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Tree-raising on the fruit farm—an essay on management

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"Should I raise the trees myself to replant the North Hill block, or should I borrow the money to buy trees from the nursery?" Many commercial apple growers are asking themselves questions of this sort as they are faced with the large cash investments required for high density plantings. This essay is designed to aid the orchardist in objectively answering such questions. Consideration will be given to some of the tactics of using the nurseryman's skills, to the economics of raising trees on the fruit farm, and to the management factors leading to the final decision on tree purchase or tree raising.

Cost in different orchard densities. Modern high density plantings (Fig. 1) utilize rootstocks that limit tree size and induce early bearing. The close spacing and precocity make possible commercial production at an early age and early amortization of investment (2,4,7,12). Cost of trees becomes an increasingly important part of orchard capitalization as the number of trees per acre is increased.

Capital investments other than tree purchase and the interest on tree costs vary little among the five densities considered in Figure 2.

54	Trees per acre	$1840
90	Trees per acre	1506
200	Trees per acre	1303
450	Trees per acre	1541
1000	Trees per acre	1938

The low apparent cost of low density orchards is balanced by the long period of time over which these costs are spread. On the other hand, the comparatively early onset of commercial production in high density plantings offsets the cost of poles for tree support (Fig. 2).

Figure 1.—Golden Delicious/M.9 growing as slender spindles in Limburg province, Netherlands. Spacing shown permits an orchard density of about 1,100 trees per acre.

In times past, costs of orchard establishment often seemed relatively minor to the fruit grower who already had considerable acreage in production. Labor, machinery, fertilizer, and spray materials were usually taken from the operating system of the producing orchard with little or no accounting made;

interest, taxes, depreciation, and other overhead costs were commonly ignored, even though these were actually the items of greatest expense.

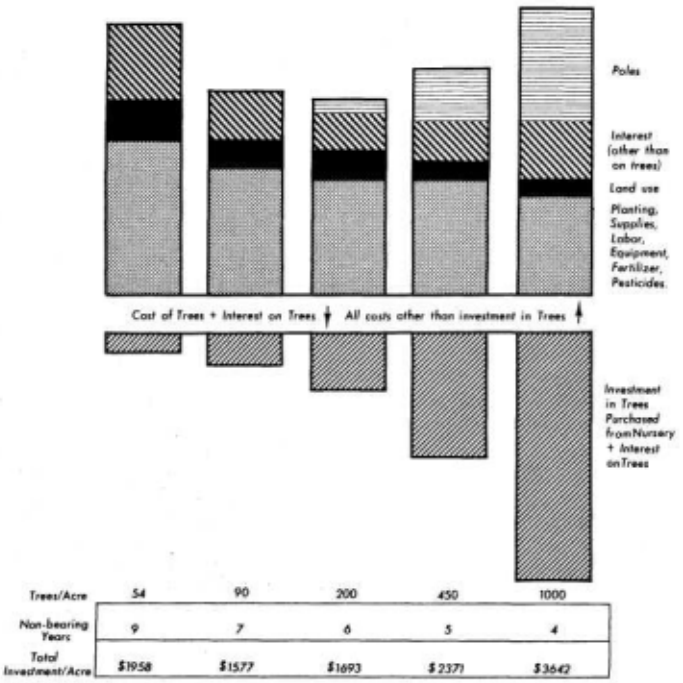


Figure 2.—Comparative cost estimates for planting apple orchards at various densities. Maiden trees purchased from commercial nursery @$1.30. Labor input calculated @$2.50/hr. Interest compounded @7 per cent. Land use calculated @$30/acre/year.

"Rules of the Game." In the comparisons following, basic charges related to the 1972 price structure will be used. Three orchard goals will be examined, each requiring 3,000 trees:

5 acres @ 600 trees per acre
15 acres @ 200 trees per acre
30 acres @ 100 trees per acre

In commercial quantities, in 1972, No. 1 maiden trees were priced at about $1.60 each, less 25 cents if ordered two seasons in advance. Interstem (3-piece) trees were priced 25 cents higher. Clonal rootstocks cost about 30 cents each. Rental value of land varies widely, but will be considered here at $30 per acre per year. Interest will be calculated at 7 per cent.

A significant part of the production costs of the commercial nurseryman is "wastage"—stocks on which the buds did not take, growing trees destroyed or damaged in cultivation, and trees dug but not sold because of inferior grade. Since the orchardist has less skill and experience in tree-raising and has less specialized labor and equipment than does the nurseryman, a relatively high attrition rate, usually 33 per cent, will be included in cost estimates.

GENERAL CHARACTERISTICS OF "SET-IN-PLACE" TACTICS

Land Occupancy. When tree-raising is carried out with plants set directly into permanent orchard positions, land is occupied longer before onset of commercial production than would have been required had maiden trees been set. Bench-grafts set in place are 1 to 11/2 seasons behind maiden trees. Stocks set in place and later budded are *11/2* to 2 seasons later. Interstem trees raised on site are 11/2 to 3 years delayed.

When prime fruit land is in short supply, this lag time can be of critical importance. In any case, such land use is an expense that must be charged to the tree-raising enterprise (e.g., see Table 1).

Care of Trees. Whether in the nursery at 10,000 trees per acre (TPA) or scattered over the farm at 75 TPA, young grafted or budded apple stocks must receive precise management and intensive care. This includes cultivation, spraying, and irrigation, plus some hand hoeing and "sprouting" every 2 weeks through the early summers. Doing the job on time is nearly as critical in tree-raising as it is for scab control in the bearing orchard.

