soil salinity is below 4, otherwise salt problems do occur. Salt levels can be controlled by leaching or high frequency irrigation if saline water is used for irrigation. With the installation of liquid feeding using very soluble fertilizers; these fertilizers add to the salinity problem. For example, if we use 2 lb ammonium nitrate to 1,000 gallons you add approximately 0.4 to your conductivity reading. If you add, say, 1 lb potassium nitrate per 1,000 gallons also you, in effect, add 0.33 to your reading, giving you an overall salinity addition of 0.73 m mho. These levels can be very important if you already have high salt water levels. So to reduce the effects of salt, care must be taken in the selection of fertilizers and quantities used under liquid feed programmes.

CONTROL SYSTEMS FOR PROPAGATION

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A "system" may be defined as a method for the collection and presentation of facts. Its only product is information. Information collected from the system enables decisions to be made which, in turn, improve efficiency by allowing the maximum use to be made of resources and labor.

While the various operating areas of a nursery are intimately related, each one can be considered as a separate entity from the point of view of a systems design (Figure 1).

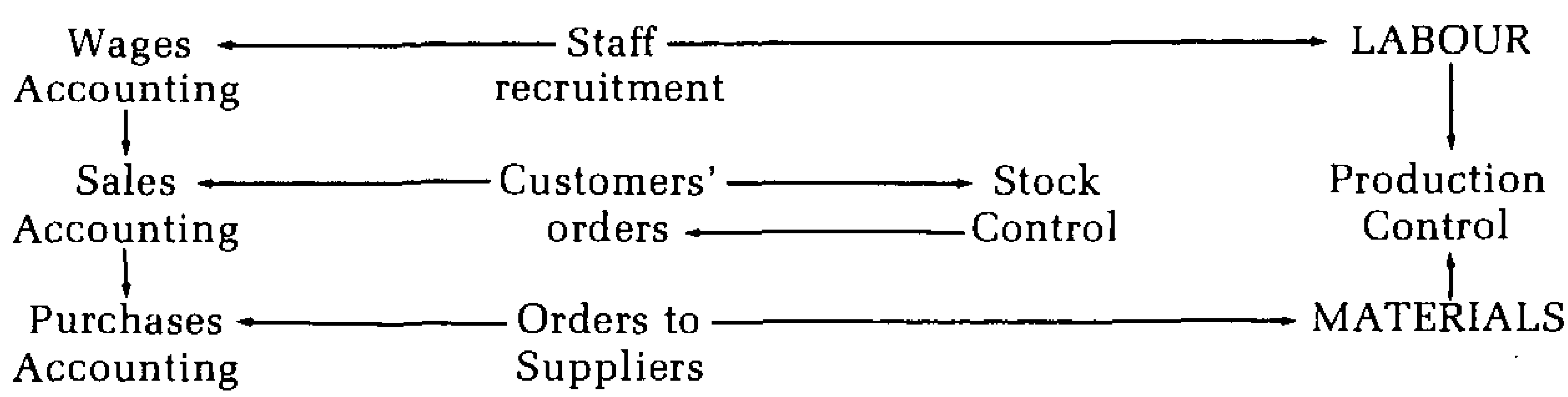

Figure 1. Interrelationships of Various Information Systems in the Nursery

It is readily accepted that every nursery has some kind of "system" for accounting, and within this system, separate methods for processing of wages, sales and purchases. It is not so readily accepted that every nursery should have a system for the control of its stock and production. Before proceeding to designing the system it is necessary to consider fundamental requirements for any system. These are:

1. It must be cost efficient. This means that it must not

demand more in time and effort than it returns in effective, useful information.
2. It must be capable of being used over a long period by competent but average intelligence personnel.
3. It must be flexible, that is, capable of coping with changes in the operation and also of being expanded or even absorbed into a larger and more comprehensive system.

The first step in systems design is to investigate fully the requirements of the operation for which it is to be used. To illustrate this, we propose to consider the design of a low-level or manual system for the control of seedling production for eventual sale in containers (Figure 2).

