COVERED DRAINS

By P. F. BOULLE

Summary

Pieces of bamboo can successfully be used in the construction of sub-soil drains. The preparation of bamboo for this purpose is described and the construction of covered drains using this material for both heavy and light soils is given. The cheapness, advantages and efficiency of drains so constructed as well as the disadvantages are detailed.

Introduction

In these days of mechanisation it is highly desirable to have unbroken field surfaces on which to work if it is at all possible. With this object in view then, one has to consider the use of covered drains to rid a field of excess or surplus water.

The materials one can use are, tiles, concrete pipes, mole drains and pipes made of bamboo. It is with the last that I intend to deal.

The "pipes" are made by cutting out the bamboo internodes irrespective of length or diameter. This may be done on the site on which they are to be used or near the workshop whenever labour is available, in which case the pipes are stacked according to internal diameter. All sizes of bamboo are used, from 1″ diameter to 3″ or more. I have found bamboo as effective as tiles and it has the advantage of being cheaper and therefore disposable should a drain no longer be used.

Layout

On the area to be drained one has to mark out the drains so as to obtain the maximum fall from top to outlet which is usually in a stream or drain along the field boundary. The outlet should always be about 6″ above the spillway which should be deepened if necessary. The outlet is very important and more often than not it is the limiting factor which either makes or mars the whole scheme.

Where the area to be drained requires laterals, whether few or many, always work on the herringbone system as opposed to the contour system, to provide a good fall.

Once the layout is satisfactory the necessary materials must be brought to the site, i.e. bamboo pipes and trash. Then, and only then, should digging commence. The pipes are laid alongside the drain commencing with small diameter pipes at the top gradually working up to the largest diameter near the outlet. Naturally the diameter of the pipes is governed by the amount of water to be moved, and should the flow be big from the commencement of the drain then large diameter pipes are to be used all the way. Trash in a line is also laid alongside the drain. Having the pipes and trash within arms' reach facilitates the work and speed of the pipe layer.

Laying of Pipes

The actual laying of the bamboo pipes depends on the nature of the soil in which the drains are to be laid. In a heavy soil where no erosion takes place with running water the whole system may be dug before laying commences. It is essential that the drain bottom be smooth and that there be neither high nor low spots but one continuous fall from top to outlet. The bottom must also be wide enough for the pipe layer to be able to move down it when laying pipes.

The bamboo internodes are then laid end to end in a continuous line ensuring that the bottom internal surface of a pipe is not higher than that of the previous one. A little soil is packed on either side of each pipe at its middle when it has been laid to prevent movement, having first made sure that the pipe is firmly pressed on to the soil. Trash is now put into the drain over the pipes and the soil pushed back to give complete cover. The layer of trash should be a generous one of about 12″ to 18″ before it is compressed by the soil covering. Coarse sand may be used if it is handy. It is not necessary to leave a gap between pipes, as in practice, the ends of the bamboo have not been cut at right angles there is always a little opening when pipes have been laid end to end and it is through this opening that water enters the line. Always remember to work from top to outlet when actually laying pipes.

Junctions

Where lateral drains meet the main drain and a junction, as opposed to a second line, is to be made, then the lateral must be 2″ to 4″ higher for an effective junction. A large diameter bamboo is split lengthwise and the larger portion—not less than half—is laid in the continuous line and a whole pipe laid below it. The last pipe of the lateral drain is laid so that it protrudes slightly over the open pipe section. This protruding pipe must be wedged so that it does not move forward. Other pieces of split bamboo are used to cover the open section on sides and top—a good pipe layer will devise his own methods of stopping soil entering the junction.

Sandy Soils

Easily eroded soils pose more of a problem in covered drains. In this case it is not always possible to dig the drain in its entire length. One can however, dig the major portion and should one encounter a troublesome spot such as a mud hole or an area in which the sides fall in, then it is advisable to dig a shallow drain through this portion and continue normally to the end of the drain. Pipe laying takes place as before up to the soft spot which is then deepened, a little trash placed on the bottom and stamped down to provide a firm surface on which to lay the pipes. Should the banks fall in due to water seeping in through fine sand then all cavities must be

packed with trash. Once out of the soft spot, pipe laying as before is carried out. It is always advisable in these soft spots to cover up with trash and soil immediately the pipes have been laid.