Interplanted Cropping. Using row middles for cash crop production has seldom proved satisfactory. Too often the intercrop interferes with handling the machines needed for tree-raising. More serious, late cultivation of a crop such as cabbage encourages the trees to grow late in the fall, which makes them more susceptible to winter injury. A winter cover crop such as buckwheat and summer fallow in sudan grass are better choices.

Uneven Stands. When uniform nursery-grown maiden trees on clonal stocks are set in the orchard site, few trees die and the orchard tends to be uniform for tree size and in onset of bearing. When any of the raise-in-place options are followed, there are some failures and some "runts"; the resulting orchard tends to be uneven, usually permanently.

Growth Control. Bench-grafted trees tend to cease growth prematurely. Such plants need to be stimulated to grow rapidly through the early part of the first summer. Stocks set in place to be budded in August must be maintained in active growth until budding season so the bark will separate properly.

Weed control is essential, since the root systems of apple liners are quite restricted. The grower should plan for considerable hand hoeing. However, except on the lightest soils, herbicides such as princep, applied at half strength 4 to 6 weeks after planting, have facilitated weed control with no apparent ill effects to the trees (3,6).

Replant Problems. Liners and grafts are much more

Table 1.—Projected costs and returns of Bench-Grafting + Setting in Place option.

	Orchard Density (TPA)		
	100	200	600
Stock purchase (allowing 1/3 failure)	$1200	1200	1200
Interest on stocks (1 year @ 7%)	84	84	84
Bench-grafting, scion preparation, records, and storage @ 20 cents	800	800	800
Land preparation in excess of regular orchard planting preparation @ $5/acre	200	75	40
Hand labor in Summer I—suckering, hoeing, irrigating	180	120	50
Machine cultivation (rows only) in Summer I	225	180	125
Middle tillage and buckwheat seeding	180	80	30
Land rental (Summer I only) @ $30/acre	900	450	150
Expenses for raising 3,000 trees	$3769	2989	2519
Less savings in setting maidens in orchard	-300	-270	-240
Net expenses	3469	2689	2219
Potential management income (Tree cost $4050)	+$581	+$1361	+$1531

sensitive than are maiden trees to the soil conditions in old orchard sites. At least 1 and preferably 2 years should be used to refit the land after an old orchard has been removed. Complete soil analyses should be made and appropriate fertilizers applied as early in the cycle as possible. It is advisable to have root samples from the old orchard examined by a specialist for indication of nematode injury. Sudan grass or a sorghum-sudan hybrid would be the best green-manure crop, since these do not encourage maintenance of nematode populations. Growers with known or suspected nematode problems should consider row fumigation (1,10).

Groundhogs and Deer are attracted to the young shoots erupting from buds and grafts. Damage from browsing is much more serious on a plant just beginning to grow than on a maiden or older tree.

TACTICS OF APPLYING NURSERYMAN'S SKILLS

The grower has a number of options for utilizing the grafting, budding, and other skills of the nurseryman. In general, he may opt either to purchase rootstocks or to multiply his own, and either to grow trees in a home nursery or to set directly into the permanent space in the orchard.

Tactic 1. Bench-Grafting + Permanent Setting. Stocks purchased from the stoolbed operator are bench grafted to provide 15 to 25 inches of rootstock stem below the union. Scion and union should be waxed, preferably by being dipped into hot wax. Paper tape is the preferred binding. The success of this system is completely dependent on proper storage of the grafts, on timing of planting, and on weather during the first weeks in the field.

Merritt Thomas of North Rose, N. Y., followed this procedure in his 1970 planting of nearly 2,000 trees. In well-prepared soil, he used a subsoiler to mark rows and cross-rows, then a 2-inch "dibble" to set the grafts about 15 to 18 inches deep. His Rome/M.26 made 68% No. 1 trees, 16% No. 2, and 16% failure. The Rome/MM.106 yielded 95% No. 1 trees, 4% No. 2, and 1% failure. At the end of two seasons in the orchard, Thomas' trees were about the same size expected with one season's growth of maiden trees (Figs. 3,4,5).

During the first month after outplanting, graft unions are easily broken, even though well wrapped. A flock of starlings can destroy a planting of grafts in a matter of minutes. This problem can be avoided if a stake taller than the graft is set at the time of planting (see Fig. 3). Making a planting of grafts in a wheat or rye field is a guarantee of failure due to bird activity.

As with all systems of direct planting, acreage directly influences costs such as cultivation, spraying, hand labor, and land use. For this reason, potential income for management rises with orchard density (Table **1).**

Advantages of Graft + Plant Tactic: (1) Winter labor is used efficiently. (2) No special equipment is required. (3) Orchard planting costs are eliminated. (4) Varietal and rootstock decisions can be deferred longer than when ordering custom-budded trees.

Disadvantages of Graft + Plant Tactic: (1) Land is occupied for 1 year more than if maiden trees had been set (2) Grafts are very susceptible to damage by nematodes, woodchucks, and birds. (3) Close attention to sprout removal and growth continuance is required; even with close attention, high mortality and/or poor growth may be experienced. (4) Graft

Figure 3.—Tydeman/M.26 after two seasons' growth in the orchard. Tree was set in the permanent location as a bench-graft. M. Thomas farm, Wolcott, N. Y.

Figure 4.—Block of trees set as bench-grafts into permanent orchard locations. After two seasons' growth. M. Thomas farm, Wolcott, N. Y.

Figure 5.—After two growing seasons, this tree is only 12 inches high. A small percentage of bench-grafts will be small plants, due to imperfect unions. In the nursery, such trees are eliminated.

failures and subsequent replanting may result in uneven tree sizes in the orchard. (5) If frequent attention is not given during the callusing and pre-planting storage period, total loss may be sustained.

