

# Cane management and training of field grown blackberries and hybrid berries

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This factsheet outlines the importance of good cane management and training of field grown main season black and hybrid berries. It offers growers information on how best to achieve this, thereby reducing picking costs, reducing the incidence of disease and maximising yields.

## Introduction

The demand for well-managed blackberry crops (Figure 1) has risen substantially in recent years, resulting from increased popularity of fresh fruit with consumers and retailers. There has also been a modest resurgence in the market for frozen blackberries, either as a constituent of mixed soft fruit packs

or for further processing. Interest in blackberry production for direct sales has also experienced a revival.

In contrast, the area devoted to the production of hybrid berries such as Tayberry, Loganberry and Tummelberry remains very small. These crops are currently produced primarily for PYO, farm shop sales and Farmers Markets, with small quantities used for jam production.

Poor primocane (current season's non-fruiting cane) and floricanes (fruiting cane) management of black and hybrid berries can result in high levels of cane disease, ineffective pest control and a substantial loss of yield and fruit quality. It can also lead to significantly higher harvesting costs, at a time when pay rates are rising and labour availability is diminishing.



1 The increased demand for fresh blackberries has resulted in an increase in the planted area in the UK

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## The cost of poor cane management

The current commercial cost of picking blackberries in a well-managed plantation, where fruit is displayed well to pickers, is typically £1,200 per tonne. Where cane management is poor, access to fruit is hampered, which leads to reduced picking speeds and increased costs. For a 15 tonne/ha crop, the increase in picking costs could be as much as 33%, rising from £18,000 to £24,000 per ha.

Poor cane management during spring, summer and autumn can also lead to a marked increase in the time and cost incurred for winter pruning. This is especially so where cutting out and tying in is left until the winter. By this time, in trailing varieties, many of the primocanes which have been allowed to trail on the soil surface all

summer will have rooted at their tip, and are more difficult to lift and tie in (Figure 2).

Varieties which bear spines on their floricanes, primocanes, fruiting laterals

or leaf petioles tend to be less easy to handle than spine-free varieties. They take longer to pick and it is essential that they are managed correctly to reduce costs to a minimum.



2 Primocanes that are allowed to trail on the soil surface are more difficult to lift and tie in

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## The approach to cane management

Main season blackberry and hybrid berries bear their fruit from mid to late summer into the autumn months. During their growing season, the rows of established plantations contain both primocane (spawn) and floricanes (fruiting canes). The primocane emerges from the soil in the spring from buds at or just below the soil surface around and between the bases of each plant. The primocane grows through the spring, summer and autumn, reaching 1.5–3 m or more in length.

Primocanes can either produce a single stem or be branched. Their growing habit varies by variety and can fall into one of these categories:

- 1 Erect – those that grow upright.
- 2 Semi-erect – those that grow upright initially and then become trailing.
- 3 Trailing – those that naturally grow or trail along the soil surface throughout their growing period.

The following growing season, primocane becomes floricanes, producing flowers during the spring and summer and fruit from early summer into the late autumn months (depending on the variety).

All established plantations, (unless managed biennially), have both primocane and floricanes present in the crop rows throughout the spring, summer and autumn months. After the fruiting season the floricanes should be cut through at ground level, removed from the crop row and disposed of either by pulverising in the alleyways or by removal from the plantation for burning or other means of disposal. At the same time, the stand of primocane should be reduced in number selecting the required diameter and length of cane to crop the following year. All unwanted primocane should be cut out at ground level, removed from the crop rows and disposed of in the same manner as the spent floricanes.

Growers should aim to retain sufficient primocane to provide a similar or improved crop the following year. However, it should be noted that the emergence of excessive numbers of primocane in spring can have a detrimental effect. They will compete with floricanes for light,

water and nutrients, leading to reduced berry number and size (yields). They will also compete with themselves, limiting growth and cane quality, producing an adverse effect on yields in the following season. Excessive numbers of primocane, particularly those emerging between plants in the crop rows will reduce access for pickers and reduce spray penetration for pest and disease control. It is therefore necessary with some varieties in some years to reduce primocane numbers during the spring and summer months.

In the case of erect and semi-erect growing blackberries, primocane may need to be cut back (tipped). This will encourage branching, improve cane habit so that it remains upright during its growing season and lead to the production of the required number of canes of a suitable stature and thickness for cropping the following year. Be aware that despite the removal of unwanted primocane during the spring and summer months, some further cutting out of unwanted or damaged canes may still be necessary at the end of the growing season.

## Methods of removing and controlling primocane

Primocane removal in blackberry and hybrid berry plantations is generally carried out by hand, using secateurs or pneumatic pruners, cutting through unwanted primocanes at their base. The cane is removed from the rows and placed in the alleys, to wilt and then be pulverised. This applies both to primocane which has emerged from around the base of stools (individual plants) within each row and from the soil between plants in the rows.

Primocane emergence between plants in the rows does not generally occur in semi-erect, spine-free blackberry varieties such as Loch Ness and Chester Thornless where emergence is confined to the stools of individual plants. However, black and hybrid berry varieties with a trailing habit and spiny canes such as Silvan, Fantasia, Kotata and Tayberry do have a tendency to produce spawn between stools and in the alleyway. These unwanted canes may need to be removed two or three times prior to harvest.

To save time and reduce the cost of management in the spring and summer months, some growers use mowers to remove primocanes that have emerged between crop rows and hand-held trimmers between plants in the rows. Such uses however require considerable care to avoid cutting through or damaging the rind and underlying tissue of the primocane to be retained. This damage reduces cane vigour and winter hardiness. It can also provide egg-laying sites for female raspberry cane midge on loganberry and tayberry. On black

and hybrid berries, such damage provides infection sites for crown gall (*Agrobacterium* spp.) or cane blight (*Leptosphaeria coniothyrium*).

An alternative to mechanical control is the use of a chemical herbicide or desiccant directed carefully with a shielded sprayer onto primocanes growing in the alleys and between plants in the row (Figure 3). Materials currently being used include glufosinate-ammonium (Harvest), diquat (Reglone) and the desiccant carfentrazone-ethyl (Shark).

Shark has a Specific Off-Label Approval (0551/08) for use to remove unwanted primocane growing in both outdoor and protected raspberry, blackberry and rubus hybrids. Shark has now been used by black and hybrid berry growers to remove primocanes up to 20 cm in height. Primocanes treated include those in alleys, outside the crop row and between plant stools. Individual canes around the base of floricanes and stools are sometimes treated by growers, but great care must be

exercised to avoid contacting those canes to be retained.

To destroy primocane around fruiting plants in biennially-cropped plantations and to completely remove the first flush of primocane in close-planted annually-cropped plantations, Shark can be applied throughout the base of the crop row to contact all primocanes. However, in so doing, growers should be aware that the second flush of primocane will be thinner, weaker and potentially earlier cropping the following year. If unsure about when and where to use Shark, be guided by an experienced crop agronomist.

Shark may be used under the terms of the SOLA on blackberry and rubus hybrids as outlined in Table 1.

