

plished the other side is secured. We try to cover with the poly on warm days without wind as the poly is more elastic then and permits a really good pull-down when rolled on the lath and nailed on the second side. All hands and often feet are urged constantly to muscle it down to get it drum tight. We don't want that poly to move and chafe against the bows. Later, when it gets colder and the poly shrinks, the house actually sounds like a drum when tapped.

The many advantages of this technique are as follows:

(1) First and foremost is that of economics. The poly now going into its 6th year was put on at a material cost of 0.96¢ per sq ft Today's cost is 3.21¢ per sq ft. Labor cost to pull off, dispose of and reapply the poly annually is about 0.0012¢ per sq ft. The labor to roll and cover is about 0.0064¢ per sq ft. We have a total annual saving of approximately \$3357 on the unheated houses covered with white poly using a 6 year use factor and of \$1207 on the heated houses covered with clear poly using a 2 year use factor (in both instances using an inflation factor of 10%). This totals about \$4500 per year saved. In our installation this comes to about .0276¢ per sq ft (white .0329¢, clear .0205¢).

(2) Second is our contribution toward savings of energy in both the raw mineral product and the energy used for production and distribution.

(3) We have a capability of rapid recovering of the houses in the event of needed frost protection.

(4) We have greatly diminished our disposal problem.

(5) Additional saving of wood laths, productivity, supervisory time, overhead, etc.

We see no reason why, with some minor modifications, this technique cannot be adapted to almost any structure or method of poly sheet covering.

HADLOW COLLEGE — THE AIMS OF THE NURSERY STOCK DIPLOMA EDUCATIONAL PROGRAMME

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BACKGROUND INFORMATION

Hadlow College is situated in Kent, some 30 miles south of London. The village of Hadlow lies between the towns of Maidstone and Tonbridge. As horticultural and agricultural col-

leges function, Hadlow is relatively new in that it was founded in 1967. It was formed with the amalgamation of two Farm Institutes in Kent — Swanley, which was devoted to horticulture, and Sittingbourne — where the bias was agriculture and fruit growing.

The structure of the college is basically as follows: Firstly, there is the College Principal, K.E. Garner, and he is backed up by Adam Sommerville, who is both Vice-Principal and Head of Horticulture. Within the Horticulture Department there are the college lecturers, the great majority of whom teach and instruct in specialist subjects. Working closely with them are the technical instructors, whose involvement is teaching students the practical skills. If one takes the nursery stock section, then Chris Lane as senior instructor is very much responsible for the planning and day-to-day running of the nursery, besides instructional involvement.

The college now has some 170 full time students, out of which usually just over 90 specialize in horticulture. In addition, there are 250 part-time horticultural students who attend on a daily or weekly basis on a wide variety of short courses. The college farm is made up of 450 acres, while the horticulture department consists of 135 acres. The latter acreage is made up of 90 acres for fruit growing, 3 acres for glasshouse crop production, 20 acres for vegetable production and 20 acres for nursery stock production, which includes 2 acres of glasshouses and tunnels.

As with other sections of horticulture at the college, the nursery stock section is managed along commercial lines with full student involvement. A major philosophy of Adam Sommerville is that students must have the opportunity of working with the full-time nursery staff in order that they are better equipped for the industry after they leave the college.

The nursery can be categorized into two divisions: firstly, field-grown stock where a 10 acre site produces annually some 10,000 to 12,000 trees and 5,000 bush roses. Other items grown here are seed-raised crops, conifers, and a considerable area devoted to stock plants. The container plant division now produces annually over 100,000 saleable plants. One area is devoted to larger quantities of a basic range of material, for example \times *Cupressocyparis leylandii*, *Elaeagnus pungens* 'Maculata', *Skimmia japonica* and *Mahonia japonica*. Another area is devoted to ericaceous and high value crops — for example *Rhododendron*, *Magnolia*, *Hamamelis* and Japanese maples. Over the last three years the range of plants grown has greatly increased, for example 92 cultivars of azalea, 110 species/cultivars of dwarf rhododendron, 11 cultivars of *Hamamelis*,

together with well over 300 unusual and rare plants. The college is constantly checking new plants for both field and container work. These are bought or exchanged with many specialist nurseries, both within Britain and abroad. One can assess the propagation and growing on of many of these plants while at the same time ensuring that the student leaves with an up-to-date knowledge of a broad range of plants. The most recent development is the introduction of a container liner production unit.

A major national event at Hadlow is the Biennial Conference devoted to nursery stock production. The morning is spent listening to specialist speeches invited from the trade, advisory and research services, while the afternoon is devoted to viewing the college production units where a number of practical demonstrations based on the morning program are carried out. These demonstrations involve the industry, students and nursery staff.