Tactic 2. Home Nursery. A grower may decide to be his own nurseryman, following the same basic nursery program used commercially throughout New York State—line out rootstocks in April; bud in August; grow in the nursery for the following season; and then dig, usually in the spring, for planting in the orchard. Some growers have been able to hire skilled budsmen to do that most critical job on a piecework basis.

Homer Collins of North Rose and Arthur Burrell of Peru operate such home nurseries; in addition, they operate small stoolbeds (Fig. 6) to produce their own liners. Such a variation has proved especially desirable when particular rootstocks have been difficult to locate in normal commercial channels.

Figure 6.—Harvesting MM.106 stoolshoots in a 5-year old bed. Such a stoolbed is capable of producing 20 to 30,000 salable shoots per acre annually. M.26 and M.9 are much less productive.

To produce 3,000 finished trees in the home nursery, about 1 acre of land (including turning space) would be required. Either a high-clearance tractor or a garden tractor is necessary for cultivating during Summer II. A transplanting machine is desirable for lining out, but well trimmed stoolshoots can be set by hand behind a subsoiler or other furrow-opening tool. A commercial-type digging machine is necessary. Projected orchard density is not a factor in costs (Table 2).

Table 2.—Projected costs and returns of home nursery tree production.

Stock purchase (allowing 1/3 failure)	$1200
Interest on stocks (2 years)	168
Land preparation—fertilizer, plowing, fitting in previous year. Fumigation desirable.	50
Preparing stocks; lining out	40
Hand labor in Summer I—suckering, hoeing	65
Scion preparation, budding & record taking	280
Machine cultivation (2 summers)	210
Topping & suckering, Summer II	65
Digging, bundling, trimming, labelling, grading, and storing stock	250
Land rental	60
Net expenses for raising 3,000 maidens	$2388
Potential management income	$1662

Advantages of Home Nursery Tactic: (1) Having all trees in a limited space permits easier and better management. This is especially valuable during Summer II for control of topping, sprouting, and pest control. (2) The dense planting permits selection of the finest site for tree-raising. (3) The dense planting facilitates re-budding or stub-grafting in the spring those stocks on which initial budding failed. (4) Land rental costs become negligible. (5) Flexibility is gained, since it is possible to permit the maiden trees to grow on for a second year in the nursery. (6) The grower gains two additional years for refitting the land for the new orchard. This is especially important on lighter soils in which nematodes may be troublesome. (7) The lining-out, topping, and digging seasons may coincide with the spring vacations of students of the family; budding and summer care may become the responsibility of a vacationing student. (8) If bud take is poor, then relatively little land has been wasted.

Disadvantages of the Home Nursery Tactic: (1) Much of the work must be done during the grower's busiest season; e.g., lining-out and topping must be done at about the time that delayed dormant sprays should be put on, and budding time may interfere with necessary preparation for the main crop harvest. (2) Special equipment such as planter and tree digger may be required; usually such equipment cannot be rented at the exact time needed. (3) Pest control applications are quite different from those in the orchard, and often these interfere with the orchard schedule. (4) The concentrated plantings are quite susceptible to deer, snowmobiles, and other such pests.

Tactic 3. In-Place Budding. "Extra" grade root-stocks are set into permanent positions in the orchard and are budded in place in August (dormant budding may be done in May or June). Essentially, in this option, the grower is running a dispersed nursery. It is necessary that stocks be set deeply—12 to 15 inches for MM.106, 16 to 24 inches for M.9 and M.26. In lower density plantings, a subsoiler is useful for marking rows and a dibber is an excellent tool for setting well trimmed stocks. In medium and high density plantings, a machine planter can be useful if one can be obtained which permits planting to proper depths. A reserve for replanting should be grown either between permanent trees or in a small separate nursery.

Advantages of In-Place Budding: (1) The scion bud can be placed at exactly the correct height above soil level so there will be no later problems with scion rooting. This also promotes greater uniformity among the trees. (2) Digging and replanting trees, as in Tactic 2, can be avoided. (3) With a minimum of stress from

Table 3.—Projected costs and returns for In-Place Budding.

	Orchard Density (TPA)		
	100	200	600
Stocks (20% reserve to be planted in nursery; budding failures to be corrected on original stocks)	$1080	$1080	$1080
Interest on stock investment (2 years)	151	151	151
Land preparation (beyond regular orchard-planting preparation)	150	75	75
Hand labor in Summer I—suckering, hoeing, etc.	128	96	72
Budding, scion preparation, records	330	297	231
Machine cultivation (Summers I & II)	360	320	260
Middles maintenance (Summers I & II)	300	150	50
Hand labor in Summer II (topping, suckering, staking, pruning, hoeing)	144	120	84
Land rental (2 years)	1800	900	300
Estimated cost of tree raising	$4443	3189	2253
Less cost of planting maiden trees	-300	-270	-240
Net cost of 3,000 trees	$4143	2919	2013
Potential management income	-$93	+1131	+2037

wind, an outstanding system of anchorage roots develops early in the life of the tree. These arise as adventitious roots along the rootstock stem. They are well developed by the end of Summer II when the wind stresses begin to become serious. (4) As with Tactic 2, timing of planting, budding, and topping may coincide with vacation time available to students in the family. (5) No special equipment is required.