For full details of use, consult the current SOLA. In practice, growers have found that lower rates of use than those given in Table 1 will provide a satisfactory kill of unwanted primocane in these crops, provided that the cane is at no more than the recommended height for treatment.



3 Chemical desiccants have been used successfully for many years to control unwanted primocane – here photographed in a raspberry crop

**Table 1 Summary of terms of SOLA for use of Shark in blackberry and rubus hybrids**

Product	Active ingredient	Max. individual dose (litres of product/ha)	Max. total dose (litres product/ha/crop)	Maximum number of treatments	Latest time of application
Shark (MAPP 12762)	Carfentrazone-ethyl	0.8	1.6	–	21 days before harvest



## Crop establishment & early management

When establishing a new plantation of black or hybrid berries, the choice of management and training system should take account of the growth habit of the variety to be grown.

Growth habits vary enormously between varieties, but can generally be grouped into the three categories described on page 3 (Erect, Semi-erect and Trailing). Table 2 provides a guide to which category some of the commonly grown varieties fall into.

In the planting year, the canes of all cultivars often display a trailing or semi-trailing habit. In the following year the true form is more fully expressed.

However, irrespective of growth habit, all varieties must be trained and supported by a post and wire trellis. This ensures the separation of the floricanes from the primocanes, aids the production of primocanes and positions as much floricanes as possible in front of the pickers.

The choice of management after planting and in the establishment year will depend upon:

- type of plant (bare rooted, module or container raised)
- date of planting
- soil conditions
- availability of irrigation/fertigation
- degree of site exposure or protection (eg Spanish tunnels)

### Choice of planting material and subsequent cane management

Planting material can be purchased in a range of forms and the type used will dictate the subsequent management required.

#### Weaned ex micro-propagated plants

These are usually unsuitable for planting out directly, but are normally re-potted in a soil-less compost into 9 cm and subsequently 2 litre pots. They can either be grown outdoors in a sheltered and well-drained container bed or alternatively in a

glasshouse or polythene clad tunnel. They are planted out into their fruiting position in either late winter or early spring, by which time they will have produced at least one cane, and a substantial root system.

#### 9 cm pot plants

Raised from micro-propagated stock or propagated from leaf bud cuttings, these plants have been grown on for one season and can be planted out directly. Successful establishment requires good soil conditions, adequate supplies of irrigation and fertigation, good weed control and a well sheltered site or protection by polythene tunnels. Without these, growth in the planting year can be very poor, so that cane produced in the first year has to be cut back to ground level in the late winter of the following year. If planted in the spring, whilst they are actively growing, their cane should be kept intact. If winter-planted, the cane is usually cut back to just above the point where it has been produced from the top (crown) of the plant.

#### 2 year old plants

Offered for sale either bare-rooted (in winter) or in 10 litre containers. These are the easiest size of plants to establish as they already have a substantial crown and root system. If well cared for, they can produce 3 or 4 good quality primocanes in the planting year and as a result, an appreciable crop the following summer or autumn. By the third year after planting such plants can be fully cropping.

Some growers choose to retain intact floricanes already present on these plants, after planting, to take a small crop of fruit in the planting year. This can work well without any detrimental effect upon plant establishment and primocane production, provided that the plants are not subjected to any undue stress during their growing season. Containerised plants are more suitable for this technique. However, many growers choose to remove all of the cane present on both container and bare-rooted plants at the time of planting, to ensure that they grow away well in their first year.

#### Once or twice-fruited 5–10 litre containerised plants

Some growers choose pot grown plant material that has previously been used for cropping under glass or tunnels. They are planted in the soil in June or July after late spring cropping. These plants are in reality 3 or 4 years old at the time of planting out in the open, as their primocanes have usually been removed at least once during the harvest immediately prior to their purchase. Characteristically, they have a well-established root system, but this can be pot-bound. They may have been weakened by previous treatments and are more likely to be affected by pest (blackberry leaf midge) or disease (downy mildew, rubus stunt). Successful establishment of such plants in the open often proves to be far more difficult than envisaged.

**Table 2 Guide to the growth habit of commonly grown blackberries and hybrid berries**

Growth	Blackberry	Hybrid berry
Erect	Apache, Navaho, Ouchita	
Semi-erect	Chester Thornless, Helen, Loch Maree, Loch Ness, Loch Tay, Triple Crown	
Trailing	Bedford Giant, Black Butte, Black Diamond, Black Pearl, Fantasia, Karaka Black, Kotata, Nightfall, Obsidian, Metolinus, Silvan	Tayberry, Loganberry, Boysenberry, Marionberry, Tummelberry

## Early support

Whatever type of plant is used to establish a plantation, it is important to provide the primocane and floricanes (where present) with support from the onset of growth or from planting onwards. This is necessary to keep the canes off of the soil surface, to prevent wind rocking or rubbing and adequately display any fruit to pickers.

By the late autumn of the planting year, plants may have just current season's primocane or a mixture of primocane and floricanes present.

Any floricanes should be cut through at ground level, removed and disposed of.

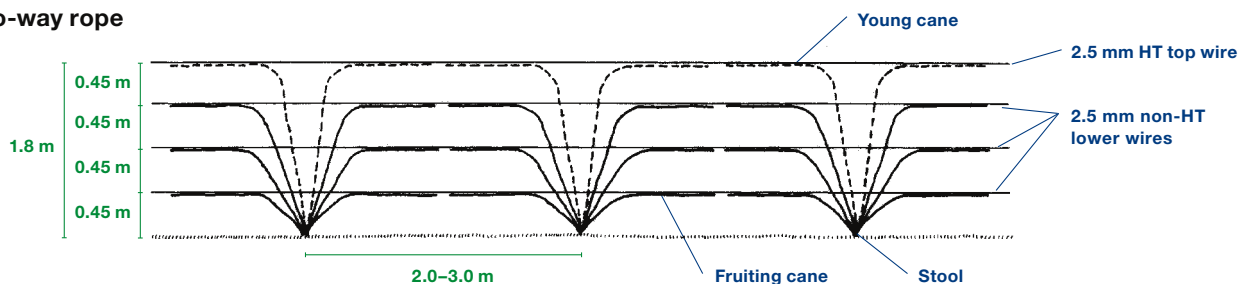
The primocane should be trained upwards, spaced out across the support trellis and fixed securely to the wires at various heights to produce a fan of canes to either side of each individual plant (Figure 4). Alternatively, the canes can be secured in position to one side of the centre of each plant (one way system of training). Diagram 1 illustrates four different training methods that can be used.



