The Development of a Market-led Propagation System

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INTRODUCTION

Propagation has more influence on the final quality of nursery stock than does any other stage of the production cycle. Both efficiency and effectiveness of production are controlled by the rate at which saleable plant size is achieved and this, too, depends to a large degree on the quality of the liner emerging from the propagation house.

Using modern technology to improve traditional cuttings propagation systems can come close to ensuring that each plant produced is of premium grade But they still have the drawback of being production-led rather than market-led. They fail to deliver high quality, fresh plants throughout the season. Instead they lead to maximum availability of plants in the autumn at a time when demand is below peak.

A MARKET-LED MULTIPLE SALES SYSTEM

The production system to be described in this paper develops plants to the point of sale in the same time as direct sticking but produces a more consistently high quality product. Delivery of plants can be scheduled to meet consumer demand throughout the normal growing season, and a smaller propagation facility is required It can produce a new batch of consistently high quality, uniform plants in each month of the growing season. This is a most important feature, since it allows plants to be produced in prime condition throughout the periods when consumer demand is at its highest.

The system is thus a truely market-led system. The producer can negotiate with the retail outlets the quantity of plants required at particular times during the sales season, and can adjust the growing programme accordingly to deliver fresh plants, in prime condition as required. In addition, by careful selection of plant type, it is possible to enhance the sales appeal of many species by producing plants in flower for delivery to garden centres throughout the season.

In this system, cuttings are rooted in cell trays in which the cell sizes are determined by the leaf area of the cutting. This greatly reduces the container size required at the propagation stage For example in the case of *Abelia* cuttings a cell size of only 37 × 37 mm is required, whereas if such cuttings are struck in the final pot, a container of 16 cm diameter is typically used.

Placing cuttings in small cells greatly reduces the rooting time. The roots are forced to grow downwards in the ribbed cells. The check to growth at potting-on which usually occurs when roots are allowed to spiral can thus be avoided and the particular advantages of direct sticking, in which checks to root growth and root disturbance are minimised, are retained

As the system uses the existing nursery infrastructure and does not demand investment in extra acreage it is ideally suited to small or medium size nurseries with limited capital and resources.

Different crops require different production programmes. The programme described in this paper is designed to produce, for the retail market, deciduous plants which normally require a 15 to 18 month production cycle.

METHOD FOR THE DEVELOPMENT OF THE MARKET-LED SYSTEM

The first step in developing the new system was a detailed analysis of the traditional Autumn Sales Production System (ASPS) which was then in use on the nursery. Its major shortcomings were identified as.

1) Cuttings for the year's plant production are taken at one time requiring large amounts of space in the propagation unit.

2) Large numbers of stock plants have to be grown to make available sufficient material at one time.

3) "Factory" mechanisation techniques rather than careful individual selection results in variable quality and high failure rates.

4) The utilisation of production facilities and systems is poor. Bottlenecks occur at crucial stages.

5) Major checks in growth occur at potting-on due to root disturbance or liners being pot bound

6) The throughput of the system is low with high handling costs.

7) Marketing strategy is constrained by the production process. Plants for spring sales are produced from July onwards and thus require additional space for overwintering.

8) The time to saleability is dictated by the liner pot size Thus there is a need for different sizes of liners to achieve sales at different times of the year. This inflexibility of the production process is one of the system's greatest shortcomings.

MAJOR PARAMETERS OF THE NEW SYSTEM

Consideration of the above shortcomings led to the identification of the following major parameters that would affect the design of the new system:

1) The actual growing season.

2) The earliest and the latest times of year the plant could be successfully rooted in economic numbers (i.e greater than 70%).

3) Cutting availability, rooting and weaning time.

4) Cutting to liner establishment time.

5) Liner to final pot establishment time.

6) The time to point of sale after establishment.

7) Indoor growing space available and whether the plant requires final potting indoors to aid establishment.

8) The earliest convenient indoor potting date

9) The amount of outdoor growing space available.

10) The earliest frost free outdoor potting date

11) The time of year stock requiring winter protection should be moved indoors.

