A METHOD OF MARKING OUT CONTOUR LINES IN THE FIELD

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INTRODUCTION

It is a proven fact that working the land along contour lines is easier, whether one works with hand labour or tractors, than working up and down hill. For example, for a tree crop on hilly ground, all the operations of harvesting, weeding, spraying, etc. are done more efficiently and easily along contours. Working the land on the contour also lessens the run-off of water and so there is less erosion.

There seem to be very few people who are concerned about these things and for those who are, it is not always clear how to go about marking out contour lines on the ground. It is often thought that expensive instruments are needed to do the job, but this is not so. This article is written for those who feel that land and gardens should be worked along contours and is intended to show a cheap and easy way of doing this.

WHAT IS A CONTOUR LINE

Let us first say what a contour line is. A contour line (or level line) is a line joining points at the same height above sea level on the ground or on a map. An example of a map with contour lines on it is given in Diagram 1. Without contour lines the map in Diagram 1 would look like the one in Diagram 2. You cannot tell from Diagram 2 if there are any hills, if the road goes uphill or downhill, how steep the road is, or how fast the river flows. From the map showing contours you are able to see or work out all of this.

Example: From Diagram 2 it is impossible to tell which house is on higher ground. From Diagram 1 you can see that house A is slightly higher than 1800 m and house B is around 2500 m above sea level. Therefore house B is above house A.

THE INSTRUMENTS USED TO MARK OUT CONTOUR LINES

Expensive instruments usually used to establish contour lines are:

1. The theodolite, used by land surveyors.
2. The engineer's level, used by surveyors, engineers and soil conservationists.
3. An instrument called the Cowley level, used by some people, but expensive and not always reliable.

These instruments will not be discussed any further in this article because there is another instrument which can be easily made and used by just about anybody.