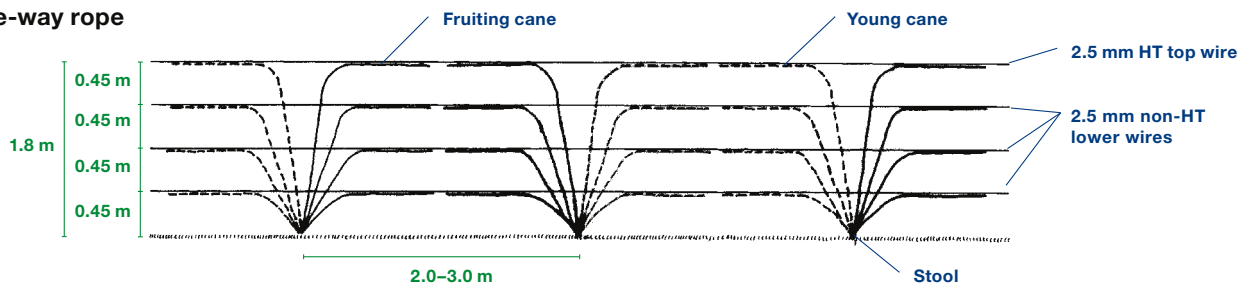
4 Primocane should be trained upwards, spaced out across the support trellis

## Diagram 1 Methods of training trailing & semi-trailing blackberries & hybrid berries

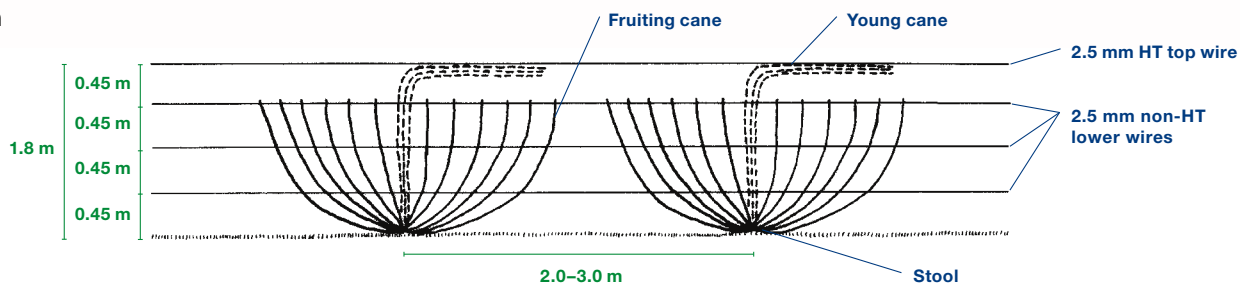
### Two-way rope



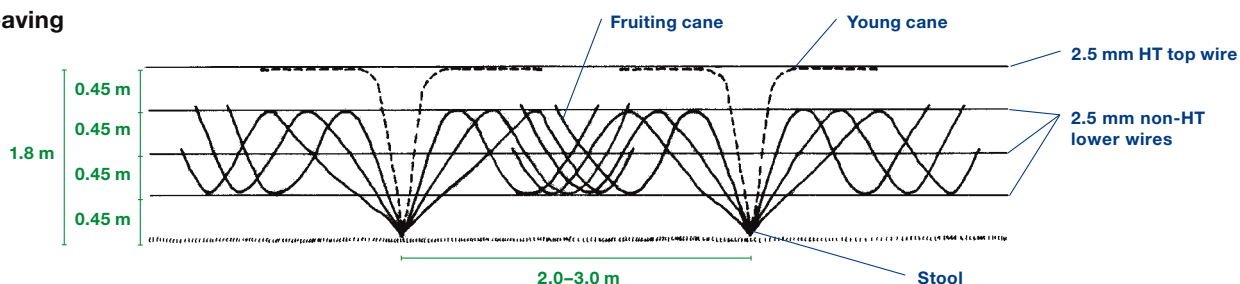
### One-way rope



### Fan



### Weaving



## Cane management and training from year two onwards

During the winter, the primocane becomes florican and just prior to bud break, their tips should be cut back by 20–45 cm to remove any dead, diseased or weak wood. The remaining cane should be at least pencil thickness and individual bud nodes at least 15 cm apart.

This removes apical dominance encouraging all lower buds to break evenly down the cane's length, leading to the production of well-spaced fruiting laterals, which bear fruit of a good size.

By May, new primocane will have started to emerge from around the base of the stool. The number of primocanes that emerge is dictated by the vigour and growth habit of the variety:

- 2–6 primocanes – weaker growing erect and semi-erect cultivars
- 6–12 primocanes – vigorous trailing cultivars

### Erect and semi-erect blackberries

Erect and semi-erect blackberries usually assume their natural growth habit in their second year. Managing them in the same way as trailing varieties often produces unsatisfactory results. The stout, stiff and often very long primocane produced by varieties such as Loch Ness and Chester Thornless are not easily separated from pickers or machinery. They are also prone to wind rock and breakage during the growing season and can be difficult to manipulate and tie onto the support trellis. The number of primocanes produced in some years by these plants can also be very small, resulting in a reduced yield potential.

To counteract this, many growers cut back the primary primocane when it has reached 60–120 cm according to plant spacing and vigour, to encourage production of several branches (laterals) (Figure 5). The height of tipping and how far the canes are cut back depends on the height at which the laterals are required.

### Cane tipping and management in closely spaced plantations

In closely spaced plantations (0.9–1.5 m between stools in the row), where the vertical wall trellis is used to support the crop (Diagram 9, pg 10), the first flush of primocane may be tipped back to within 15–20 cm of their base as soon as they reach 60–90 cm

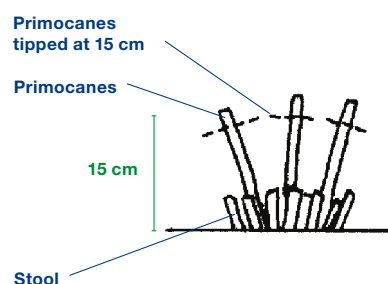
in height in June (Diagram 2a). Two or more laterals may be produced from the stubs. The stub of the primary cane will continue to grow for a while after tipping, so by the end of July they will have reached around 30 cm in height (Diagram 2b). The laterals will reach 1.8–2.0 m by the end of their growing season (Diagram 2c).



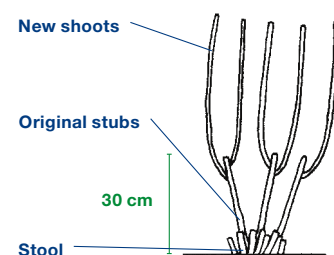
5 Many growers cut back primocane to encourage the production of branching

### Diagram 2 Training system for intensively planted erect & semi-erect blackberries

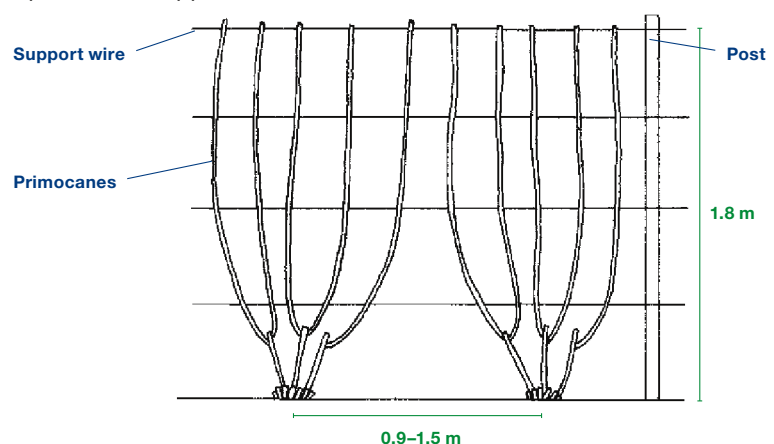
2a Primocanes begin to grow and are tipped at 15 cm long to encourage multiple shoots to form.



