be used for irrigation in Western Australia about 1905.

Practically all pumping for irrigation is now done with centrifugal pumps. The centrifugal pump is simple in design, easy to operate, maintenance is not unduly high and it has a long life.

Its working parts consist of a rapidly rotating impeller which imparts velocity to the water passing through it and the casing which guides the water from the impeller and serves to convert the velocity head into a pressure head.

The size of a pump as quoted by the manufacturer refers to the diameter of the delivery pipe. Thus a 4 in. pump is one with a 4 in. delivery. Where the pump size is shown as being 3-4 it means that the delivery is 3 in. and the suction is 4 in.

Often the term "high lift" is used. This is not related to the suction lift but refers to the head against which the pump will operate.

Except where authorised by the manufacturers the suction lift should not exceed 15 ft.

The term suction lift means the height of the water surface level to the centre of the pump plus the friction losses incurred by the flow of water in the suction pipe.

In the installation of the pump the suction line should be as straight and as air tight as possible. Sharp bends should be avoided and no part of the line should be above the pump centre.

The efficiency of the pump varies chiefly with the quantity discharged, the head against which the pump works and the speed.

In the final testing of a well designed pump the designer draws characteristic curves in which the head, horse power and efficiency are plotted against the output at constant speed.

From the consideration of these curves the manufacturer is able to advise the correct size of pump, operating speed and horsepower required for any particular job. In order to ensure maximum efficiency irrigationists should adhere to these recommendations.

Operating a centrifugal pump with the discharge valve closed or partly closed does not result in a dangerous pressure being built up. However, if this is unduly prolonged overheating and subsequent damage to the pump may ensue.

Where a pump is delivering water against a high static head it is liable to damage in the event of a reversal of the direction of flow such as could be caused when the motor fails. In such cases it is advisable to fit a non return valve on the discharge side of the pump. This valve permits water to flow in one direction only and so prevents any tendency towards reversal of flow when the pump is stopped.

When trouble occurs it can be quite frequently traced to the suction side. Very briefly apart from mechanical defects the answer to troubles likely to occur are found in:

1. The suction line is not properly air tight nor filled completely with water.
2. The suction lift is too high or the suction line is blocked.
3. Speed of the pump is too low.
4. Wrong direction of rotation.
5. The discharge head is higher than intended.

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