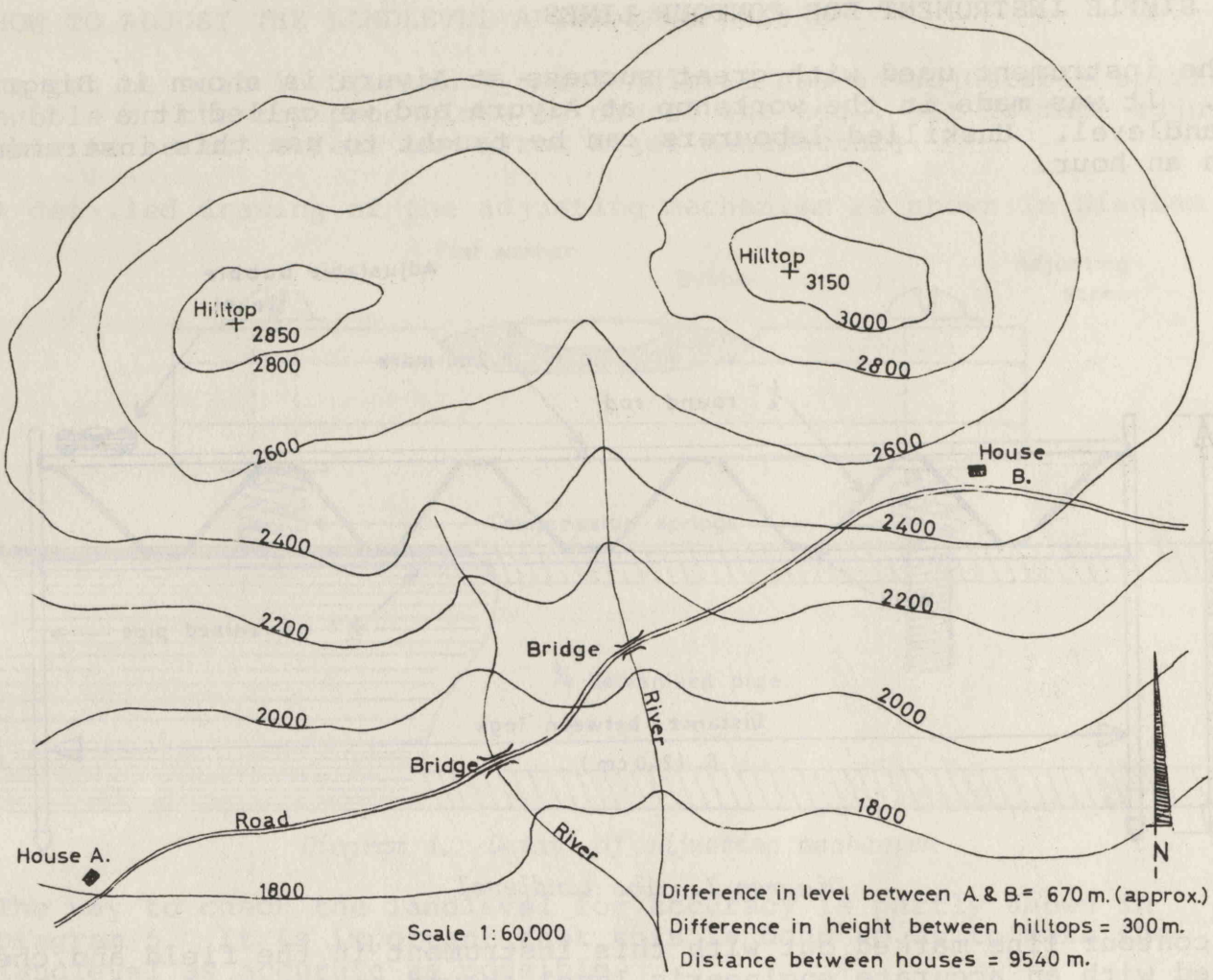


Diagram 1. Map with contours

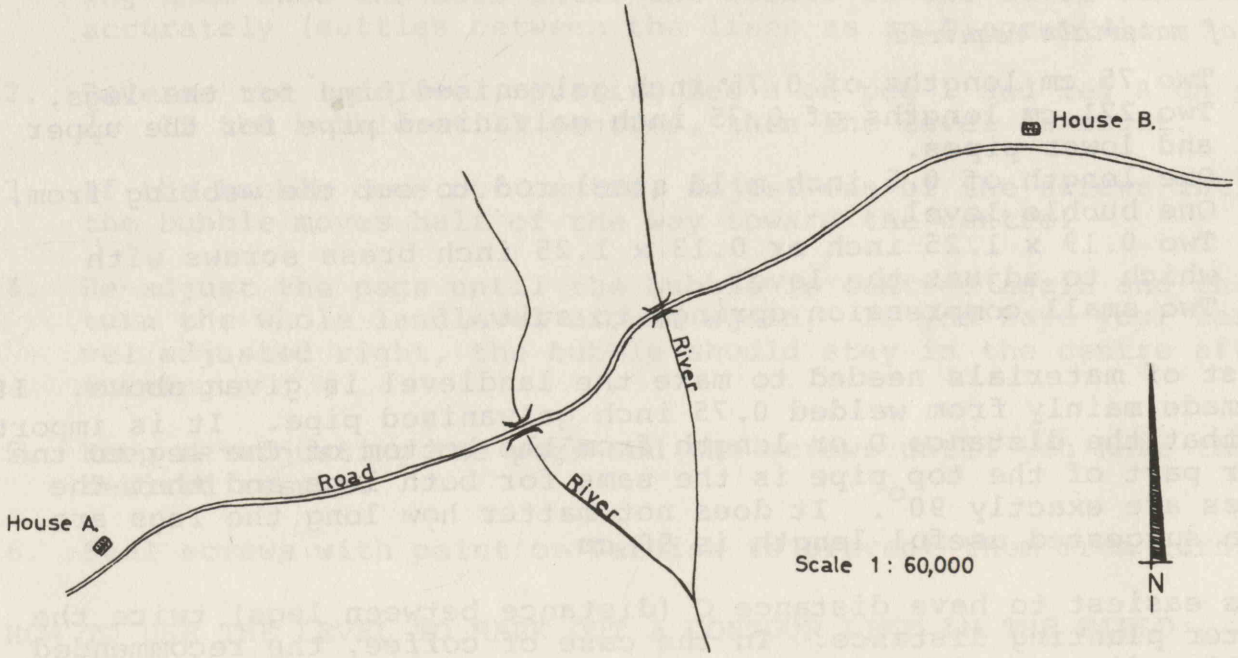


Diagram 2. Map without contours

A SIMPLE INSTRUMENT FOR CONTOUR LINES

The instrument used with great success at Aiyura is shown in Diagram 3. It was made in the workshop at Aiyura and we called it a landlevel. Unskilled labourers can be taught to use this instrument in an hour.