Depth

So far no mention has been made of depth at which to lay pipes. The reason is that standards cannot be laid down. Each system of drains is governed by its own conditions and outlet. As a rule however, always work on the principle that the deeper the pipes the better. There are two good reasons for this: firstly the deeper the drain the greater the area from which it will draw and secondly deep drains are less likely to be blocked by roots. 3′ is a desirable depth but not always possible.

General Remarks

The quantity of water to be removed from an area determines the number of pipe lines to be laid in a drain. One may start with one line and as laterals increase so can the number of lines be increased, usually 2 or 3 in one drain. Remember always lay pipe lines side by side, never one on top of another. Likewise the distance between drains is governed by the lie of the land, the nature of the soil and the amount of water to be drawn off.

In heavy soils, even in clay, covered drains work very well, in fact better I think, than open drains. I recall an area in which water in a cane furrow next to an open drain would not seep into the drain, yet that area today, with covered drains, never has standing water even after rain.

It is in alluvial deposits, which are mostly the flatter areas, that problems arise. Often these soils have a clay topsoil with a layer of sand underneath varying in depth from 2″ to 2′. Trouble is mostly encountered in this sandy layer along which water travels causing silting and eventual clogging of pipes. Here too one finds that erosion takes place while digging, and sides collapse, and it is in such places that liberal quantities of trash have to be used. Unfortunately it is not always possible to get below this sandy layer, due either to the ground formation or lack of height at the outlet, but if it is at all possible one must lay pipes below this sandy layer. If not, then one can expect trouble.

Disadvantages

Stormwater is not easily led off and in sandy fields this can cause erosion. Blockages occur due to silting, movement of pipes and roots entering pipes. I have extracted a mass of closely woven roots completely blocking 5 feet of pipes.

Advantages

Erosion is reduced to a minimum as compared with open drains. In clay and other heavy soils covered drains appear to be working more efficiently than open drains. In open drains it is possible that the sun bakes the sides thus not permitting lateral movement of water. The main advantage and a great one these days, as stated at the outset, is that they make for ease of mechanical cultivation, reaping and transport.

Mr. B. Trevor Wilson asked Mr. Boulle what he estimated the life of a bamboo pipe to be in a drain. He had experimented with bamboos using these in the form of a triangle and he found the bamboo lasted only about 4 years.

Mr. P. F. Boulle replied that he had such drains going for some seven years, the bamboos had not rotted at all.

Mr. C. F. Pollock said that several bamboo pipes on Tongaat Sugar Company's Estates had been going for 25 years and were still working satisfactorily.

Mr. C. H. O. Pearson commented that it was advisable to fix the last pipe in the line to stop the drip from the end underming the soil, thus causing the last pipe to fall away, leading to the pipes higher up becoming blocked up. In England where sub-soil drainage had been done for a 100 years or more, the workmen had special tools. Filling in had to be watched closely and trash spread over and around the pipes saved disturbance when the soil was replaced. In "mud holes" it was advisable to put in bundles of brush-wood to firm up the bottom of the "mud-hole" and thus avoid the sinking of the pipes.

Mr. R. W. Ric-Hansen said that bamboos should be selected according to age, the older ones being best. His father, realising the cheapness of this timber had immersed bamboos in a cattle dip for a week, and the arsenic prevented termite attack. He had found that well-selected bamboos so treated, outlasted iron fencing poles. Such treatment might well help to preserve bamboo pipes.

Mr. B. C. R. Tedder suggested that old engine oil should be useful for preserving bamboos. He had used old fertiliser bags to help consolidate trash on which to lay the pipes.

Dr. T. G. Cleasby thought that if one was to go to the trouble to dig four feet down, it might be more economical to use tile drains.

Mr. P. F. Boulle said he had used tile drains and had found them no better than bamboos, which were cheaper. A main advantage of bamboo was that it was disposable and one could put in another drain if one choked up.

Mr. R. G. Gow said he had used two, three and four inch tile pipes, and had also used bamboos. On digging up these bamboo pipes after six to seven years he had found that deterioration of the bamboo was negligible. Clogging was the problem with both materials.

Mr. C. H. O. Pearson remarked that the clogging was inevitable with a deep rooted crop, and it was conceivable that in dry weather, roots in search of water might even enter the pipes. If a drain has been well laid in clayey soil, it was possible for the pipe to deteriorate, but still leave the water passage intact.