2b Several new shoots grow from each cane stub. The best are selected and trained upwards. Extension growth of original stub continues.



2c Growing primocanes are spaced out and clipped or laced in vertical position to support wire.





As primocanes grow, they are held upright and against the face of the support trellis, out of the way of machinery and pickers, so that the current season's fruiting laterals grow out through them and are well presented at harvest. Primocanes can be held in position by a pair of mobile wires (Figure 6), which are held by hook nails driven into either side of each post at intervals, the first at 0.45 m above the ground. The wires are tensioned at each end with a short length of galvanised chain, located over the head of a nail or the end of a bolt fixed to the end post. As the canes grow, the wires are moved upwards to a higher position on the trellis to provide optimal support. Diagrams 3, 4 & 5 illustrate how this system works. Alternatively, the canes can be supported using several lines of string stretched out between the support posts at various heights as the cane grows, but as the string tends to stretch, tension is lost so this form of support is poorer.



6 Primocanes can be held in position by a pair of wires. Note the tape used to fasten canes to wire

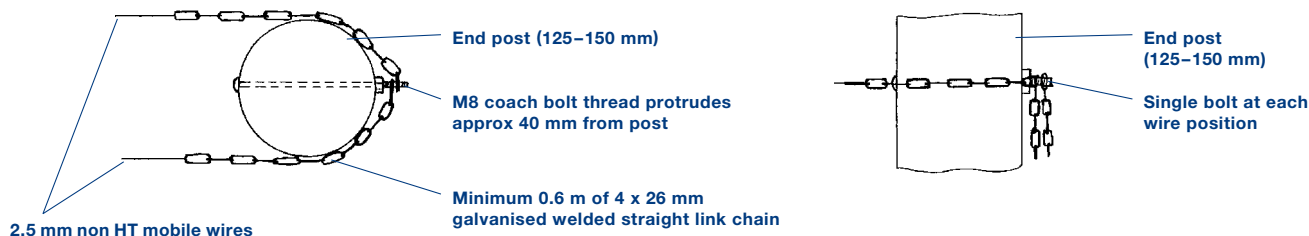
**Diagram 3 Vertical wall support trellis-hook nails & mobile wires**



**Diagram 4 Method of holding chains on end posts with two nails**



**Diagram 5 Method of holding chains on end posts with single bolt**





After harvest, the current season's spent floricanes should be cut through at ground level and removed from the support trellis wires. The primocanes selected to crop the following year should be placed directly into their fruiting position and either laced or clipped to the top (or top and mid) wires of the support trellis. Diagrams 6, 7 & 8 illustrate different options for attaching canes to wires. This work may be delayed until the end of the growing season, when the rind of the

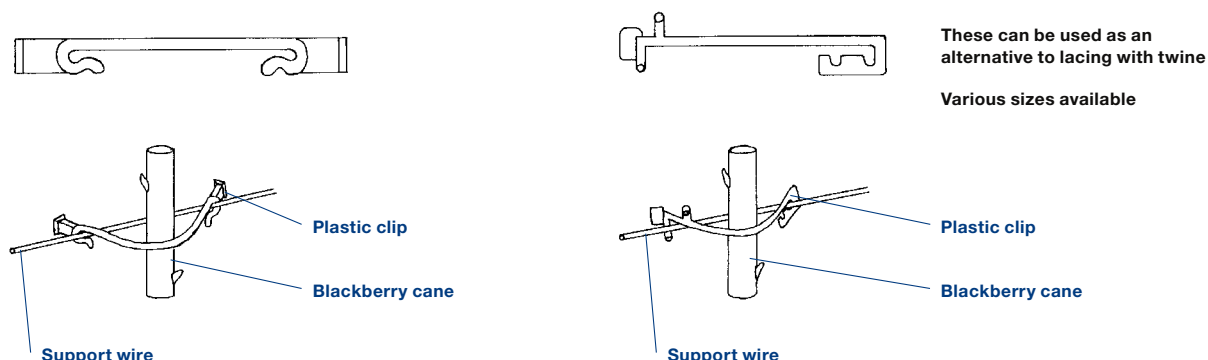
cane has sufficiently lignified to avoid damage from clips or twine. If so, canes should be held upright against the trellis using mobile wires or strings which, after floricanes removal, are usually clipped together using galvanised G-clips (Diagram 7) at several points between each set of intermediate support posts. This stops the canes from moving and abrading each other in the wind.

At the end of the winter, just prior to bud break, these canes (which are

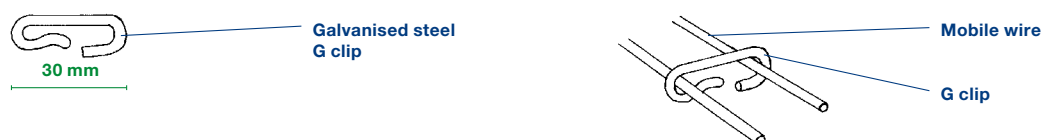
now floricanes) should be cut back to within 15–20 cm of the top fixed wire of the trellis. Any side shoots produced during the previous late summer and autumn should be either completely removed or shortened to within 15–20 cm of their base.

With this system of training, the canes should be spaced 10–20 cm apart, with 5–10 canes per metre of row retained to crop per annum.

**Diagram 6 Black & hybrid berries support system-clips**

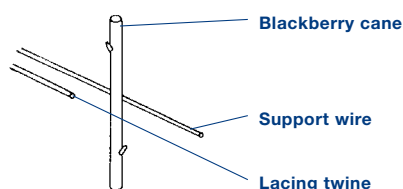


**Diagram 7 G Clip to hold pairs of mobile wires together**

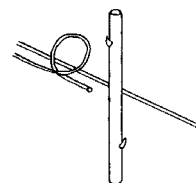


**Diagram 8 Black & hybrid berries support system – lacing technique**

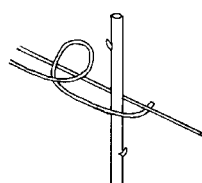
**1** Move from previous cane to next cane to be tied-in, keeping tension on twine



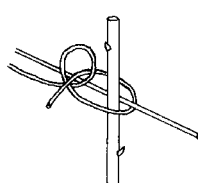
**2** Away from wire, form loop in twine with one hand



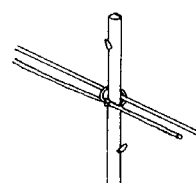
**3** With other hand, pass end of twine (on spool) in front of cane and below wire



**4** Pass end of twine behind cane, over top of wire and through loop



**5** Position cane correctly against wire, pull knot tight and proceed to next cane keeping tension on twine



### Cane tipping and management in wider spaced plantations

In wider spaced plantations (1.8–3.0 m between stools in the row), where the vertical wall trellis (Diagram 9) is used to support the crop, then tipping should take place when primocanes reach 60–120 cm in height. The canes should be pruned back to around 30 cm below the height at which branches are required. Each pruned cane will produce 2–4 branches (laterals) which in turn can be tipped later in the summer to induce further lateral production. By the end of the growing season, this cutting back will have substantially increased the number of canes per plant compared with un-tipped plants, all of which should bear fruit the following summer (Figure 7).