Disadvantages of In-Place Budding: (1) Orchard land is occupied for an extra year, which may present a major cost increase for low-density plantings (Table 3). (2) The "dispersed nursery" requires excessive time and field travel for an extra year, especially with the low and medium density plantings. (3) Management of topping, re-budding, and suckering operations is much more difficult than with Tactics 1 and 2; likelihood of malformed trees is increased (Figs. 7, 8,9,10). (4) As with Tactic 2, unless special help is available, the planting, budding, and Summer II work requirements conflict directly with the orchard schedule.

Tactic 4. Interstems Made in Place. Multiple stock trees, especially those with M.9/MM.106 or M.9/MM. 1ll stock systems, may offer numerous advantages compared to single-worked trees (4,12). Three-piece trees usually sell for 25 cents more than single-worked trees, and they are usually available only by contracting 2 years in advance.

The scheme most often practiced by New York nurserymen is to bench-graft the interstem onto the chosen rootstock, line this unit out as if a regular stoolshoot, and bud in August. Some growers **are** using this grafting + budding sequence in a direct-setting program.

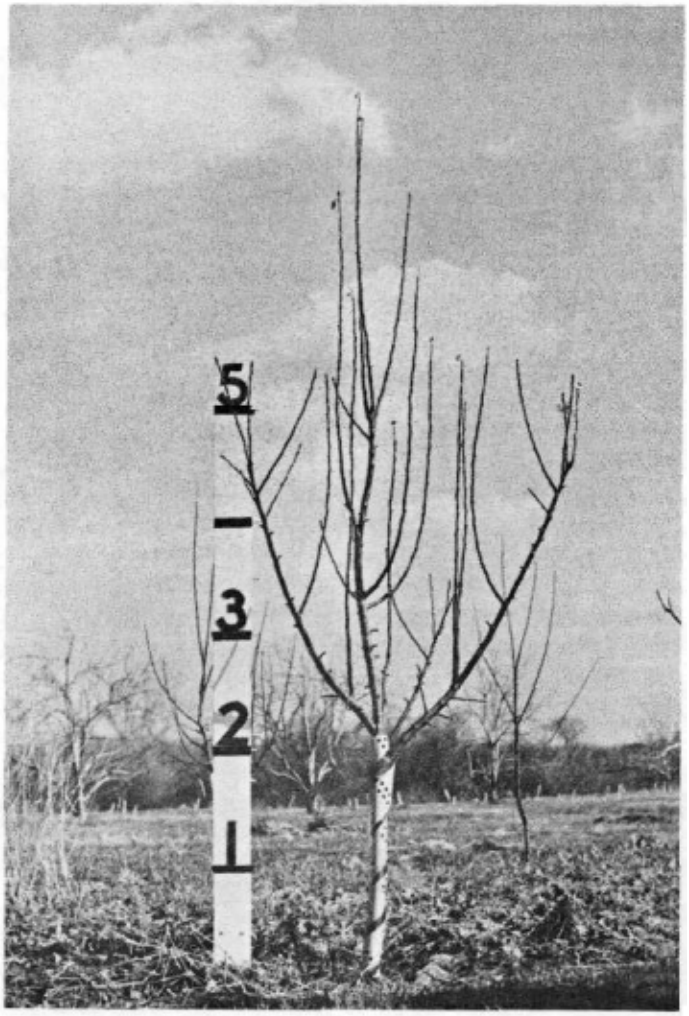


Figure 7.—Starkrimson/MM.106 set as a maiden tree shown after three seasons' growth.

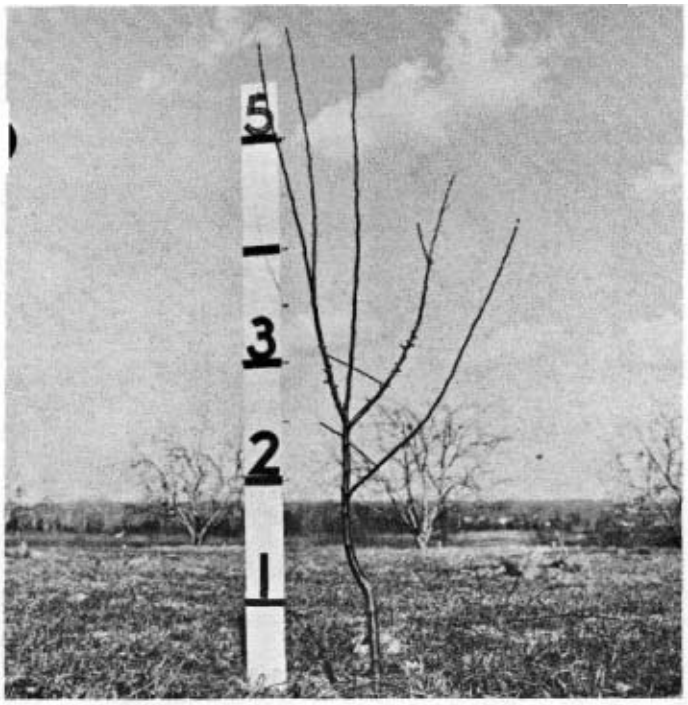


Figure 8.—Starkrimson/MM.106 set as a stock and budded in following August. Scion has grown for two seasons.