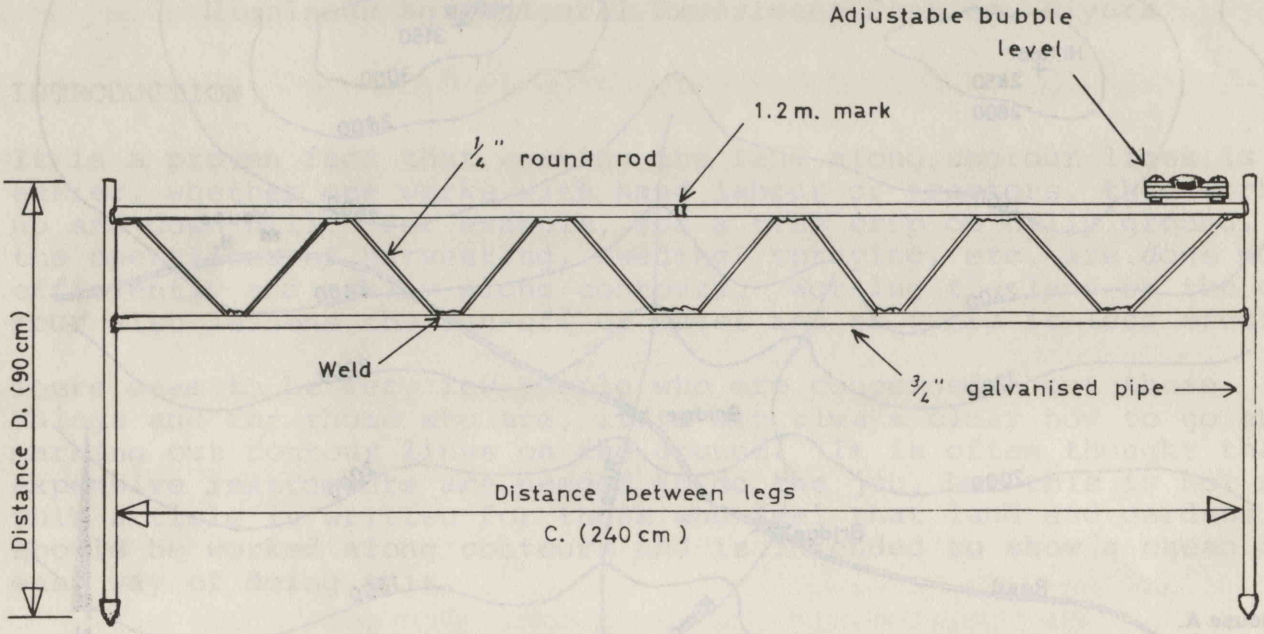


Diagram 3. The landlevel

A contour line marked out with this instrument in the field and checked with an accurate engineer's level showed an error of only plus or minus 37 cm horizontal distance over a 120 m length of contour line. This is an error of only 0.31%. This is perfectly good enough for agricultural purposes such as planting.

List of materials required

Two 75 cm lengths of 0.75 inch galvanised pipe for the legs.
Two 221 cm lengths of 0.75 inch galvanised pipe for the upper and lower pipes.
One length of 0.5 inch mild steel rod to cut the webbing from.
One bubble level.
Two 0.19 x 1.25 inch or 0.13 x 1.25 inch brass screws with which to adjust the level.
Two small compression springs to suit.

A list of materials needed to make the landlevel is given above. It was made mainly from welded 0.75 inch galvanised pipe. It is important that the distance D or length from the bottom of the leg to the upper part of the top pipe is the same for both legs and that the angles are exactly 90°. It does not matter how long the legs are, but a suggested useful length is 90 cm.