As they grow, the primocanes may be held erect against the support trellis by lines of strings or using the mobile wire system described before for closely spaced plantations. After harvest and the removal of spent floricanes, the current season's primocanes are selected, trained and secured onto the support trellis, normally using the two-way rope training method (Diagram 1, pg 6).

Where a one-way method of cane training is practiced, the primocanes are trained up and clipped into their fruiting position as they grow into the section of the trellis wires which are not occupied by floricanes (Diagram 1, pg 6).

In both cases, it may be necessary to cut back some shoot tips and laterals produced by primary and secondary canes in the previous summer.

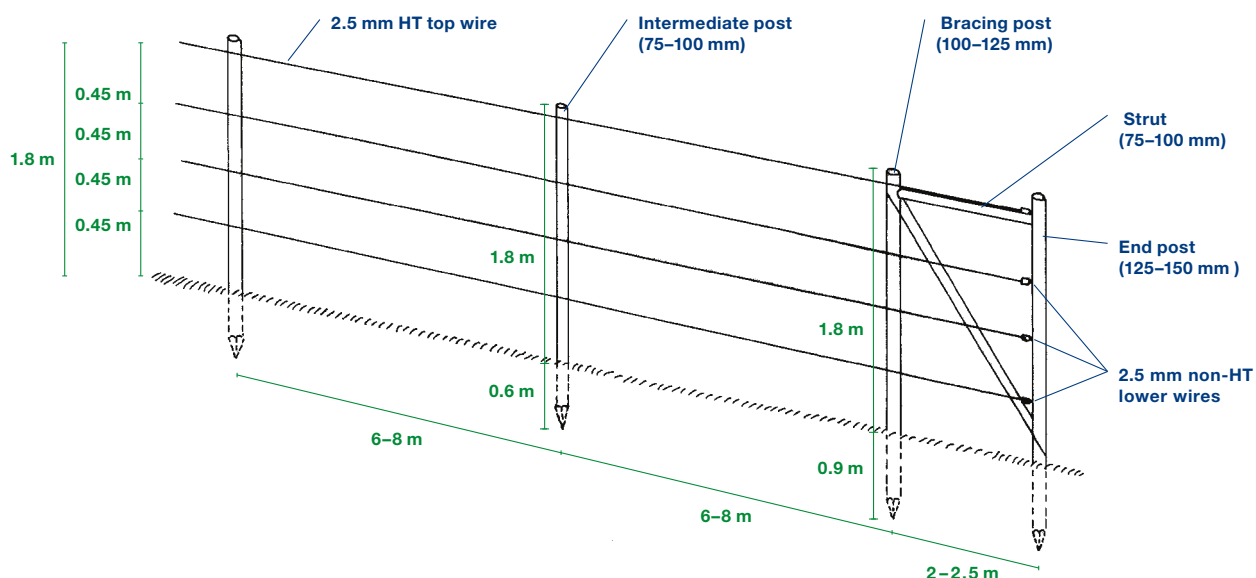
Some growers prefer to use the double wire trellis to support semi-erect black or hybrid berries (Diagrams 10 & 11). In this case, the primocanes are tipped back when

they reach a height of 1–1.2 m. The cane stubs and laterals are then supported by two or three wires running down the centre of each row. At the end of the season, the spent floricanes are removed as usual.



7 Cane tipping can substantially increase the production of new canes per plant

Diagram 9 Vertical wall support trellis



The new primocane and laterals are then split evenly into two and wound along and clipped to the wires on either side of the centre of the row. This system separates the primocane from fruiting canes and provides a good display of fruit to pickers (Figure 8).

## Trailing blackberries and hybrid berries

With trailing varieties, the primocanes are usually kept intact, being allowed to fall outwards and downwards onto the soil surface in the alleys or trained to run along the sides of each

crop row. Alternatively, they may be gathered together around the centre of each plant, the bunch of canes being secured with strings or baler twine to each of the fixed wires of the support trellis as they grow.

On reaching the top wire of the trellis, the bunch is left intact and either trained along the top wire in one direction or split in two and the canes trained in both directions above the floricanes (Diagram 1, pg 6). This keeps the primocane well out of the way of pickers and prevents damage by machinery or others working in the plantation. After harvest, all of the floricanes are cut through



