Agriculture Notes

The Tatura Trellis - construction

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The Tatura Trellis is a close-planting system for tree fruits, in which trees are trained to form a V shaped canopy. A trellis structure is needed to train the trees in forming the V, and to provide some support for the tree when carrying the crop. Each row of trees requires a trellis. The trellis consists of two end frames, intermediate frames, wires, and anchors.

The capital outlay for materials and labour for the trellis structure may be as high as 30% of the total establishment costs of the planting. Also, a failure of the trellis may lead to significant crop loss. Therefore design and erection of the trellis must be carefully considered.

This Agriculture Note describes some trellis construction practices currently being used. Research into trellis design has been included.

Frames

A wide range of materials can be used for trellis frames: new, second-hand or second quality channel iron, railway line, pipe etc., or alternatively timber in the form of untreated hardwood poles, treated softwood (pine) poles, or milled timber. The basis for the decision is one of economics - what is the cheapest material that will do the job safely and last long enough.

Frequently, treated pine poles have been used, either the green coloured CCA (copper chromium arsenate) treated, or the black/dark brown coloured creosote treated ones. The creosoted poles cost about 15-20% more than CCA treated poles of equivalent size. However, CCA poles appear to become more brittle with age.

Poles of 100-125 mm diameter are commonly used for end-frames; intermediate frames are constructed from 75-100 mm poles. Frames are often braced with a wire tie across the V at the level of the top wire during heavy crop loads in the first seven or so years of the planting, when the tree limb is not able to support as much of the crop load. If frames are not so braced, it is usual to use poles of 100-125 mm diameter for all frames.

The length of the trellis frame posts depends on row width. A gap of about 2 m must be maintained between the top of one canopy and its partner in the next row, and it is usual to have the top of the frame 300-400 mm below the top of the canopy. Therefore row spacings of 4.5 m or 5.0 m require 3.6 m long frame posts, and 6 m row spacings require 4.2 m posts. It has been found that posts placed 800-1000 mm into the ground are satisfactory.

For ease of training young trees, the height where the two frame members cross should be the height of the tree crotch, which is usually 300-500 mm from soil level. For pine poles this measurement applies to the top of the crossed poles.

Frame erection

An efficient method of installing the trellis frames is to carefully erect the frames at each end of the trellis row, with the aid of a jig, and then line up the intermediate frames with the ends for correct angle and height.

Figure 1 shows the details of a jig that has been found useful for erecting the end frames. After making such a jig, pegs should be placed to mark the site for each frame. An anchor point is usually located 4 m from each end frame. Intermediate frames are usually placed no more than 15 m apart.

Trellis frames can be erected manually or with a post driver. If they are erected manually the jig can be used as a guide for augering the post holes (mechanical or manual auger). Usually the post holes are augered to a larger size than the post so that the correct angle can be set, and then the soil round the posts is firmly rammed. The jig is easily removed by first withdrawing the 6 mm steel pin (see Figure 1).

Alternatively a modified tractor-mounted fencepost-driver may be used to set the posts. Posts should be pointed, and can be driven into the ground at the appropriate 60 degree angle. Care should be taken to ensure that the angle of the driver is correct for each frame, as uneven ground conditions mean it frequently has to be reset. Such a post driver can be hired to install trellis frames.

Wires

High tensile (HT) wire of 2.8 mm diameter (heavy galvanised) is normally used. Field measurements indicate that 2.5 mm "Tyeasy" high tensile wire is strong enough.

A wire strainer with a tension gauge should be used to strain 2.8 mm HT wire to a tension of 2.0-2.5 kN. This tension will relax slightly due to consolidation of the trellis. Maintaining wire tensions in the unloaded trellis