It is easiest to have distance C (distance between legs) twice the shorter planting distance. In the case of coffee, the recommended planting distance is 2.4 x 1.2 m and so it is easiest to make the distance between the legs on the landlevel twice 1.2 m which is 2.4 m.

HOW TO ADJUST THE LANDLEVEL AFTER MANUFACTURE

As can be seen in Diagram 3 the landlevel has an adjustable spirit bubble on the top pipe close to one of the legs. It is made adjustable so as to correct any error after manufacture.

A detailed drawing of the adjusting mechanism is shown in Diagram 4.

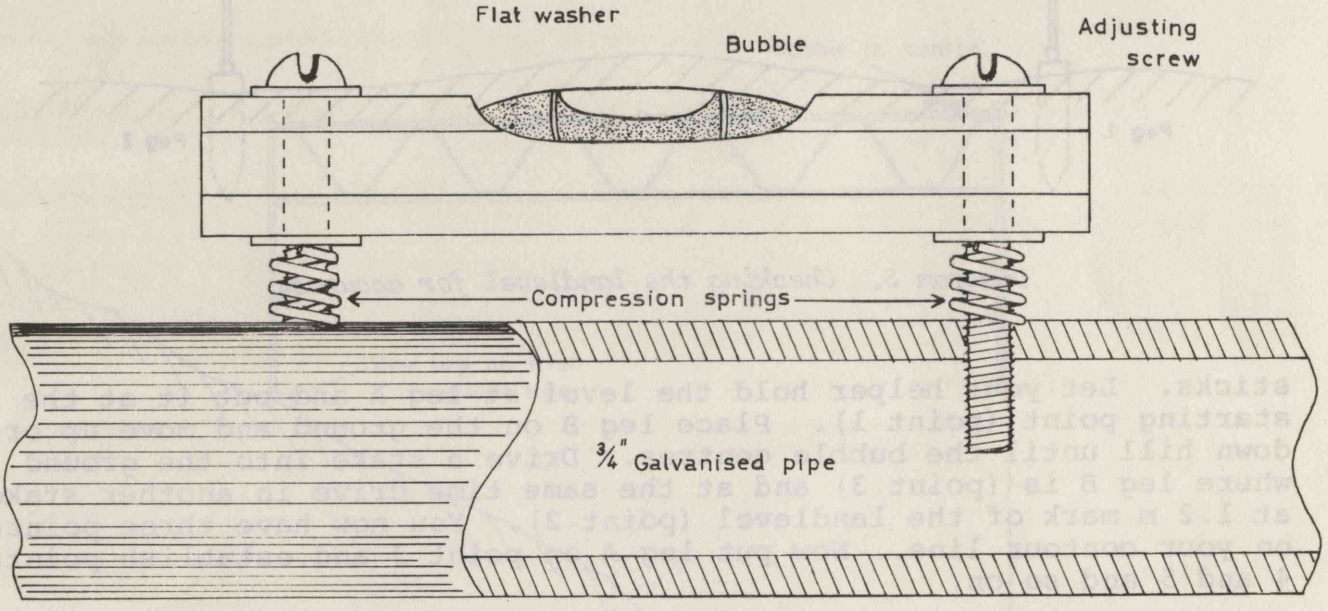


Diagram 4. Detail of adjusting mechanism

The way to check the landlevel for accuracy is partly shown in Diagram 5. It is important that this is done so as to make the landlevel as accurate as possible.

1. Take two pegs and drive them partly into the soil, one under leg A and the other under leg B. Keep adjusting the pegs by hammering them into the soil until the bubble in the level centres accurately (settles between the lines as in Diagram 4).

2. Reverse the landlevel, putting leg B on peg 1 and leg A on peg 2. If the bubble still centres, then the level is right.

3. If the bubble does not centre, adjust one of the screws until the bubble moves half of the way toward the centre.

4. Re-adjust the pegs until the bubble is centred again and then turn the whole landlevel around again. If you have your landlevel adjusted right, the bubble should stay in the centre after turning.