8 The double wire trellis system separates floricanes from primocane, which can improve presentation of fruit to pickers

Diagram 10 Double wire support trellis

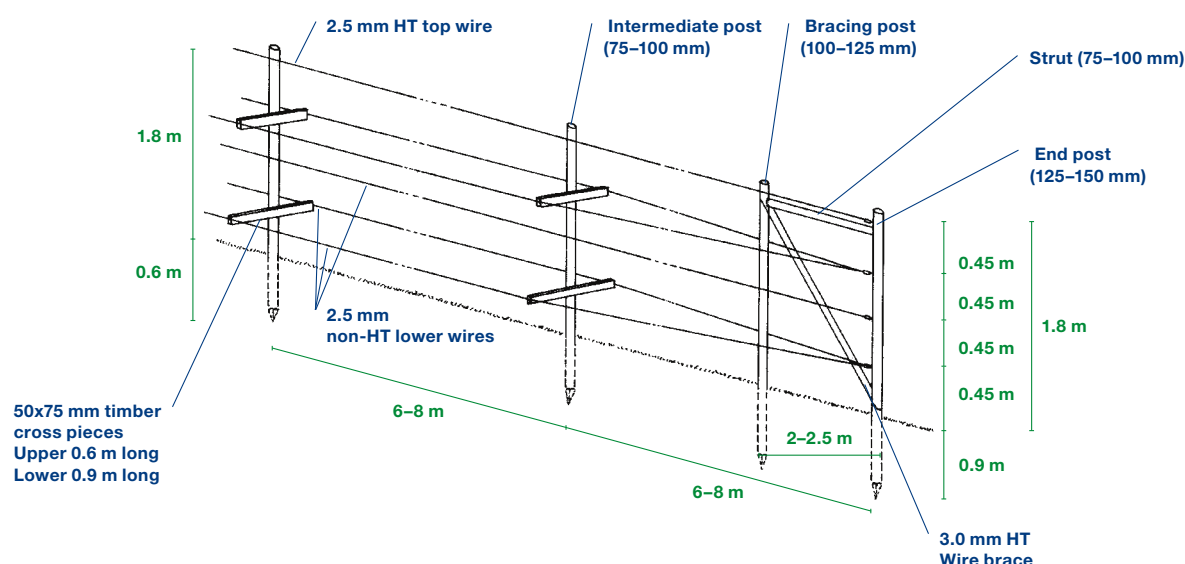
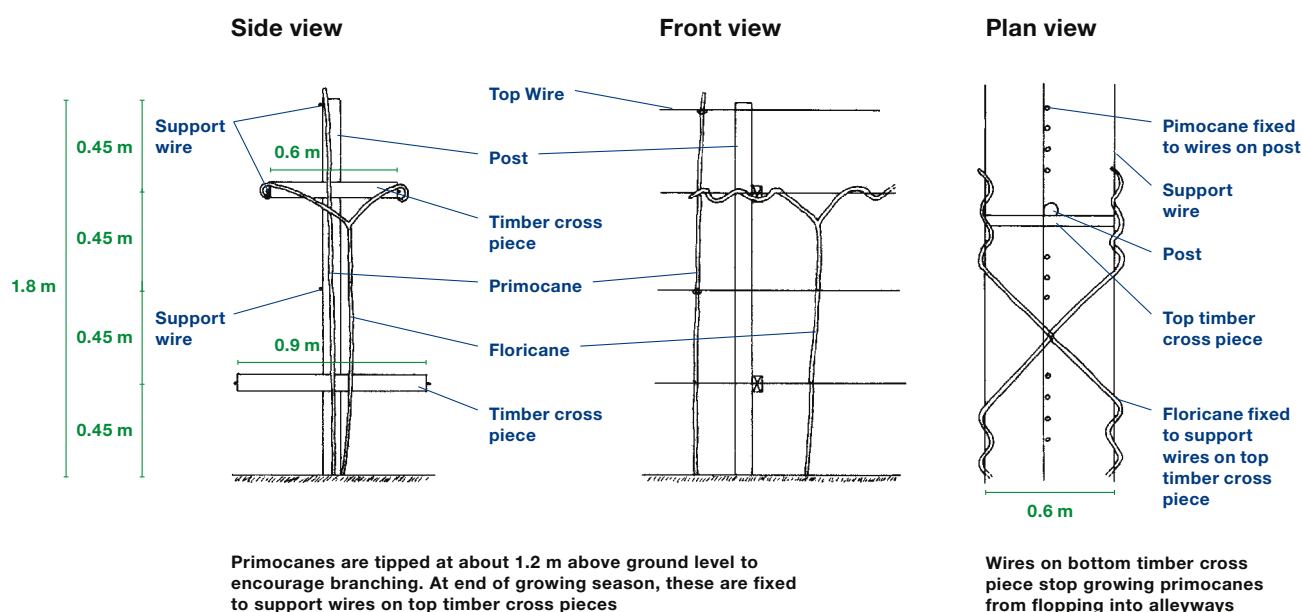


Diagram 11 Training of trailing or semi-erect black & hybrid berries on double wire support trellis





at ground level, removed from the support trellis and disposed of.

This year's primocanes are then detached from the top and lower wires of the trellis and laid out on the ground, with weak or badly damaged canes cut through at their base and discarded. Each remaining cane is carefully lifted and then attached to each of the three lower fixed wires of the support trellis. They can be wound onto the wires, clipped, taped or tied. In all cases, it is important to secure the canes and to fix the wires of the trellis on its upwind side, to minimise the risk of canes or wires detaching themselves during windy weather.

The canes are trained to the wires in one of four ways, as illustrated in Diagram 1, pg 6. They can be trained to either side of the centre of each plant (Two-way rope – Diagram 1 and Figure 4, pg 6), to one side only (One-way rope – Diagram 1, pg 6), in a fan shape (Fan – Diagram 1, pg 6) or woven (Weaving – Diagram 1, pg 6 and Figure 9).

In a one-way rope system, the primocanes can be positioned in this way as they grow during the summer and autumn.

In all trailing black and hybrid berries, pruning out and tying in should be carried out as soon after harvest as practically possible. Where the first flush of primocane removal has taken place or primocane growth has not been adequate prior to harvest, the removal of the floricanes will give the primocane an opportunity to grow away and to reach the required length and diameter by the end of its growing season.

In areas where the winters are likely to be sufficiently cold to cause cane damage after pruning out, the current season's primocane may need to be lowered from the top to the lowest or lowest two wires of the trellis, in such a way as to prevent the cane tips from rooting into the soil. Canes are left in this position through the winter and then released, re-selected, placed and secured into their fruiting position before bud break in the late winter.

In all cases, some additional pruning will be required just prior to bud break in the spring. Side shoots that were produced by the canes in the autumn should either be cut back to their base or alternatively pruned

to leave a short 1 or 2 bud stub.

Any dead cane tips should be pruned back to healthy tissue of at least pencil thickness. Dead or badly diseased canes should also be cut back to healthy tissue or completely removed at this stage.

In fully established trailing black and hybrid berries, total numbers of both primocane and floricanes will range from 6–18 per plant depending

on spacing. However, if trained correctly, they can be managed sufficiently well to support the primocanes adequately, whilst presenting fruit well to pickers. Figure 10 illustrates a well managed plantation of the trailing variety 'Silvan' on the vertical wall trellis.



9 Closely spaced plants trained by weaving across the support wires



10 Well managed plantation of 'Silvan' on a vertical wall trellis. Primocanes are held upright using two pairs of mobile wires

# Optimum specification for the support trellis

Post and wire specifications will vary according to site conditions, including soil type, degree of exposure, length of row, etc. Listed below are typical specifications for the vertical wall and double wire support trellis systems on average sites. Whichever support trellis is used, all posts and timber should be pressure-treated to ensure acceptable durability.

## Vertical wall support trellis (Diagram 9, pg 10)

This trellis can be used for erect, semi-erect and trailing black and hybrid berries.

### Posts

- End post 2.7 m long x 125–150 mm round, set 0.9 m in ground, 1.8 m above
- Bracing post 2.7 m long x 100–125 mm round, set 0.9 m in ground, 1.8 m above
- Intermediate posts 2.4 m long x 75–100 mm round, set 0.6 m in ground, 1.8 m above
- Bracing struts 75–100 mm round
- Intermediate posts are spaced 6–8 m apart in the row, depending on site

### Wires

This trellis has three or four fixed wires. The bottom wire is 0.45 m above the ground and the other

3 wires spaced at 0.45 m intervals above it, so that the top wire is just below top of the posts. Wires are strained with radisseurs or other suitable wire strainers and all are fixed to the posts with heavy duty galvanised staples. All wires should be of 2.5 mm galvanised steel. The top wire may be high tensile (HT), the lower wires non-HT. Use 3.0 mm HT for wire brace.