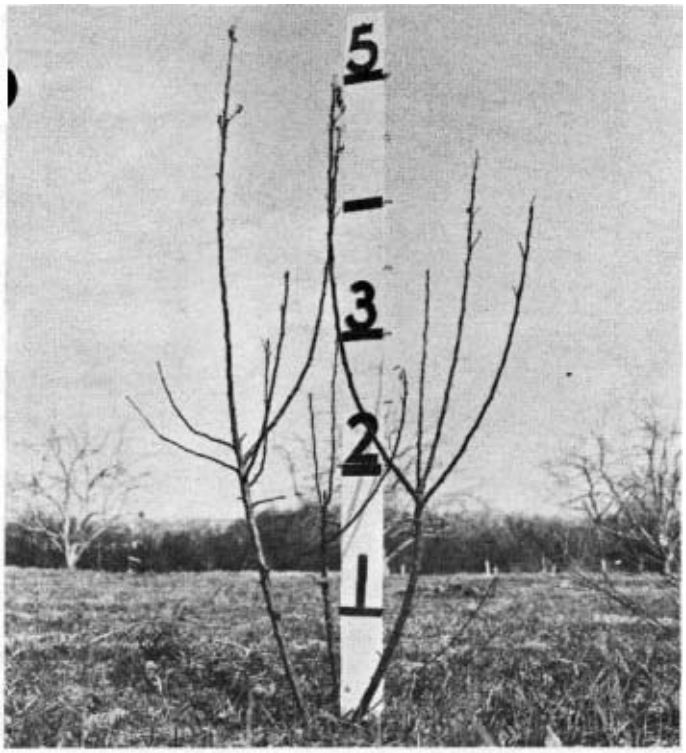


Figure 9.—Starkrimson/MM.106 after 3 years in the orchard. The original MM.106 stock was budded, but the bud failed. Rebudding in Summer II was successful, but failure to remove MM.106 shoots and to train the young Starkrimson shoot resulted in a very unsatisfactory tree.

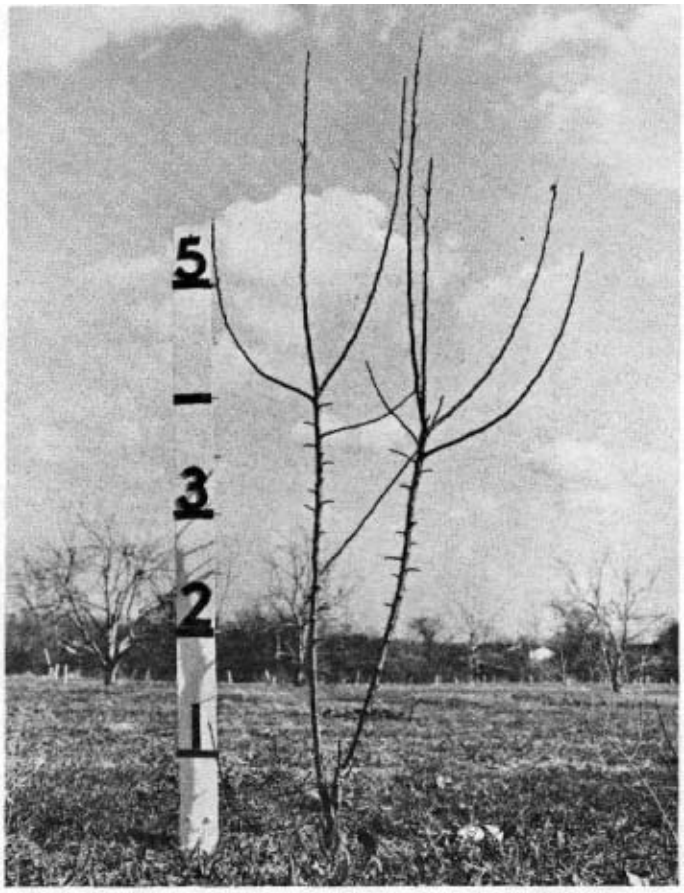


Figure 10.—Three-year old MM.106 growing in permanent site in orchard. Buds failed to take in three attempts. This tree should have been replaced at the beginning of Summer II.

Advantages of Tactic 4: Same as with Tactic 1.

Disadvantages of Tactic 4: Those of Tactics 1 and 3, plus: (1) Rate of failure is usually considerably greater than anticipated, even when management is ideal. (2) When the graft union fails, then the grower must either double-graft the interstem + scion or replant with one of the reserve trees; approximately 1 season's growth is thus lost. (3) Such double-worked trees are more susceptible to the vagaries of the weather; the grower should be prepared to provide supplemental irrigation.

Tactic 5. Arch-Trench + Budding. In the four preceding sections, required investment in rootstocks amounted to 20 to 50 per cent of the total expense, substantially more than that in cash-out-of-hand outlay. The clonal rootstocks suitable for the modern orchard are usually produced in the Pacific Northwest by stooling (Fig. 6), the rooted stoolshoots are harvested shortly after leaf fall or perhaps even before.

Table 4.—Estimated costs and returns for production of interstem trees by Bench-Grafting + In-Place Budding.

	Orchard Density (TPA)		
	100	200	600
Rootstocks (with 30% reserve)	$1200	$1200	$1200
M.9 interscions	198	198	198
Interest on stocks investment (2 years)	196	196	196
Bench-grafting	800	800	800
Land preparation	150	75	25
Hand labor in Summer I	200	160	120
Machine cultivation in Summers I & II	360	320	260
Middles maintenance	300	150	50
Budding, scion collection, records	363	327	254
Hand labor in Summer II	173	144	101
Land rental	1800	900	300
Gross cost of tree raising	$5540	$4270	$3304
Less savings for tree planting	-300	-270	-240
Net cost of 3,000 trees	5240	4000	3064
Management potential income	-$440	+$800	+$1736

At Geneva, improving the methods of rootstock production has been one objective of the nursery research program. Our intentions have been, firstly, to reduce the ultimate cost of trees to the orchardist, and, secondly, to make more practical the establishment of a rootstock production industry in New York State.