To summarize, the major points to stress are as follows:

1. All staff work as a team to produce well-trained students for the industry and to manage an up-to-date commercial unit.
2. Lecturing, technical instructors and nursery staff are all involved in teaching practical skills by demonstrating and working with the students.
3. Strong links with industry are absolutely vital for two-way communication. The college is very fortunate to have nurserymen on the college governing body, advisory committees, for course assessment, participation at college conferences and also willing to receive and guide students, when visits to their nurseries are arranged.
4. A student is trained so he or she can carry out a range of practical skills and, depending on ability, will be able to subsequently take a level of responsibility.

In order to be a full time student and study at the college, four basic requirements must be met:

- (1) That a full 12 months practical work has been completed.
- (2) That he or she is 18 years of age.
- (3) That the necessary academic entry qualifications are obtained. This will depend on the type of course selected.
- (4) That an interview and outside references indicate that he or she is keen, reliable and will benefit from a full-time training period.

THREE YEAR COURSE —
ORDINARY NATIONAL DIPLOMA IN HORTICULTURE

To qualify for this course the proposed student must have four selected "O" levels or equivalent, together with the necessary 12 months of practical work.

This course is termed a "sandwich course", in that a person spends one year at the college, during which time he can choose one of three commercial options — fruit, glass, or nursery stock production. The second year is spent on a selected nursery holding, and the third year is spent at the college specializing in-depth his chosen option.

The course is designed so the student can be assessed regularly over the year period — for example, when he(she) is on practical operations, weekly tests, projects, plant identification and sandwich year work. In addition to this, they will have exams in February and June, both in the first and third year.

My colleague, Ken Turner, oversees the basic organization of the three year program and acts as course tutor in the first and second year. During the third year the course tutor is the specialist crop production lecturer in either fruit, glass or nursery stock production. The course has two outside assessors, one who is industry based and one who is an experienced educator.

Year 1. Here the aim is to give the student a broad insight of the horticulture industry in Britain. Besides botany, soils science, crop protection, machinery and management, the student has one lecture a week on nursery stock, landscape, fruit, vegetable and glasshouse production. This general year is felt extremely important in that it gives the student a background knowledge which may be useful if he or she enters retail sales or, at a later date, should they wish to change from nursery stock production into fruit growing.

The student's practical work is varied in that complete mornings are spent on the nursery while, in addition, time is spent on machinery and estate maintenance.

During May of this first year a week's study tour is arranged to visit different nursery holdings, gardens, research and experimental stations. The college mini-buses were used for this and each night is spent at one of the many youth hotels situated within Britain. This study tour is most important in that it firstly gives the student the opportunity of seeing modern horticultural production, it teaches him to get along with other people in a close proximity, and thirdly it tells the staff member with them a great deal more about each particular student.

Year 2. At a half-way stage during the first year the student is encouraged to select one of 3 options — glasshouse, fruit, or nursery stock production. In conjunction with the industry, a nursery is selected on mutual agreement with the nurseryman, the college, and the student. He or she is then finally selected on condition that the nurseryman will employ the student for a full 12 months.

Before the student departs for his sandwich year he or she is briefed on its objectives by the industry assessor (currently Tom Wood, of Oakover Nurseries, Ashford, Kent) and also the course tutor on the necessary project work to be carried out. This project work is divided into 4 sections:

1. Monthly diary of operations — these are returned monthly to the course tutor.
2. Prepare a map(s) and written material on the nursery resources. This includes labor, buildings and machinery.
3. Detailed account on crop production techniques of the major items grown.
4. An assessment of the student's contribution to the nursery.

The employer submits to the college a bi-monthly report on the student — in particular relating to work output and interest shown in his work. The course tutor visits each student twice a year and may hear problems relating to the student's performance. These can be discussed with the employer in addition to any personal problem the student may have. During February of the sandwich year all the students are invited back to the college for an afternoon and evening where he or she relates to their fellow students and college staff information about their work. During this period the students are informed about college developments and they are asked for topics which they may wish to study for their third year project work.

An observation made by many staff is how many students quickly adapt and mature during this practical year and how they both improve in character, interest, and work outputs.

Year 3. The third year, again commencing in September, is where the student studies his chosen option in depth. Nursery stock teaching is dealt with on the production of named crops, also the principles of production — for example, irrigation, cold storage, mechanization and quality control, operation of a garden centre, and plant identification. Along with this is landscape construction, management, soil science, crop protection and botany.

Built into the course are 4 other important contributions:

1. Practical work dealing with a wide range of nursery op-

erations.

2. Project work in both management and crop culture. Two management projects are implemented by the management lecturer, Paul Truscott.

Firstly, one relating to legislation in horticulture, while the second is formulating a financial development program for a nursery. Local nurseries are used and the owners give great assistance by providing realistic financial background. Last year this took place at Walmeston Nurseries, owned by Roger Butler, where they had to financially plan, with technical back-up, an extension to a current container area with a market outlet, mainly to local authorities. Later they present their case to the owner of the nursery and a bank manager.

