4. Eventually some production schedules suitable for particular market requirements for individual, or groups of species may be developed.

Question to Joanna Wood: Is supplementary shading necessary?

Joanna Wood. We thought that supplementary shading would be necessary and I used it in my trials on the East coast. Margaret Scott has carried out trials at Efford without shading and there have been no problems. As the light intensity levels are higher on the South coast, we would conclude that supplementary shading is not necessary.

Question to Joanna Wood: How is weed control achieved in the sun frames?

Joanna Wood: We were putting on a fairly deep layer of sand onto the beds but found this sand layer to be unnecessary as the weeds are so lush and lank that they are easily removed by hand after the covers are removed. With no sand layer the roots of the cuttings can exploit the slow-release fertiliser more quickly.

STARTING A NURSERY AFTER COLLEGE

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I shall give a brief account of why we started a nursery and include a short history of Welland Vale Nurseries. I will then outline the various problems and limiting factors we encountered and describe how we attempted to solve them.

The idea of starting a nursery was first discussed among various friends while still in the first year of our Ordinary National Diploma (OND) course at Pershore. At that time several people were interested in the project. However, by the end of the third year interest had waned and, on leaving college in the summer of 1972, only 3 people remained committed to the idea — these being Trevor Burns, who now deals with sales, Nick Cox, from whom we parted company after one year, and myself.

The initial impetus for the project which may well have been alcohol-induced, probably came from a romantic view of life and a naivety of business. We had very little experience in nursery work and none of business. None of the partners' families had any connection with the nursery trade and all of us came from cities. So it was going to be very much a question of learning as we went. At that time we did not consider the task too daunting and the comparatively low wages being offered to OND students reinforced our feeling that nothing would be lost by trying to set up for a few years.

At the time of leaving college in summer 1972, our capital was approximately £650, which we used to buy an old pick-up truck and a few tools, whereupon we started landscaping. However, by Christmas of that year the money had run out and in January, 1973, we started working full-time on a local building site. This continued until the spring when we resumed landscaping work. Shortly after this Nick Cox left and Trevor Burns and I continued, using Uppingham as our base which is the location of our current nursery business.

By the summer of 1974 we had accumulated approximately £3500 worth of capital by paying ourselves subsistence wages. At this point we began looking for land in the area and consequently met Alan Carr who is our third partner. He owned 4 acres of wind-swept land on top of a hill which we were only too pleased to obtain. We concluded leasing arrangements in November, 1974, and formed a limited company at the same time.

This 4-acre green-field site had neither mains water nor electricity, although it did have a well from which we could extract about 200 gallons per day. In 1975 we started growing on a part time basis some plants which included wallflowers, spring cabbage, and a few lettuce. At the same time we propagated nursery stock for container growing which was our intended purpose for the land. Turnover on sales in 1975 was £964 By the middle of 1976 mains water and a 3-phase electricity supply had been installed and a turnover of £3374 was achieved from similar crops to the previous year. We were still combining part-time work in the nursery with landscaping because we lacked sufficient capital.

In 1977, both Trevor and I began working full-time on the nursery using propagated material from the autumn of 1976. At this time facilities consisted of 3 propagating tunnels, a water tank, pump house with a 3-phase pump and a small amount of irrigation equipment. The turnover in 1977 increased to £9625, mainly from container-grown liners and ground cover.

Each succeeding year we increased production, laid down more standing beds and improved facilities as money became available. In 1980 we purchased 4 acres of adjoining land. At this point we reappraised our progress and made new plans for coping with the effects of doubling the nursery area. Since 1980 we have increased production while slowly developing the new land for standing beds as required.

At this stage I should say that the solutions to our problems and the time-table of development were strongly influenced by a shortage of capital and our reluctance to finance development by borrowing.

Our ambition was to create a container nursery and for this we drew a site plan on which we detailed the position of all facilities, incorporating our ideas for creating an efficient layout for the future. The first practical task was to set up the basic facilities necessary for container growing. These were polythene tunnels, standing beds, an irrigation system and windbreaks.

Our first tunnel was destroyed in a storm and was replaced by a larger stronger type. We have used this type since. The standing beds were improved. At first they were made of levelled soil with an adjacent soil path. Hardcore was then used to create good access, and gravel was spread for standing pots on. Irrigation was standardised to Cameron spraylines in the tunnels and Rotoframe sprinklers for outside stock and these are operated manually from standpipes. Windbreaks proved necessary at an early stage due to the exposed position of the land, and consist of a combination of Paraweb and × *Cupressocyparis leylandii* plantings.

During these early years all the potting was done inside the polytunnels which we also used for the storage of materials and equipment. A considerable amount of improvisation was required in order to achieve production with facilities which were really very primitive for container growing. Our office at this time consisted of a telephone on a shelf in the pump house. It remained like this until the end of 1981.

We very soon realised the limitations of working in a polythene tunnel and were therefore prompted to construct a small building from concrete blocks. This gave us better access, a concrete floor, more efficient electric lighting, and room for four people to pot. Compost was mixed 3 bales at a time on the floor using a Howard Gem rotovator and turned by hand into a heap against the wall. From here it was shovelled manually onto the bench by each worker as required. We had bought several old Bonser trucks in various states of disrepair to move plants. These were cajoled into running spasmodically

and were used to tow shelved trailers made from angle iron. We were able to continue like this for about 18 months until the Bonsers were superseded by a 14 HP Kubota tractor.