12) The number of plants required each month by the retail outlets

13) The attributes of the plant that motivate sales (e.g foliage, flower, size, etc.

14) The species/cultivars to be grown

SYSTEM CRITERIA

The criteria the new production system should meet when established are as follows.

1) The system should provide a programmed production of a regular supply of different sizes of liner.

2) It should produce simultaneously a variety of market-fresh plants with a predetermined shelf life.

3) It should allow the production unit to work to contracts placed in advance.

4) Modern techniques and equipment should be used to release staff from mundane activities which are best left to automation This allows staff to concentrate on those activities which are not suitable for automation.

5) The propagation unit should be used exclusively for propagation. Weaning should be carried out elsewhere to ensure the maximum effective use of the facility.

6) Propagation misses should be minimised by rooting and pregrading cuttings before transferring them to liner pots.

7) The system should enable the production of the smallest fastest rooted unit of maximum flexibility that can be sown in the different sizes of liner pot.

8) Stock plants should be utilised to greatest effect by the provision of multiple batches of cuttings throughout the growing season. This is most effectively achieved by inserting the cuttings and potting the liners and final pots at staggered intervals during the season. This will also help to reduce overproduction.

9) The liner-pot stage of production should be retained to allow slow growing and difficult subjects to be adequately established.

10) The stock turn at every stage of production should be increased by optimising the use of indoor and outdoor facilities.

11) Optimum conditions should be provided to permit uninterrupted growing

12) Production time should be reduced without sacrificing quality

13) The number of final pots overwintered on the nursery should be minimised

DEVELOPMENT OF THE SYSTEM

In the analysis of the existing ASPS it was noted that subjects requiring final potting indoors to aid establishment, needed less production time than those that were final-potted outdoors, due to the faster growth rates achieved under protection.

To allow comparison with the existing system, two deciduous subjects were chosen for the pilot programme of the new system. One of these was normally final-potted indoors, the other outdoors, in the 15- to 18- month programme of the ASPS The two chosen subjects were:

Abelia x *grandiflora* 'Francis Mason' (Table 1),

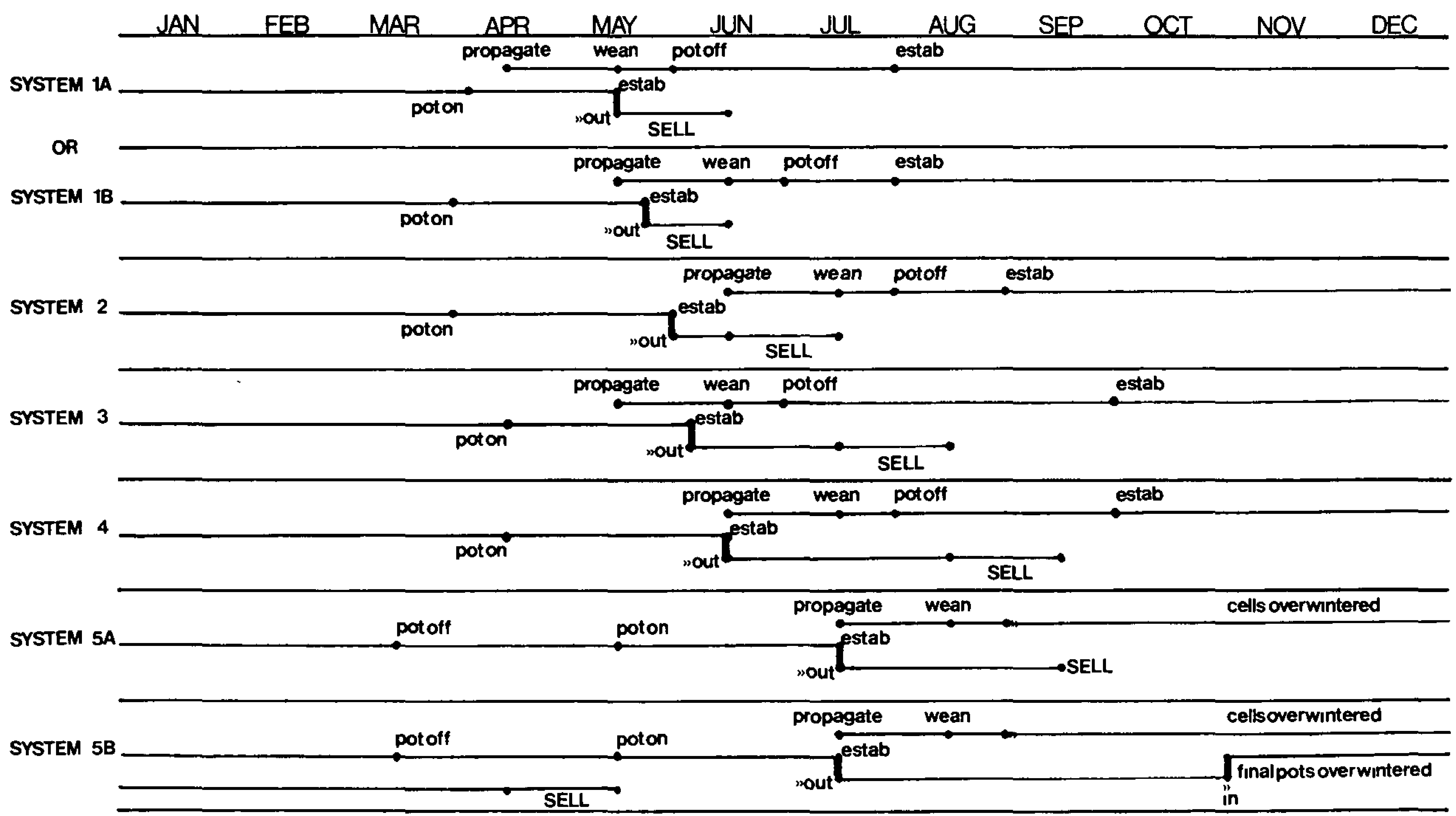
Spiraea japonica 'Gold Mound' (Table 2).