### Brace

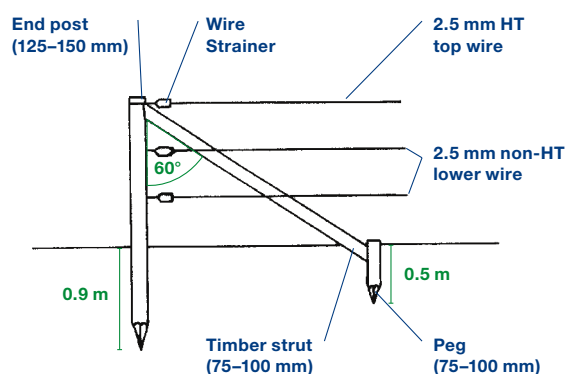
Various methods of bracing are employed, including simple wire brace, wooden strut and wire brace and strut. The wire brace and strut is generally the strongest and least likely to pull the end post out of the ground (Diagram 12 and Figure 4, pg 6).

### Plant spacing

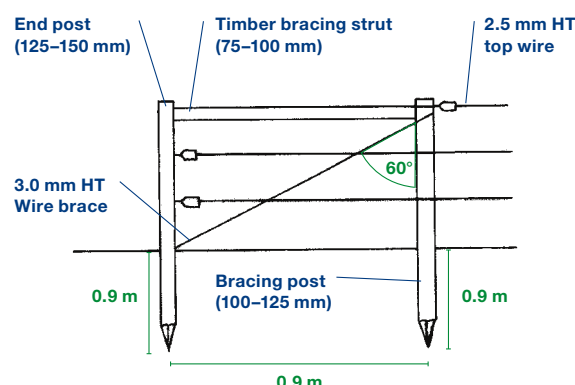
- 0.9–3.0 m apart in the row

Diagram 12 Black & hybrid berries support systems – methods of bracing end posts

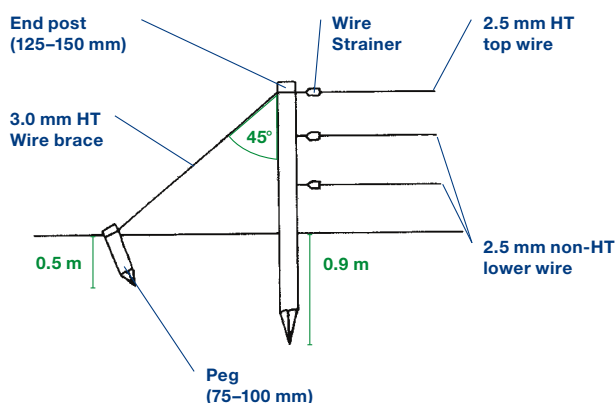
### Wooden Strut



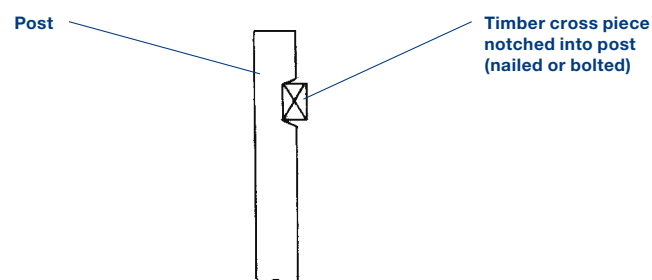
### Wire brace & strut



### Simple wire brace



### Method of attaching timber cross piece to post



### Fruiting lateral supports

Varieties which produce long fruiting laterals when grown under cover require additional support for them during the growing season (Diagram 13). This is achieved by using up to 4 timber battens, each 0.6 m x 50 mm x 25 mm, nailed horizontally onto each intermediate post, either just above or just below each of the four fixed wires. During the growing season, tapes, baler twine or similar are strung between the ends of these timbers to support the fruiting laterals. The tape or twine is removed at the end of the season, but the battens remain in place. To withstand the weight of the fruiting laterals, the battens at the end of the row should be of 50 x 75 mm timber, and be nailed to the **outside** of the end posts.

A modification is to attach the top most batten so that it can be pivoted into the vertical position and thus provide support for fleece that may be used to cover the crop in the spring. This top batten is fixed to the post

with a single galvanised nail to allow it to pivot. String or tape attached to the uppermost end is left in place to help support the fleece.

### Double Wire support trellis (Diagrams 10 & 11, pg 11)

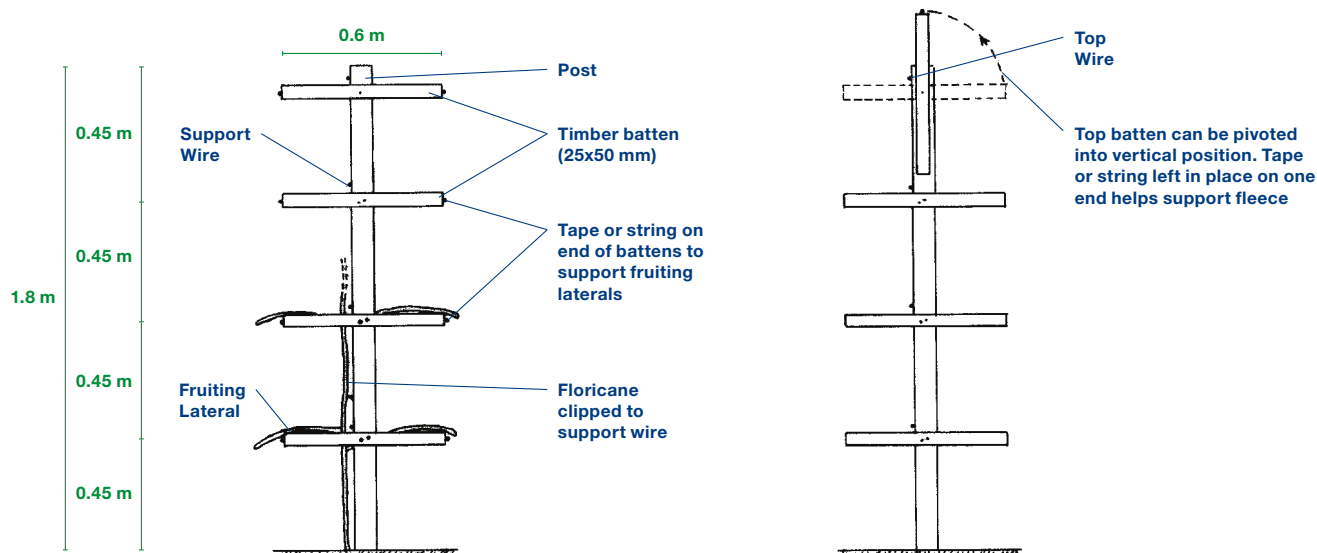
This system is usually adopted for vigorous semi-erect varieties which produce particularly stout canes eg Chester Thornless.