5. Keep re-adjusting the pegs and the screws until you have the desired result.

6. Seal screws with paint or varnish to prevent them from turning.

HOW TO USE THE LEVEL TO MARK OUT A CONTOUR LINE IN THE FIELD

Let us use an example of lining out coffee at 2.4 x 1.2 m. First choose a point from which you want to start a contour line. You will need two men to help you carry the landlevel and a bundle of

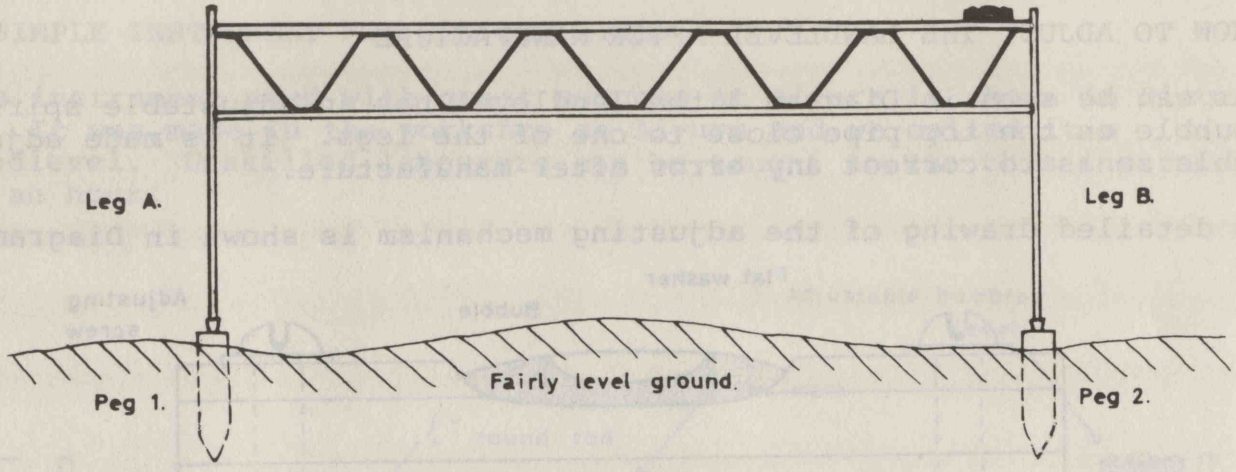


Diagram 5. Checking the landlevel for accuracy

sticks. Let your helper hold the level at leg A and put it at the starting point (point 1). Place leg B on the ground and move up or down hill until the bubble centres. Drive a stake into the ground where leg B is (point 3) and at the same time drive in another stake at 1.2 m mark of the landlevel (point 2). You now have three points on your contour line. Now put leg A on point 3 and establish points 4 and 5 and so on.

Depending on the lay of the land, you will get a typical contour line, and all points on this line will be the same height above sea level. All of your sticks in our example should be 1.2 m apart.

The contour line you have established looks like Diagram 6 on a map or on the ground.