The first trial involved taking cuttings at 4 week intervals from April to September and potting a single rooted cutting into each different liner pot at 6 week intervals. From this, definite cut-off points for the propagation and potting-off times for each of the different liner pots, to achieve successful establishment and overwintering were identified The following observations were also made:

1) The latest an 11 cm, one-litre deep pot could be produced was from cuttings taken in April and potted-off not much later than June 1st

2) The latest an 11 cm, 0 75 litre pot-liner could be produced was from cuttings taken in May and potted off not much later than the end of June.

Table 1. Optimum systems for subjects final potted indoors to aid establishment. Test subject: *Abelia* × *grandiflora* 'Francis Mason'.



3) The latest a 9 cm, 0 5 litre pot liner could be produced was from cuttings taken in June and potted-off not much later than August 1st.

4) cuttings taken in April could achieve 50% of the final required plant size by the end of the growing season.

However, cuttings taken from mid-July onwards and potted-off from September onwards made no significant gain in size and were better overwintered in the cell trays. This required less overwintering room If the cuttings were left in the trays after March, they became difficult to manage and suffered severe checks to growth.

It was obvious that to produce final plants of the required size and grade in time for some of the sales months, particularly those in spring, would require the production of part grown final plants at different stages of development at the liner stage. However to avoid any checks in growth or deterioration of quality through reducing production time, it was imperative that the liners had reached an appropriate stage of development at the final potting dates established in the programme.

The next trials involved taking cuttings at four week intervals from mid-April to mid-July and potting off different numbers of cells in each liner pot at 6 week intervals (Table 3).

It was found that using multiple cell liners considerably hastened establishment time in the liner and final pots when compared with a single cell liner. Furthermore, substantial extra growth was achieved, producing a more uniform product which could be marketed earlier. In addition, by using multiple numbers of cells, larger liner pots could be established later in the season. However less growth was achieved because of the reduced potential for growth after the longest day has passed. Thus later propagation is best suited to liners for sales later in the season.