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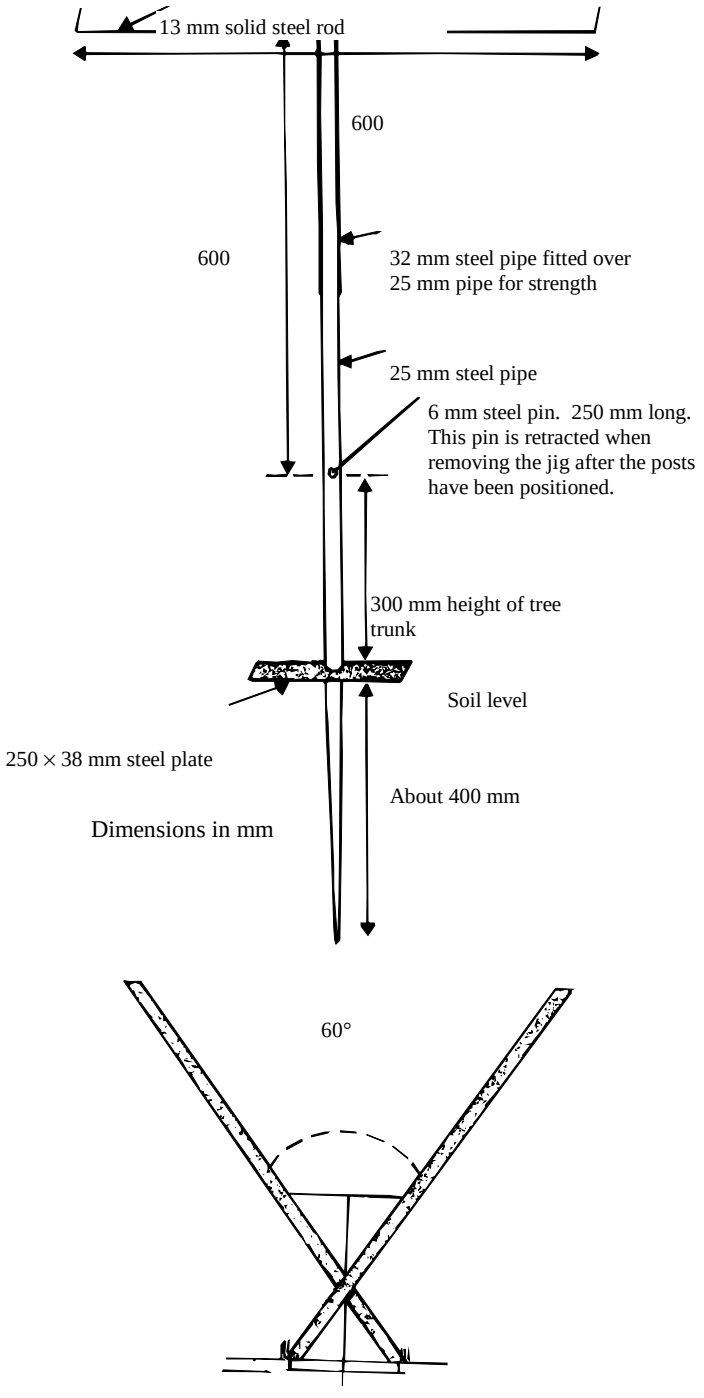
(during winter) at about 2.0 kN allows wire tension to increase with increasing fruit load without danger of wire breakage.



The jig must remain perfectly upright (vertical) when positioning the post.

Figure 1. Jig for erecting Tatura Trellis frames

It is important to tie off and join HT wire with the correct knot. The wrong knot may reduce the wire strength by half. "Figure 8" or "Pin and loop" knots are recommended. When straining trellis wires they should be strained onto the anchor, if the end-frame is not braced onto the anchor. Bending stresses can cause end-frames to break if wires are strained to an end-frame that has not been adequately tied, at the height of the wire being strained, to the anchor.

A number of wires are required. Initially three wires on each side are positioned 270 mm apart. These are the training wires, which can be repositioned as the trees grow. To support the trees once they have reached their maximum permissible height, two permanent wires are usually required on both sides of the V. One wire is at the top of the V frame and the other wire is spaced 1 m lower. However, for 6 m row spacing and using 4.2 m poles, it is recommended to leave three permanent wires - six wires per row.

The wires are strung on the inside of the V. This makes repositioning of the wires later to a higher spot on the poles an easy and quick operation, because the wires are trained **under** the wires (see Figure 2). Pine poles require 50 mm galvanised staples to keep the wires firmly in position; be careful not to damage the wire with the staples.

A wire may also be strung in the V above the tree crotches to support the irrigation lateral. Microtubes can be suspended from the lateral or microjets inserted upside down. Having the applicators off the ground makes for easy inspection and, in the case of microjets, even water distribution (weeds and mulch cannot interfere).

End-frame anchor

A secure anchor point on each end of the row is very important as only a tight movement may lead to bending loads on the end-frames, or excess sagging of crop support wires. Little is understood of the design of end-frame anchors; however, some things are clear. If deep ripping is planned for the new trellis site, the area round the anchor should not be ripped. Generally, the length of a commercial trellis row does not change the design of the anchor. Long rows need the same strength of anchor as do shorter rows. Longer rows are preferred because they make more efficient use of land by reducing wasted headlands. At least 7 m should be allowed on each headland for ease of machine access.

Materials used for anchors are varied - railway sleepers, secondhand railway line, fence posts and concrete have all been used (Figure 3).

When using a poured-in-place concrete anchor the concrete should fill the entire width of the trench. The concrete block should be thoroughly consolidated, and left to cure for several weeks before wires are attached and strained.