Of several promising methods which have been under test, one involving a modification of trench layering has potential value for the orchardist who is raising his own trees. The "Arch-Trench" method of liner production works very well for MM. 106 and MM.lll; it has not proved satisfactory for M.9 or M.26, but certain further modifications should improve performance with these clones.

Table 5.—Costs and projected returns with Arch-Trench + Budding method of tree-raising.

Rootstocks (1,200 @ 30 cents)	$360
Interest (2 years)	50
Land preparation	30
Planting	25
Hand labor Summer I	60
Budding	330
Cultivation (Summers I & II)	210
Topping, sprouting, etc.	64
Digging and sorting	350
Land rental	60
Total cost	$1539
Value of 1,500 No. 1 trees	$1950
Value of 1,500 No. 2 trees	$1350
Management Potential	$1761

1. Proper land preparation includes a heavily fertilized plowdown crop and fumigation. Virus-free stock (except M.9) is purchased in the largest available size. Untrimmed stocks are planted in an arch in a trench 15 to 18 inches deep, the roots covered as required but the arch of stem left exposed (Fig. 11). This planting must be done early—the first 2 weeks in April in most years.

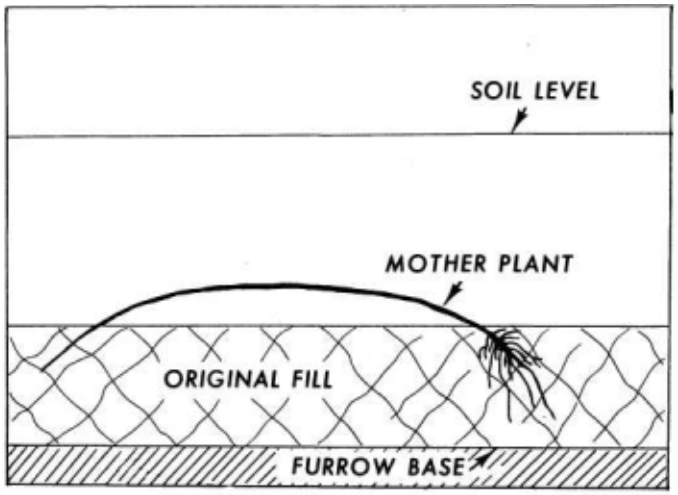


Figure 11.—Untrimmed stock planted as arch-layer in deep trench.

2. During the next 3 weeks the axillary buds along the arched stem will break; 3 to 10 shoots will be produced (Fig. 12).

3. As these extend, we begin filling in the trench, taking care that the young shoots are not covered. Moist sawdust is helpful as the first fill material (Fig. 13).

4. By mid-November, most of the shoots are well rooted (Fig. 14).

5. Digging is done mechanically, with the entire plant structure being thrown into bulk bins (Fig. 15).

6. Trimming is done in the storage cellar under more comfortable conditions than those in the field (Fig. 16).

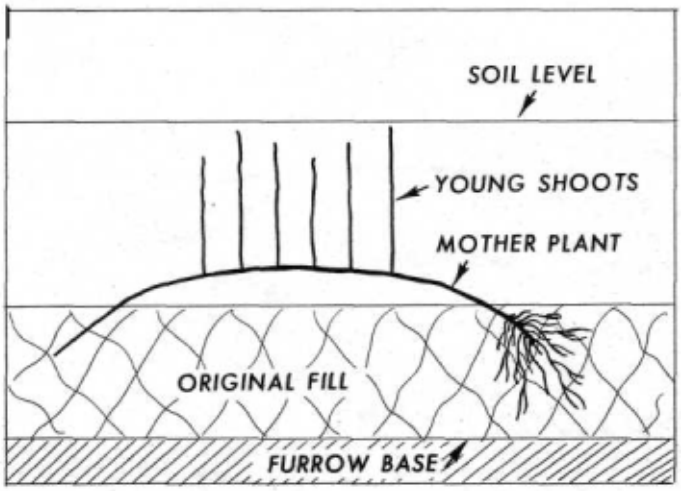


Figure 12.—Shoots have erupted from axillary buds of arched mother plant.

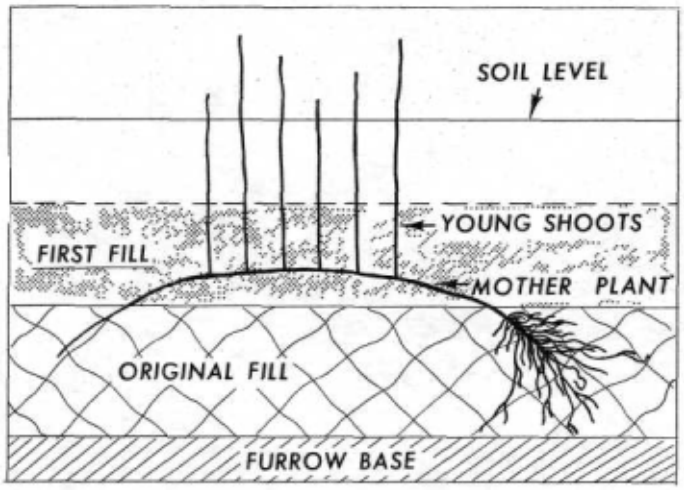


Figure 13.—Filling around bases of new shoots should be done as soon as possible. Care must be exercised to avoid covering growing shoot tips.

Yield of rooted stoolshoots varies, but 3 years' experience with MM. 106 indicates that with proper management four No. 1 stoolshoots and three smaller rooted shoots may be expected from each mother plant. This Arch-Trench approach may be used to support any of the four Tactics earlier considered; however, an additional year of lead time is required.