There is a cultural project where the student, course tutor and a member of staff, with a particular specialist knowledge, agree on a topic. Advice is also sought from industry, experimental and research establishments, for example East Malling Research Station. A number of these are devoted to propagation; projects which have been particularly interesting include the following:

- A. Bench grafting of trees for container tree production.
- B. Incision wounding of cutting, for heated bins (Garner bins).
- C. The value of an "acetone dip" to improve the performance of commercial talcs — for example with hollies.
- D. Intensive seed raising techniques for deciduous trees.
- E. Pre-sowing treatments to improve seed germination of trees, e.g. *Aceraceae*, *Rosaceae* and *Oleaceae*.

There is also a group project where 4 to 6 students work together to produce a crop using their own ideas and making their own decisions. Last year one group studied the bench grafting of trees within *Fagaceae* while the other studied *Pinaceae*. The aim of this project is investigational in that it helps the student to develop a skill and specialist knowledge in addition to observe, reason and conclude.

3. Visits are arranged to a wide range of nurseries through the year. This would be equivalent to 5 to 6 half days per term.
4. A 10 day overseas study tour to nurseries in France, Belgium, Holland and West Germany is organized. Both the college and students contribute financially to this. The college mini-buses are used and accommodation arranged at youth hotels. This tour is most valuable as it firstly enables the students to meet first-hand nurserymen from competing countries, secondly, to study their production techniques and, thirdly, to experience life in

different countries. A detailed report of the study tour is written up by the students.

The final exams are taken in mid-June and the students' performance is judged alongside their course assessment and project work over the full 3 years. They may pass at 3 levels — distinction, credit, or pass.

The college then hopes that the students, after a further 2 to 3 years practical work in the industry, will progress to a responsible managerial position. Some students naturally take responsibility earlier than others, while a number start into business in their own right.

The college O.N.D. course is regarded as a team effort by all staff, but it is realized that it could not achieve the desired result if there was not the close two-way relationship which exists with growers within the horticultural industry.

Finally, the college also provides a one-year course in nursery-stock production called the National Certificate in Horticulture. The basic entry requirement is 12 months practical work in the industry, backed up by good references. During this 12 months the student may have been released by his employer to attend day or block courses. This course is very much a practically based course on craft skills and does not contain such a high level of academic content as the Diploma course. Many students from this type of course within the country provide the "backbone" to nurseries.

Recently it has been college policy to involve itself more with short (block) courses. These courses cater to garden center and nursery personnel. The student normally attends for 3 one-week blocks over 1, 2 or 3 years.

The college is now looking to the future where it is trying to evaluate the type of courses it should be holding for the 1980's. How to provide for this future is difficult. It may be that greater emphasis should be placed on courses of a higher academic level or, alternatively, of a more practical nature. The college has to assess from its own experience, and the growers in Britain what type of trained student the industry requires and whether there are sufficient openings for them at that particular level.

PETER VERMEULEN: You mentioned cold grafting to keep your temperature down. Could you elaborate on your findings?

BRUCE MacDONALD: With bare rootstocks we use a splice graft and dip the scion and union in grafting wax. The grafts are placed in a box half-filled with peat. The box is filled with peat to above the graft union and placed in the cold for 2

months. We are getting an 80% success rate. We have had mixed results with pot-grown containers. Only the graft union is waxed with conifers and the grafts are placed on the floor at 7° (45°F). Shading is important for success during the 6-week callusing period.

Tuesday Afternoon, December 11, 1979

The afternoon session was convened at 1:30 p.m. with Dr. Roy A. Mecklenburg serving as Moderator.

APPLIED PLANT PHOTOGRAPHY

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Slides are frequently used as visual aids for presentations on many subjects. Certain techniques can be applied to plant photography which will greatly improve the quality of your presentation. Rather than listing specific formulas for good picture-taking, general techniques for improved photography with a 35 mm camera will be discussed. Purchased 5 years ago, my camera cost about \$200 with a few accessories. Comparatively, it is an inexpensive single-lens reflex camera.

Therefore get to know your camera, its assets and limitations. The proper way to hold the camera is with your left hand under the lens, with your thumb and index finger manipulating the focusing ring and other settings. Use your right hand to hold the camera body and to depress the shutter release. Keep your elbows close to your body to minimize camera movement. For low light conditions requiring a long exposure, use a tripod and cable release. Other alternatives are to lean against a tree or building, or rest the camera on a solid object. Use the following formula to determine the slowest shutter speed that you can use for a given lens. If the lens' focal length is 50 mm, use the closest shutter speed to that number, in this case $\frac{1}{60}$ of a second.

Different types of film produce different results. For comparison, I have chosen Ektachrome and Kodachrome. The packaging colors will show the predominant color of the film. Ektachrome has strong blues and cool colors, while Kodachrome shows up reds and warm tones. Other films have similar color