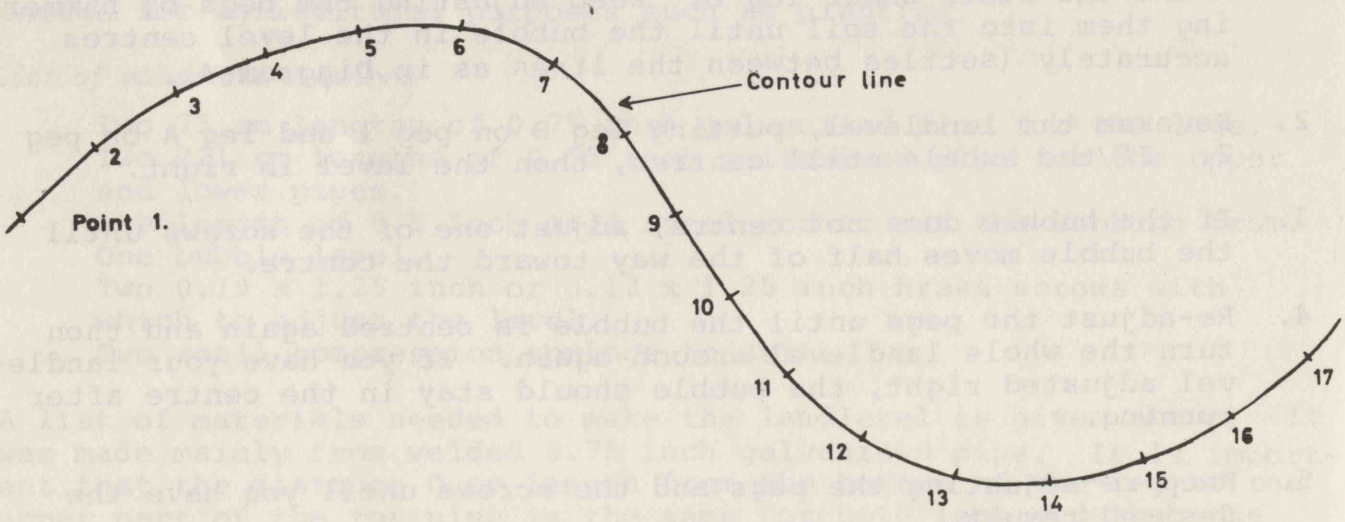


Diagram 6. A contour line

SPACING BETWEEN CONTOUR LINES

Let us continue our example of spacing coffee at 2.4 x 1.2 m. We have already marked out one contour line with the sticks 1.2 m apart.

We now want to mark out our next line at 2.4 m downhill. Put leg A of the landlevel anywhere on the first contour line (the first point or the last point would be the easiest) and centre the bubble. Hold a plumbob along Leg B and where the plumbob touches the ground is the start of your second line. Diagram 7 shows how it is done. A simple plumbob can be made just by tying a weight, such as a heavy nut or a bolt or a stone, on the end of a piece of string.