By 1980 we had achieved the basic growing facilities, limited potting facilities, and an embryonic transport system. At the same time we began negotiations for the purchase of an additional 4 acres. This forced us to analyse what we had learned on the manufacturing aspect of container nursery stock production. It can be summarised as follows:

1) As production of saleable plants increased, the existing system of mixing and handling compost became progressively more inefficient. Eventually the point arrived where the potting operation became the major factor limiting an increase in production.

2) A high proportion of the potting day was spent physically moving the compost within the potting environment.

3) Efficient and reliable transport away from the potting area was essential.

4) Hand potting speeds were improved by using rigid pots.

5) A system of bonus payments seemed to stimulate morale and improve potting rates.

We reviewed our facilities in respect of these lessons and having in mind the required increase in production, we arrived at the following conclusions:

1) That the irrigation system as originally designed was adequate but should be automated at the earliest date. We were spending a lot of time running up and down turning valves on and off.

2) That the road and path system suited our working methods as it allowed access by mini tractor to any point along the length of each standing bed.

3) That the Kubota mini-tractor gave us sufficient power for a small overall tractor size and was ideal for towing on hard surfaces.

4) That our policy of hand potting gave us great flexibility in the use of labour and was worth continuing.

5) That a mechanical system of mixing compost and placing it onto the bench must be devised to reduce the amount of non-productive time.

6) That transport from the potting shed should be improved by refining the original system of tractor-towed trailers.

7) That a system of individual performance bonuses should be introduced in order to motivate those involved in

potting and to maximise the benefits from the proposed capital investment.

8) That the original potting shed whilst adequate as a basic facility, was not big enough nor sufficiently adaptable for projected production.

These eight points instigated the following projects:

1. Construction of a main production building
2. Installation of a compost handling system
3. Making of an internal transport system
4. Improvement of practical management techniques

I would now like to take each of these projects in turn and explain our approach to the problems they represented.

1. **Construction of a main production building.** As this new building was to be built from scratch we tried to incorporate features which would improve working methods. We drew a diagrammatic plan to scale of the working area including the position of benches and trailers and suggested methods of access. We also required an office and a mess room. These facilities were incorporated into a scheme which would fit inside a standard steel portal frame building, 30 ft wide by 75 ft long, with concrete block walls and an insulated asbestos roof. It was erected in the winter of 1981/2 by a local builder. When the contractor finished we began fitting out the building with potting benches along one wall and fluorescent lights above each potting station.

2. **Installation of a compost handling system.** To achieve a more efficient compost handling system a 70 ft long conveyor belt was constructed from second-hand parts along the wall to the rear of the potting benches. This enables compost to be deposited directly onto the bench without using up valuable floorspace. We built an elevator, again from second-hand parts, to carry compost to the conveyor belt. Both the elevator and the conveyor belt can be operated by the potters by means of 24 volt low tension switches.

Initially, compost was mixed as before with the rotovator and shovelled onto the elevator. A Gregoire drum mixer was bought in 1982 which empties compost directly onto the elevator, thus improving the situation of bulk materials handling.

3. **Making of an internal transport system.** Looking at the various options available, we returned to our original concept of four-wheeled trailers towed by a mini-tractor because they had proved very flexible in the past. They suited our sloping site and the design of the potting shed. The layout of pathways between standing beds meant that pots could be placed on the trailers at the point of potting and off-loaded directly adjacent

to the relevant bed. The bed could also be changed immediately for any given load of plants.

Having decided to continue with trailers, we reassessed the prototypes towed by the Bonsers and improved their design. As we were unable to find a suitable trailer on the market at what we considered to be a reasonable price, we decided to fabricate it ourselves.

We worked out overall dimensions suitable for all sizes of pot and Empot trays that we thought we would be using. A prototype was built and tested and this was used as a model for the others. They have since proved sufficiently versatile to be used for transport and as mobile benches for the staff when packing or knocking out.

4. **Improvement of practical management techniques.** The basic idea behind all of these projects was to create a cohesive base from which we could expand production. The successful operation of most systems in horticulture rely upon the people who are involved in their day to day use. Staff motivation is therefore important. Making the potting operation easier and faster with the use of rigid pots for all saleable plants has helped to motivate staff. This was reinforced with the introduction of a bonus scheme which rewards the staff individually for their personal performance whilst potting.

In conclusion, our main aim has been to make the physical side of container nursery stock production less arduous by combining good nursery layout and mechanisation where possible. In order to achieve this we have invested the maximum amount possible each year. Although I have described the creation of our nursery in terms of individual problems and solutions, I am sure you will appreciate that, in reality, it is never that simple.

IMPROVING THE ROOTING OF *SYRINGA VULGARIS* CUTTINGS BY ETIOLATION

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Abstract. An increase in the rooting percentage of cuttings of *Syringa vulgaris* 'Madame Lemoine' was observed in response to an etiolation treatment in the field in 1983. This result was not supported by data in 1984, possibly due to the disturbances of cuttings in an attempt to assess the time of root development. Variation in the rooting of shoots within treatments was associated with their stock plant origin.