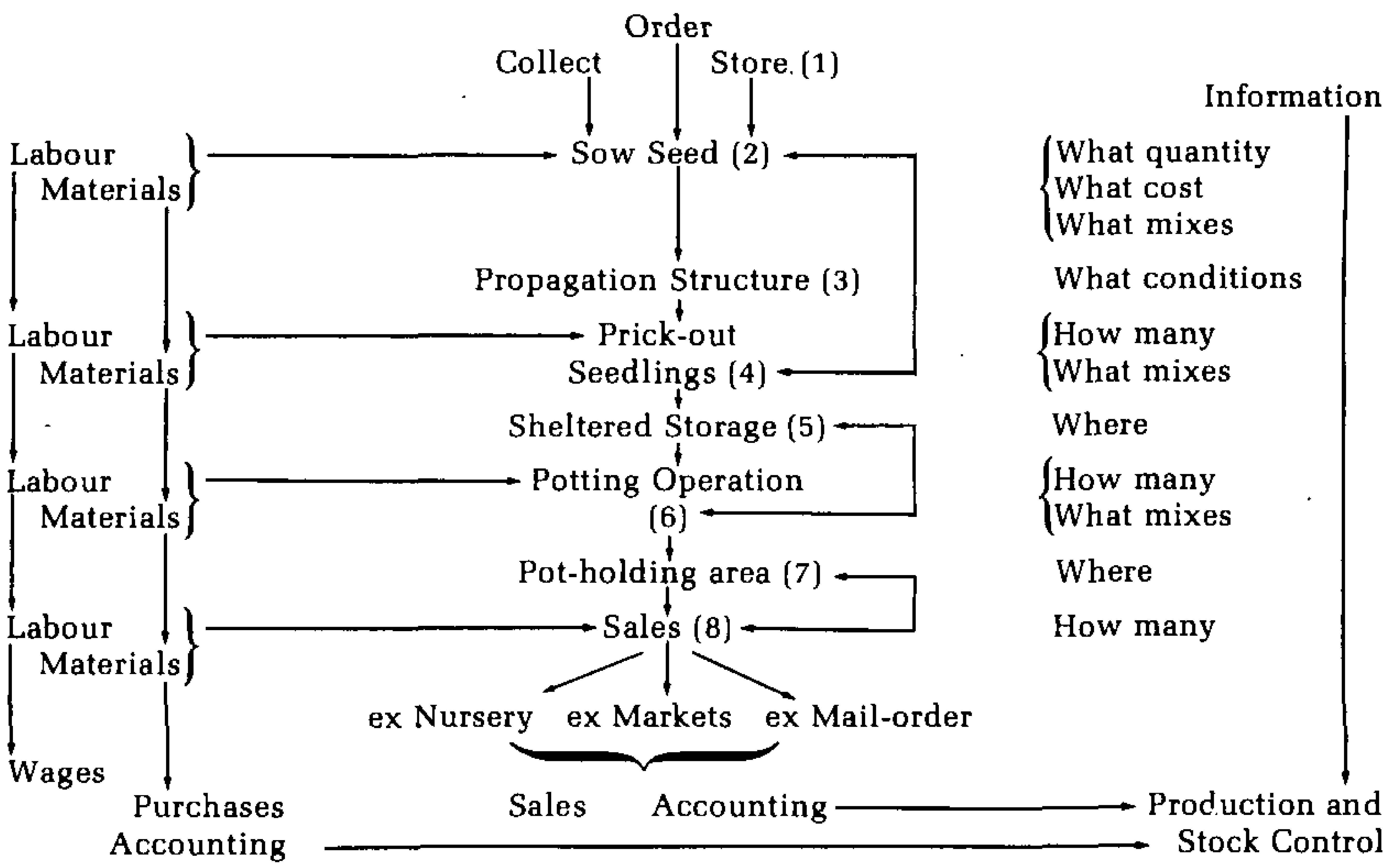

Figure 2. Design of a Seedling Production System.

This operation involves eight steps. At each stage of the production chain there are labour and materials inputs (left-hand side, Figure 2) and these reflect through the accounting system. Accepted standards control the rates of potting and tubing. We shall concentrate on drawing up a comprehensive checklist of all other facts to be collected at each stage of the operation (right hand side, Figure 2). These will relate to mixes, environmental conditions, quantities and timing.

The next step is to ensure that the information required is really necessary. Some facts will be relevant to batches individually and some to batches of the one species. Some information will be of interest only to the propagator (such as the amount of seed required to produce a set number of seedlings) and some will also have importance beyond the propagation section (quantities in production will affect forward sales planning, label, pot ordering, etc.).

In this nursery we have adopted a simple visual system for monitoring the progress of seedlings and plants. This involves the use of T-shaped cards which are slotted into a special display unit, so that the head of each card is clearly visible. Cards are available in several different colours so there is scope for display arrangements to suit a number of different requirements.

The front of the card is used to record static information for each particular species. Such information includes plant name, its target (the number of plants to be produced during the year), yield (plants/g), ideal mixes, special treatments for seed, etc., as shown in Figure 3:

S O N D J F M A M J J A

PLANT GENUS & SPECIES — Target 5,000

Seed in boiling water: soak overnight 25g/1000
Sand 1: Peat 2: Perlite 1

Seed Orders: Smith & Co. 441-8764
Jones Bros. 203-1148
Brown P/L 337-5764

24.5.78	100g	Jones 1	10.6.78	$3
14.9.78	100g	Jones 2	19.8.78	$3
30.11.78	50g	Brown 1	19.8.78	$3

Figure 3. Front of Stock Control Card.