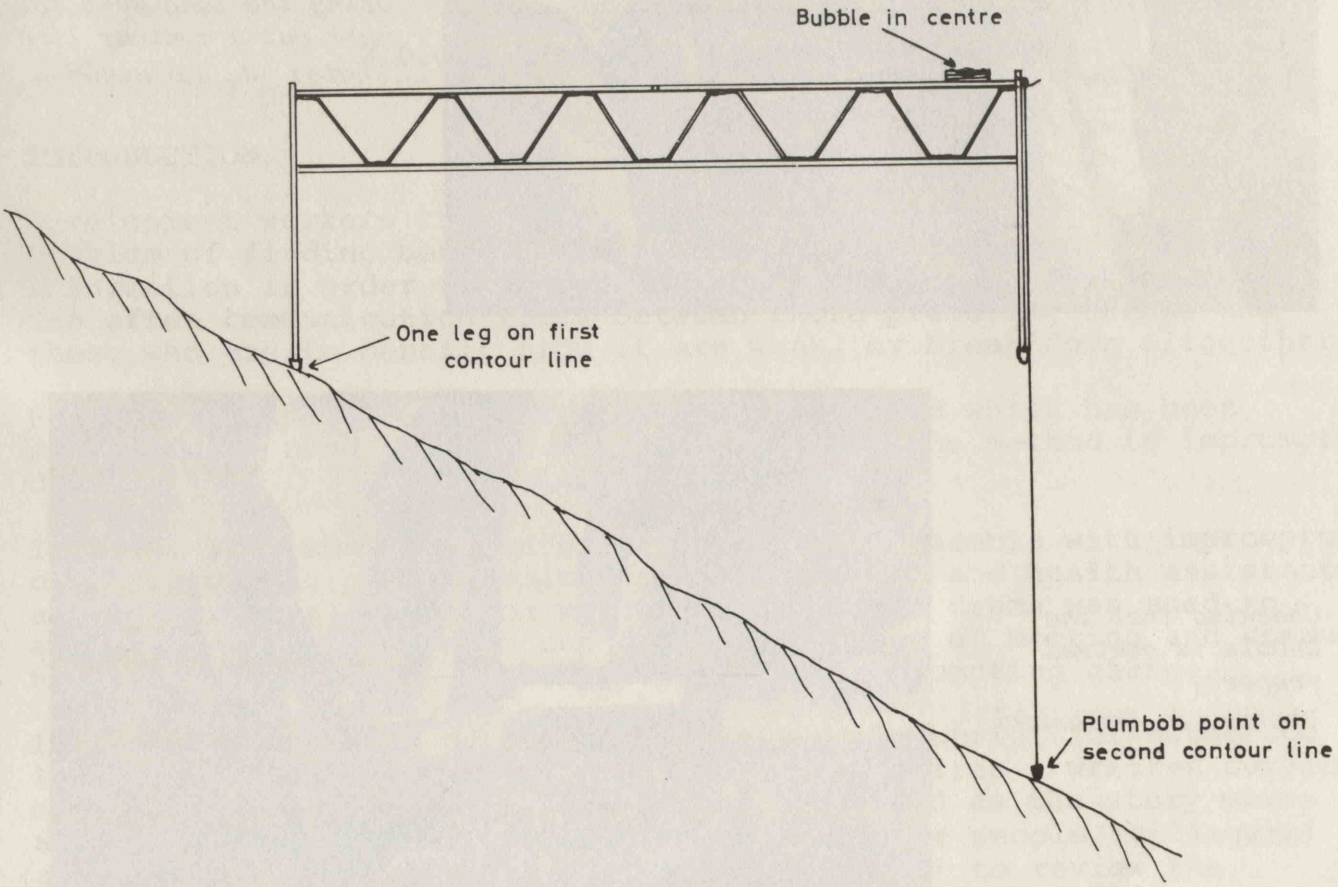


Diagram 7. Spacing between contour lines

CONTOUR DRAINS

If you want to go a step further and make contour drains with your landlevel, this is possible, but you should keep in mind that the landlevel should be checked against a good engineers level. This will ensure that your drain has the correct amount of slope. This is important because a drain which has too much slope makes the water flow too fast, resulting in erosion of the drain.

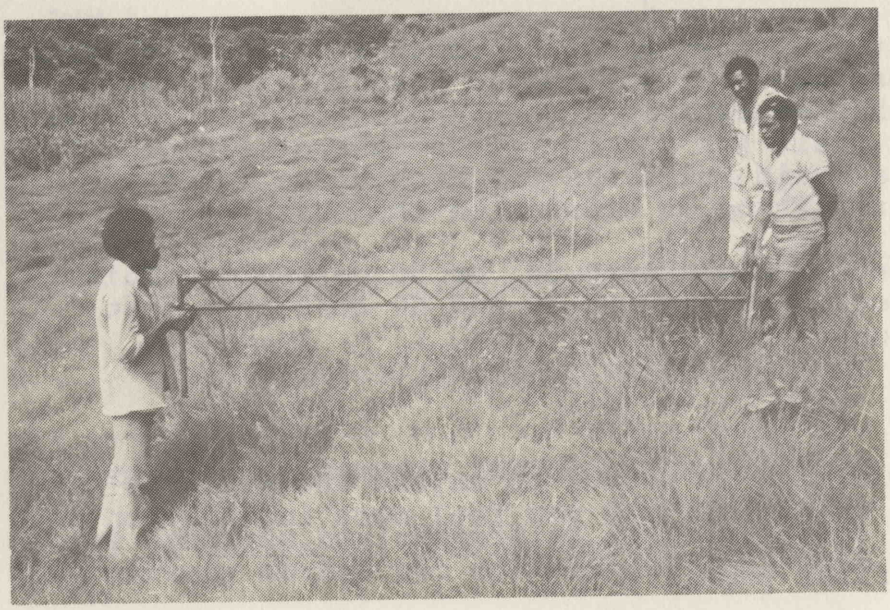
A good slope for a contour drain is 0.5%, or 50 cm/100 m. This gives the water a velocity of between 30 and 60 cm/s, not fast enough to cause erosion of the drain.

CONCLUSION

Hopefully, this article will be useful to anyone who wants to make his own contour lines or drains. If you feel more information is needed, or if you are in doubt, please contact the author at the address given on the first page.

Using the landlevel to make out a contour line
Photo: J. Wankowski

Checking that the bubble is centred properly
Photo: J. Wankowski



Starting the second contour line
Photo: J. Wankowski