From further trials it was possible to fine tune and target a particular size of liner at a specific sales month by increasing or decreasing cell numbers which either accelerated or decelerated production time. However it was not possible to produce a liner which could be potted in the same season for mid-April sales and thus a quantity of the plants produced for September had to be overwintered. Also, because of the danger of frosts before May, those subjects that were normally final-potted outside had to follow the same liner systems developed for indoor final-potted subjects for May and June sales. This required a different set of liners for the other sales months.

While it was possible for different sizes of liner with larger numbers of cells to be produced later in the year for the same sales month, those selected-out were at their optimum point of growth, required the minimum number of cells and best met the criteria established for the new system

CONCLUSIONS

The pilot programme has been successfully employed for two popular species. The system is now ready for full operational production.

It is applicable to a wide range of subjects, but growers wishing to use it will need to carefully prepare production schedules to suit each variety

The system requires high quality propagation systems and facilities but in return offers the opportunity to produce plants of consistently high quality throughout the normal sales season.

While maintaining high output levels its main emphasis is on high quality throughout the production process The quality and marketability of the final product are enhanced and the viability of the production unit thus improved.

Table 2. Optimum systems for subjects final potted outdoors Test subject *Spiraea japonica* 'Gold Mound'.

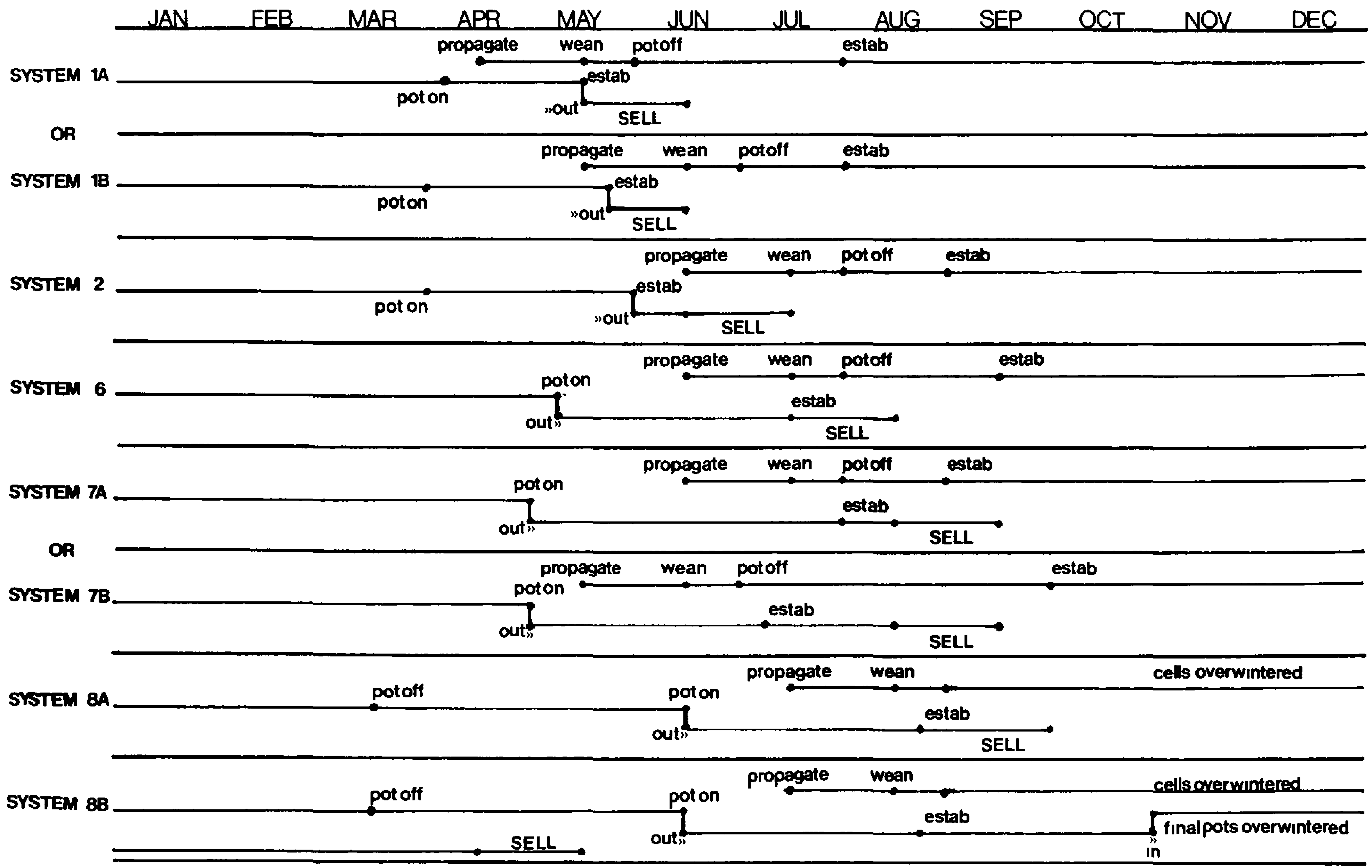


Table 3. Optimum liner systems for indoor and outdoor final potting

Liner system number	cell number and liner pot size (depth, vol.)	Propagation month	Potting off month	Establishment time in weeks of cells in liner pots	Potting on month
Optimum Liner Systems when potting commences 1st April for subjects final potted indoors to aid establishment					
1A	2 cell 11cm, 1L	April	Early June	8	Early April
OR					
1B	2 cell 11cm, 0.75L	May	Early July	4	Early April