7. A modification of the Arch-Trench layering method may be used to further reduce costs of maiden tree production. Instead of planning to dig he rooted stoolshoots in November, in late August of the first season, the rapidly growing stoolshoots are budded in place (Fig. 17).

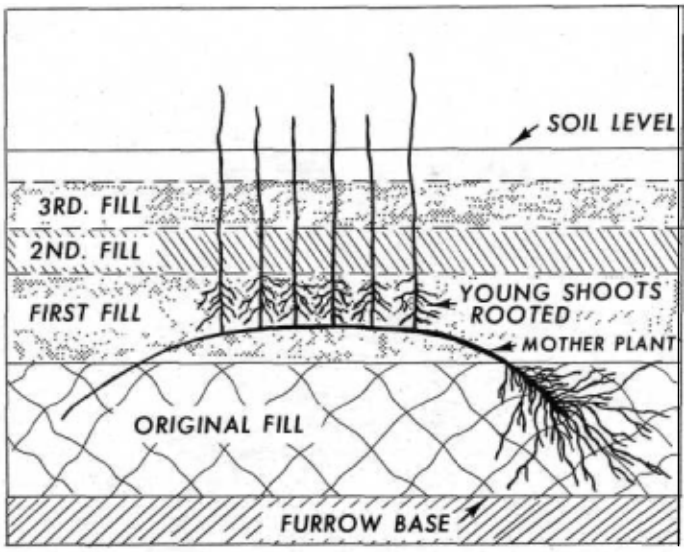
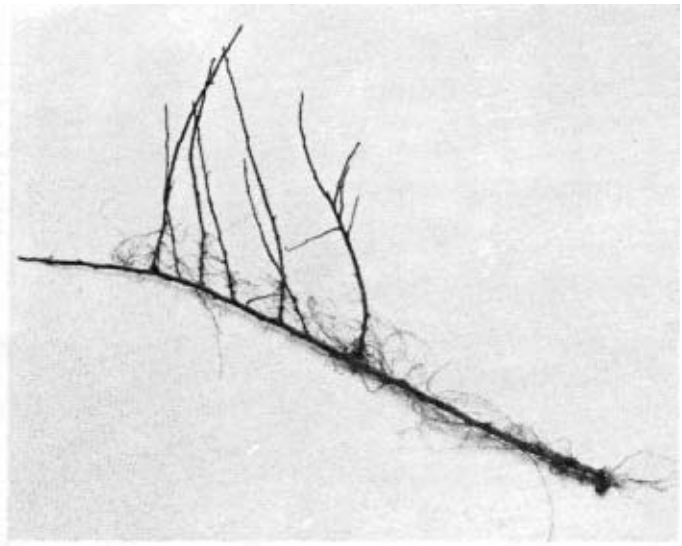


Figure 14.—Rooting from bases of young shoots is most active in September and October, if filling has been accomplished in early summer. Final cultivation should completely fill the original trench.

Figure 15.—A standard nursery digger is used to undercut the layers. The entire plant structure is thrown into bulk bins and moved to the storage cellar.

In early winter, an appropriate herbicide, such as princep or dichlobenil, is applied. The following spring, the growing of maiden trees proceeds just as if they were normal budlings. We would stub back in the spring, begin sprouting in early May, and continue with the routine nursery operations until lay-by time in August (Fig. 18).



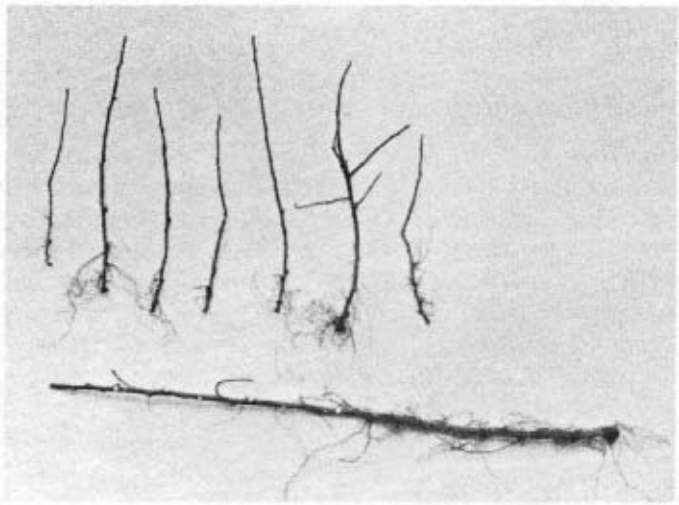


Figure 16.—Arch-trench layer dug in November, 6 months after original planting. Production of three No. 1 liners and four smaller stoolshoots is typical.

8. The trees harvested in November would be smaller than those usually purchased from a commercial nurseryman; the top will be substantially less well developed.

Although the two major components of the proposed system; i.e., the Arch-Trench + Direct Budding Tactic, have been tested separately, they have not been examined experimentally as a complete sequence. The economic projection is attractive, but it should be noted that more labor and more intensive management are required.