The end and intermediate posts are of similar specification to the vertical wall trellis, rising 1.8 m out of the ground. Likewise, the top wire is 2.5 mm HT with 2.5 mm non-HT below. Four sets of wires are used; from the top these are:

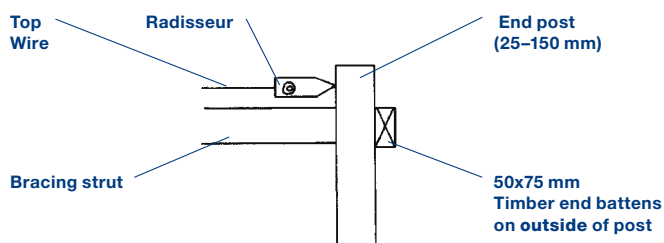
- A further single wire fixed to post.
  - At the bottom, another set of double wires separated by a timber cross piece 0.9 m long.
- The wires are spaced at 0.45 m intervals up the post, with the uppermost wire just below the top of the post. The cross pieces are notched into the support posts and held with heavy duty galvanised nails.
- The bottom pair of wires stops the growing primocanes from flopping out into the alleyways. As the primocanes grow, they are clipped to the top and third wire down which are fixed directly to the posts, to keep them out of the way of the floricanes.
- A single wire fixed directly to post.
  - A set of double wires separated by a 0.6 m long cross piece of 50 x 75 mm section timber nailed to the post.

**Diagram 13 Vertical wall support trellis – lateral supports**

#### Top timber batten pivots to support fleece



#### Position of battens on end post



End battens must be stronger (50x75 mm) and fixed to outside of end posts to resist weight of fruiting laterals.

Top battens are fixed with single heavy duty galvanised nail to allow pivoting.



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## Securing canes to support wires

Whichever method is used, the aim is to secure the canes tightly to prevent them from becoming loose. This can lead to abrasion against the wire, which gives rise to cane breakage, disease infection and increases the risk of cold injury occurring.

The three preferred systems are the 'lacing technique' (Diagram 8, pg 9), use of plastic clips (Diagram 6, pg 9 and Figure 11) and plastic tape gun (eg Max Tapener – Figure 6, pg 8). The lacing technique employs twine (medium grade plastic baler twine), which runs down the length of the row, securing each cane to the wire. This requires staff to be trained to perform the task well and can initially take longer (until the labour force achieves proficiency in the task). In contrast, it is initially quicker and easier to employ staff to secure canes using plastic clips, but they

are more expensive to purchase. A cheaper alternative is plastic tape, which is attached using a purpose designed gun. These are quick and easy to use, but are less secure and more prone to breaking or perishing during the winter months.

When securing canes to the support wires, they should always be attached on the prevailing wind side. Experience shows that they remain secure for longer on this side.



11 Typical plastic clips used to secure canes to wires

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## Old fruiting cane removal and clearance

Whichever system of cane management and training is adopted, it is best to start pruning out as soon as harvest has been completed. This will reduce the risk of disease spread from floricanes to primocanes, improve the air circulation and improve pesticide spray coverage of primocanes, should it be necessary. Early pruning and primocane training can also hasten primocane ripening, reducing the risk of cold injury during the ensuing winter.

Old fruited canes and any unwanted primocane should be cut through cleanly, as close as possible to the top of the plant's crown or at ground level. If the stubs are left, these can act as a source of disease infection from cane blight. They can also rub against primocane and damage the rind, leading to disease infection or produce egg laying sites for raspberry cane midge. Tall stubs will also impede pruning in following years, with the spent

floricanes being cut out higher and higher each year.

Secateurs, pneumatic pruners and loppers can be used for cane removal.

Pruning black and hybrid berries, especially the trailing types, is generally more difficult and therefore a far slower and more expensive process than for summer fruiting raspberries. The task is made far easier where:

- Unwanted primocanes have been routinely removed throughout the growing season.
- Primocanes to be retained to crop the following year have been trained up and secured onto the top wire during the current growing season.

In so doing, access to the base of spent floricanes is improved. They should be cut out, detached from the trellis wires and thrown down into the alley. They can then be pulverised in situ, chopped and incorporated into the soil or removed. Removal is best achieved by gathering the canes into piles with rakes and then pushing them out of the alley, using a tractor mounted buck rake, and disposing of them away from the plantation. At the

same time any unwanted primocane growing around or between the plants can be cut out and thrown down in the alley for disposal.

Where unwanted primocanes have not been removed, but allowed to grow unchecked, it can be very difficult to reach the old fruited canes and primocanes that need removal, even with loppers.

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### Labour requirement

Cutting out and tying in should take 6–15 hours per 100 metres of crop row with erect and semi-erect blackberries. A similar output can be achieved for trailing black and hybrid berries (assuming unwanted primocanes have been removed and spring and summer training of primocane onto the support trellis has been carried out). This spring and summer work can be expected to take a further 6–10 hours per 100 m of crop row, according to the plant habit, in-row spacing and plant vigour.

Where cane removal and training is not carried out earlier in the growing season, post-harvest or winter pruning can take considerably longer.

## Biennial cropping

Biennial cropping offers a completely different form of management where the growth of each plant alternates between a fruiting (Figure 12) and vegetative phase (non-fruiting year) (Figure 13). This system offers a range of benefits:

- Cropping plants are able to produce significantly more fruit than plants which contain both flori- and primocane, as competition for water, nutrients and light is removed.
- Fruit presentation and the rate of picking are greatly improved.
- Costs of cane management and pruning are reduced.
- Biennial cropping can break pest and disease life cycles, offering an opportunity to reduce incidence and pesticide usage.
- Biennial cropping lends itself to difficult to manage varieties such as Fantasia and those with a natural tendency towards biennial cropping such as Chester Thornless.

## How does it work?

In the **fruiting** year, all of the primocane produced by the plant is removed as soon as it reaches a height of 20 cm. In part, this removal may be carried out using a desiccant such as carfentrazone-ethyl (Shark), but more usually the unwanted cane is cut through at its base using secateurs, removed from the row and placed down in the alley to wilt and die. In most seasons, it will be necessary to remove two or sometimes three flushes of primocane until harvest begins and staff are no longer available for this work. After harvest, the spent floricanes are left intact as are any primocanes that have emerged.

In December or January, when the old floricane is dead and the primocane dormant, all canes are cut out, at or as close as possible to ground level or the crown of the plant. During the following growing season, these plants will not fruit, but produce two or three flushes of primocane. Suitable canes should be selected, supported and tied onto the support trellis wires as they grow, so that by the end of the growing season, they are in their final fruiting position for next summer. Any damaged, weak, diseased or poorly positioned primocane can be

removed each time the plants are trained by staff during the summer. Depending on the variety, some 25–33% more primocanes are retained to crop than would be the case with annual cropping plantations. In the late winter, just prior to bud break, the new floricane is tipped to remove any tissue that has become damaged or diseased during winter, only leaving canes which have a diameter greater than that of a pencil.

A biennial cropping plantation may contain alternate rows of cropping and non-cropping plants, or the plantation can be split into cropping and non-cropping halves. Separate plantations, with one or more varieties, in alternate cropping and non-cropping phases can also be used.

Plantations that are to be managed biennially should be fully established and at least 2 and possibly 3 years old (having been annually cropped previously). They should be free from any serious root or cane infections or weed competition. Primocanes must be provided with support to prevent wind damage throughout its growth period, using strings or preferably a pair(s) of mobile wires fitted to the support trellis. Ideally the plants should be trickle irrigated and, if possible, fertigated.



12 Biennial crop of 'Silvan' in the fruiting phase



13 Biennial crop of 'Silvan' in the vegetative phase

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