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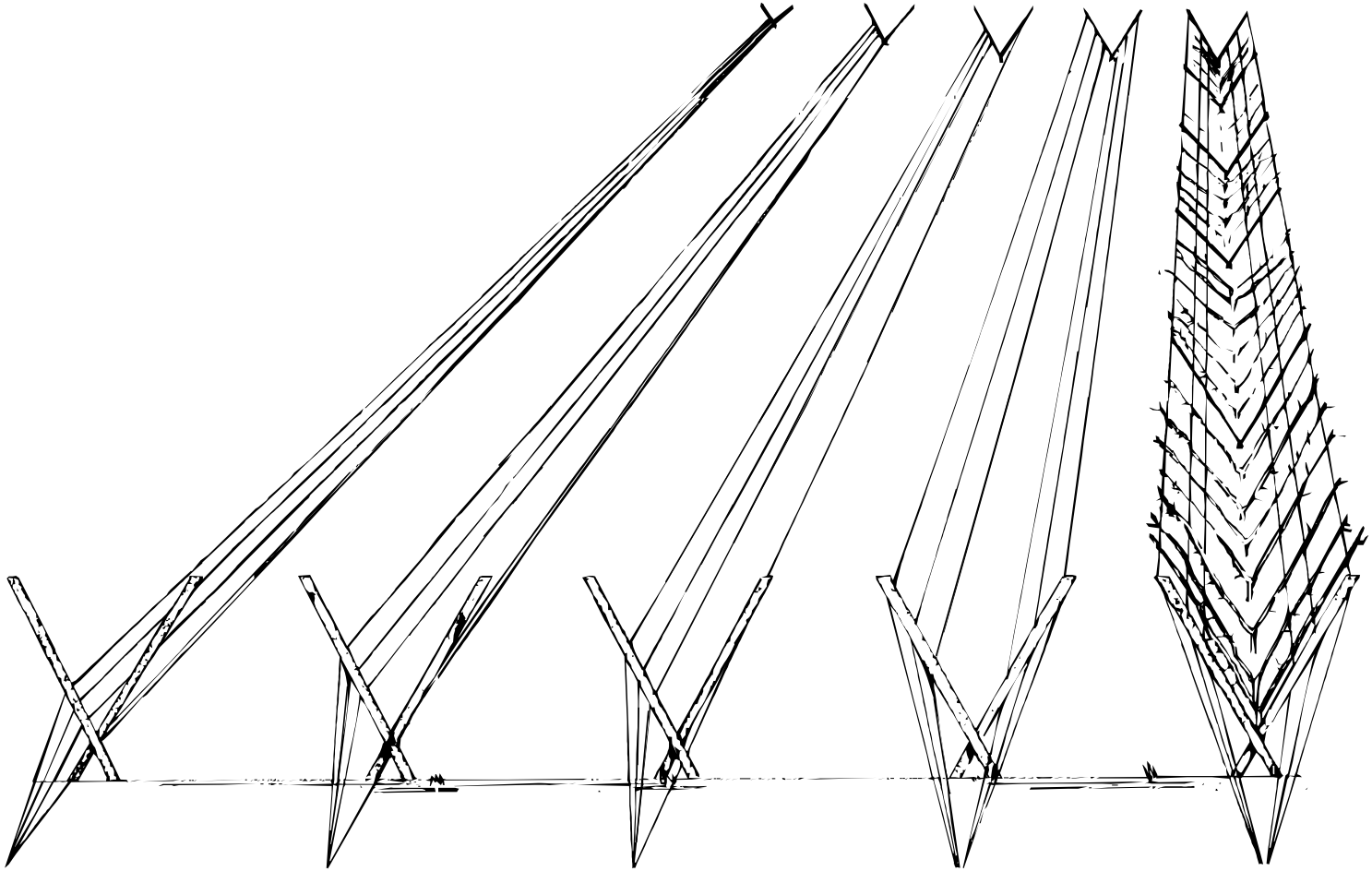
Figure 2. Positions of wires on the Tatura Trellis as the trees grow



2. As the trees grow, the bottom wires are moved up another 270 mm

3. Moving up of the wires continues as the trees grow in height. The middle wire remains in position.

4. The wires are now in permanent position, 1 m apart. Three wires either side for 6 m rows. Two wires either side for 4.5 m rows.