Advantages **of Arch-Trench + Direct Budding Tactic: (1) Investment in rootstocks (and interest on that investment) is greatly reduced. (2) Most expenses are for labor, which could be provided by the family in some situations. (3) Stronger trees could be obtained by allowing another year.**

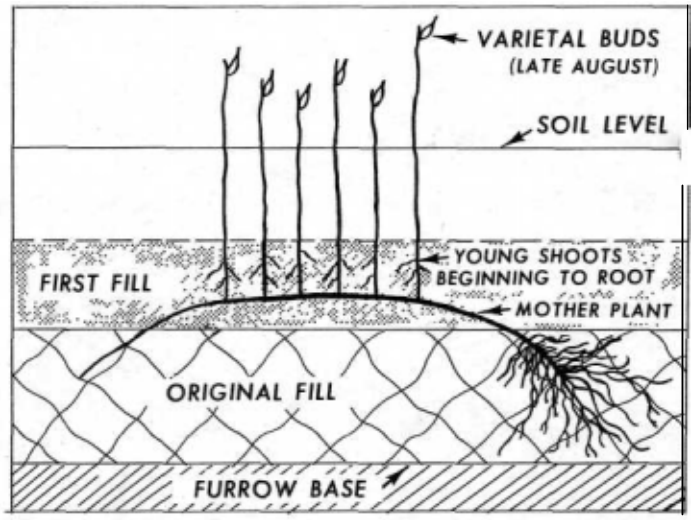


Figure 17.—In late August, varietal buds are inserted in the vigorous young shoots. Care must be exercised to avoid girdling of the stems.

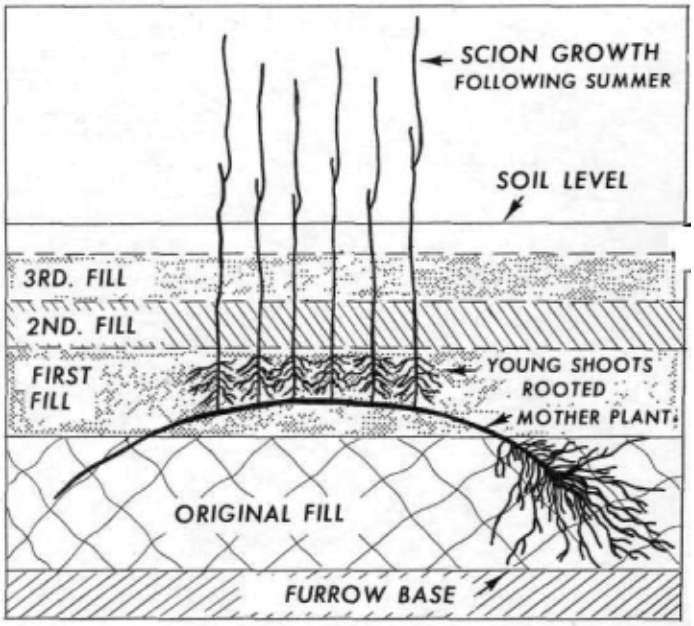


Figure 18.—After the budded shoots have overwintered in place, tops are removed in early spring and the scions grow rapidly during Summer II. The budded plants will be ready for digging in November, 18 months after the original mother plant was layered.

Disadvantages: (1) Intensive management is required over an extended period of time. (2) Trees produced are of quality lower than that generally accepted. (3) Growth of stoolshoots must be pushed hard for buddable diameters to be obtained in 4 months. (4) Irrigation must be provided. (5) Nursery digging equipment must be obtainable.

DISCUSSION

The five Tactics discussed are included as samples of the numerous options available to the orchardist who has decided to raise his own trees. Whether to become involved in the tree-raising business is a fundamental decision.

Management is the key in any farming operation and is especially critical in horticultural enterprises. The tactical management decisions of the orchard—and the supervision of their execution—would frequently conflict with the tactical management and operation of the nursery/tree-raising enterprise for time, labor, and equipment needs.

For the commercial fruit grower with substantial acreage in production, at least the following four areas of management effort may be identified:

1. Operations leading to maximum production of quality fruit on the trees already bearing (pest management, cover crop management, thinning, etc.);
2. Activities leading to proper, timely, efficient harvest, handling, and sales of the crop (labor recruitment and housing, storage arrangement, contact with buyers, etc.);
3. Summer training and pruning of non-bearing trees—investing a small amount of time, effort, and cash to reduce pruning requirements and improve fruit yield and quality as the trees mature;
4. Tree raising.

Priority of these management responsibilities is in the order listed. The management and supervisory capacities of the typical fruit grower find adequate challenge in the first two; the management of non-bearing orchards is too often ignored. In general, it would be decidedly unwise for the typical grower to add a fourth area of management requirement.

CONCLUSIONS

For perhaps 19 of 20 commercial fruit growers, tree-raising is not an appropriate enterprise. The demands of management and time conflict directly with the requirements of the orchard. Although modest dollar savings may be anticipated if the orchardist raises his own trees, these savings can only be achieved by reduction of effort in the orchard—and such reduction usually leads to losses greater than the savings realized in the tree-raising enterprise.

On fruit farms. in which there may be separate management for the fruit production enterprise and for the tree-raising enterprise, then tree-raising might be considered. Examples of such arrangements in-clude: (1) The grower's retired father wishes to "keep his hand in" but without interfering with the orchard operation. If he is capable of the management and of assembling the nursery skills, then tree-raising is a possibility (but the grower should be sure that the summer training and pruning of non-bearing trees will be accomplished). (2) Return of a second son to the family enterprise may make possible a division of management responsibilities—perhaps with one person responsible for production, one for harvest and sales, and one for handling the non-bearing orchards and for tree-raising. (It should be noted that a very substantial number of trees would have to be produced to justify such investment of time.)

On a farm without a producing orchard; e.g., one wiped out by an unusually hard winter or a new enterprise being formed, tree-raising may fit nicely into the management and labor schedule. Some individuals have been able to produce excellent trees while keeping a full-time off-farm job.

Certainly before any individual or farming team should plunge into a fruit tree-raising enterprise, the costs in management and time should be carefully assessed. Generally it will be found most expedient to have the commercial nurseryman handle this job.

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