This card is also used to record orders for seed. Included is the date of order, quantity of order, supplier, and on its receipt, date received and cost. A coloured indicator is placed at the left hand side of the T piece whether seed is on order (blue) or on hand (green).

The back of the card records details for each batch (Figure 4). This includes date sown, number of trays (or seeds if more appropriate), quantity sown and source (to tie in with front of card). When the seedlings are pricked out the date is recorded together with the number, which, allowing for a loss factor, should tie in with the target. A special notation is made to give an indication of yield, especially in cases where this is in excess of the target. A reference is also made to storage location.

12.6.78	1T	50g	J1	19.8.78	1859	no Xs	B17
20.8.78	2T	75g	J1/J2	1.10.78	2540	no Xs	A43

Figure 4. Back of Stock Control Card.

Entries collected in this manner allow comparisons to be made between batches. Information is obtained on yields/cost for seed sources, optimum sowing times, etc. which can eventually be recorded as static information on the front of the card.

Control of the production depends primarily on the target figure assigned to the particular line. This target figure prevents overproduction of a low demand species and shifts the responsibility for providing sufficient quantities of other lines to the propagator.

Control also relies heavily on information collected during a lead-in period. It is not possible to control the operation so that production coincides with peak selling times such as spring or Christmas if, for example, the time it takes between the sowing of seed and the plant being ready for sale is not known.

Other factors to be considered in planning control are:

1. Whether starting points are determined by internal or external factors; that is, does the operation rely on an outside source for seed supply or is seed on hand.

2. Are the deadlines absolute or relative? The starting date for a batch will be absolute if it is to be ready for a given peak period but other operations in the chain will be relative to those preceding them.

3. Can the activity be cycled to advantage with greater or lesser frequency? In other words, should a hypothetical target of 5,000 plants of the species for a year be obtained from only one or from more sowings in that year?

To draw attention to the various operations (seed sowing, seedling transfer, and potting) we use a series of colored indicators along the top of the T-piece. The top edge is marked for the 12 months in the year in such a manner that operations earmarked for any particular month all fall one below the other.

However, this system is only as good as its operators. If they do not look at the cards, if they do not use and move the indicators, or if they do not keep accurate records, it all falls down.

A master record is also kept, noting those entries from the propagator's cards which are of general relevance. Information on potting from the Production Day Book is added to complete the picture (Figure 5). This master record allows anybody to

PLANT GENUS and SPECIES							Target: 5,000
Date Sown		Date Tubed	No.	Loc'n	Date Potted	No.	Location
12.6.78	1T	19.8.78	1859	B17	10.11.78	1823	41A
20.8.78	2T	1.10.78	2540	A43			

Figure 5. Master Sheet Entries at 1.12.78.

check on the progress of any line grown in the nursery.

The system has proved quite adequate for the needs of a small nursery but as we have expanded and speed of turnover has increased a number of frustrations are creeping in. We are not able to keep track of plants sold from a batch — that is, how long the 1823 plants in location 41A have taken to sell out. It is often necessary to pay a visit to this location if someone other than sales personnel wishes to know the exact numbers remaining, and often a second batch may not be potted in time to follow on from the previous one. In other words, as we grow so does the gap in communication between Sales and Production.

The ultimate system would tie in all the functions of the nursery, from wages, purchases, stock and production control to sales. This is theoretically possible with the system described but to do so would break the first fundamental requirement for system efficiency: the time and effort required would prove too costly. However, the system described here will evolve fairly readily to a higher level system such as provided by a computer. Whether the information generated by electronic data processing is worth the cost of installing a computer-based system is a decision for each individual nursery. However, computers are here to stay and propagators as well as nurserymen in general should be willing to investigate further their potential.

GRAFTING MAPLES

ARNOLD TEESE

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Although taxonomists have divided the genus *Acer* into 13 or more sections this is not always a true guide to compatibility. The species, *A. pseudoplatanus is compatible with a considerable* number of species which are botanically well outside their own section; also the cv. *Atropurpureum* which has a purple coloring on the reverse of the leaf seems to be more compatible with other species. *A. platanoides* can be grafted onto *A. pseudoplatanus* 'Atropurpureum' quite readily but with difficulty onto the common form. *A. pentaphyllum*, not yet placed taxonomically but is superficially similar to the *Trifoliata* section, is compatible with *A. pseudoplatanus*, as are *A. saccharum* and *A. pensylvanicum*, each in different sections. *A. palmatum* is also reasonably wide in compatibility,