2	2 cell 9cm, 0.5L	June	Early August	4	Early April
3	1 cell 11cm, 0.75L	May	Early July	12	Early April
4	1 cell 9cm, 0.5L	June	Early August	8	Mid-April
5A	1 cell overwintered 9cm, 0.5L	July	Mid-March	8	Mid-May
(NOTE System 5B is an extended System 5A)					
5B	1 cell overwintered 9cm, 0.5L	July	Mid-March	8	Mid-May
Optimum Liner Systems when potting commences 1st May for subjects final potted outdoors.					
1A	2 cell 11cm, 1L	April	Early June	8	Early April
OR					
1B	3 cell 11cm, 0.75L	May	Early July	4	Early April
2	2 cell 9cm, 0.5L	June	Early August	4	Early April
6	2 cell 11cm, 0.75L	June	Early August	6	Early May
7A	2 cell 9cm, 0.5L	June	Early August	4	Early May
OR					
7B	1 cell 11cm, 0.75L	May	Early July	12	Early May
8A	1 cell overwintered 11cm, 0.75L	July	Mid-March	12	Early June
(NOTE System 8B is an extended System 8A)					
8B	1 cell overwintered 11cm, 0.75L	July	Mid-March	12	Mid-June

Notes 1) All liners grown and overwintered under protection

2) Systems 5A and 8A had to be extended to overwinter final pots to provide plants for the first sales month

3) Systems 1A, 1B and 2 are repeated due to insufficient outdoor growing time to develop liners to point of sale for mid May and mid June sales

Table 3 *continued*

Establishment time in weeks of liners in final pot	Month of moving final pots outside	Time in weeks to point of sale	Sales month	Total production time in months
5 5	Mid-May	0	Mid-May to mid-June	13
6 5	Late May	0	Late May to mid-June	12
8	End of May	2	Mid-June to mid-July	12
6 5	Early June	5 5	Mid-July to mid-August	12
8	Mid-June	8	Mid-August to mid-September	14
8	Mid-July	8	Mid-September onwards	14
8	Mid-July	8	Mid-April to mid-May	21
5 5	Mid-May	0	Mid-May to mid-June	13
6 5	Late May	0	Late May to mid-June	12
8	End of May	2	Mid-June to mid-July	12
9	n/app	0	Mid-July to mid-August	13
12	n/app	2	Mid-August to mid-September	14
9	n/app	5	Mid-August to mid-September	15
9	n/app	5	September onwards	14
9	n/app	5	Mid-April to mid-May	21

Parameters Growing season Mid-March to end of September / Rooting time 4 weeks/ Weaning time 2 weeks / Earliest convenient indoor potting date 1st April / Earliest frost free outdoor potting date 1st May / Time of year stock requiring winter protection moved in 1st November