5. Intermediate frames no more than 15 m apart (these frames have been shown in rows 1-4).

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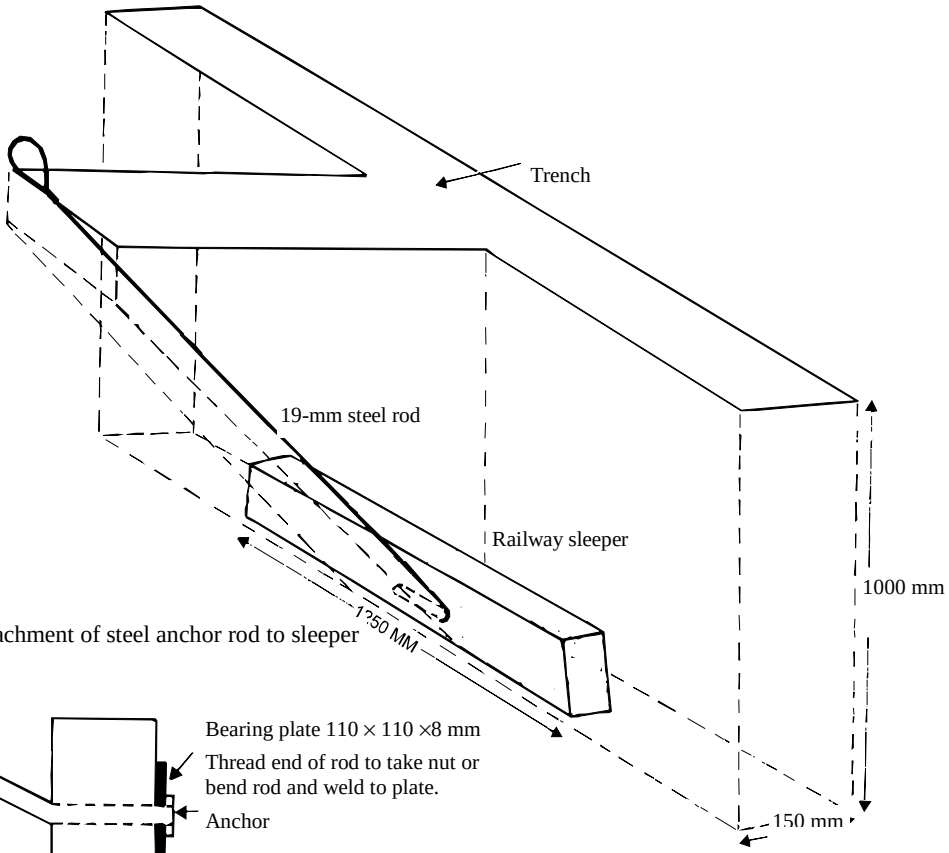
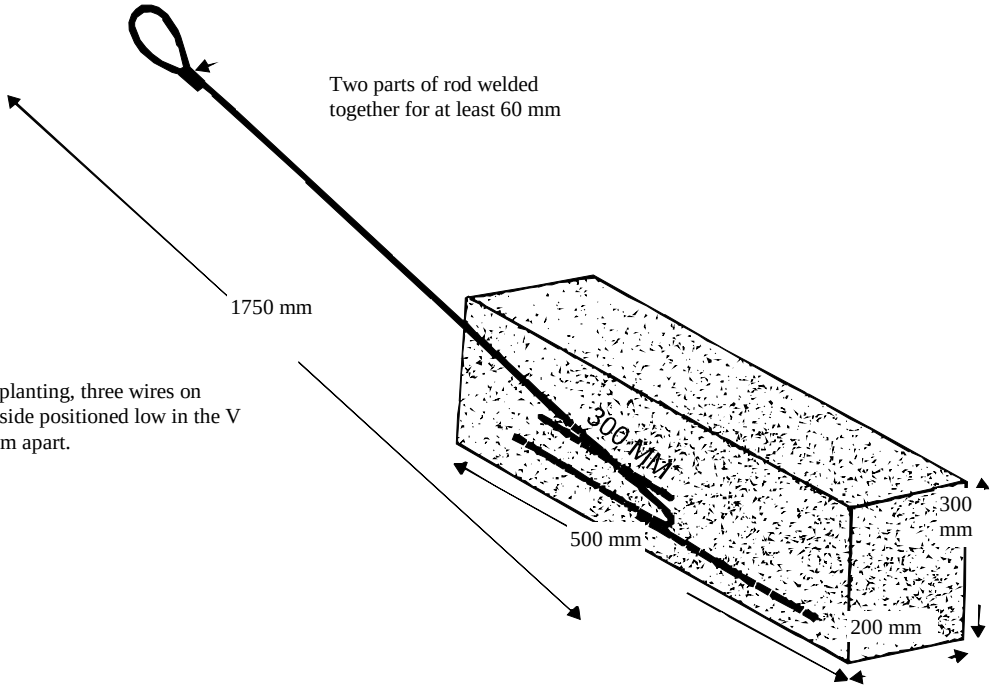
a) Railway sleeper as anchor



b) Attachment of steel anchor rod to sleeper

c) Concrete block as anchor



1. At planting, three wires on either side positioned low in the V 270 mm apart.

Figure 3. Anchors for Tatura Trellis