California Avocado Society 1988 Yearbook 72: 195-207

The Gwen Avocado

Bob Bergh and Gray Martin
Department of Botany and Plant Sciences, University of California, Riverside.

We have learned a good deal about the Gwen over the past few years. Yet the more we learn of its productivity, tree behavior, fruit behavior, cultural needs, etc., the more new questions arise; the task appears unending. Any new variety is a new intriguing puzzle— the Gwen perhaps especially so.

Production

Crucial future data will come from regular groves in various commercial regions. Our plots at the University of California, Riverside (UCR) are not in a serious commercial avocado center. Our plots at the South Coast Field Station (SCFS) are, but they inevitably reflect experimental research interests rather than the "real world" where the bottom line is economic success or failure.

SCFS Comparison

Notwithstanding the preceding sentence, the only same-age replicated comparison of Hass and Gwen that we know of is the 1984 topworks at SCFS described earlier (Bergh *et al.,* 1987). These data have been corrected by removing all abnormal trees from the calculations. Also, we projected fruit sizes for the 1987 season at 9 oz for both Hass and Gwen; subsequent actual measurements in April 1987 show Hass averaging 8.9 oz and Gwen 10.2 oz. The Gwen trees were given half the Hass row spacing; the 1987 publication disclosed Hass average tree spread as over 2.5 times that of Gwen—our latest measurements show Hass averaging over 3 times as spreading. If we assume that Hass tree spacing is 20 feet by 20 (as is present in this plot) and that Gwens could have been planted at 2.5 times that density, we extrapolate to the following *computed* yields in pounds per acre:

	1986	1987	Total
Hass	220	8,228	8,448
Gwen	19,404	43,952	63,356

Because the industry-wide Hass yield on *mature* trees averages under 8,000 pounds/acre (Takele, 1988), that variety's 8,200 pounds set just two years from grafting (maturing a year later) is precocious heavy bearing. Part of the explanation is probably

the abundant cross-pollination in this grove. A second possible reason is inferior culture, causing enough tree stress to favor fruit set.

Figure 1. Gwen fruit set: ***top,*** *two years from topworking;* ***bottom,*** *four years from planting nursery trees. SCFS.*

Both of the above factors likely contributed to the remarkable Gwen productivity. All Gwen trees at UCR and SCFS have set heavily, with different climates, soils, rootstocks, irrigation methods. But most commercial trees have not been as precocious. In some cases, the early Gwen set has been quite disappointing. Possible reasons:

1) Minimal cross-pollination,
2) Better culture and so more vigorous vegetative growth,
3) Heavy bud wood cutting on young trees,
4) Unusually cold winters recently,
5) Gwen is peculiarly adapted to the UCR-SCFS area.

We do not think that #5 is significant. Several thousand Gwen topworks at Treasure Farms (The Irvine Company), located between UCR and SCFS, have not been very precocious.

The remaining four points probably all play a part. Certainly the last two winters were unusually cold, re #4. Apart from actual tree injury, chilling damage to fruit set can be serious. Tom Markle has pointed out to us that in his large Gwen plantings, set was better last spring (1988) at higher elevation, from which the colder air could drain away. SCFS has had no evident frost problem for many years.

Gwen grove budwood cutting, #3, has varied from none to intense. Winter cutting can remove much of the bloom wood. Cutting anytime can stimulate vegetative growth at the expense of flower development. Such will be seriously aggravated by any heading back to reduce tree height or wind damage. Our SCFS replicated plot was always off-limits to harvest of grafting wood, in order to avoid this complication.

Better culture, #2, is of unknown but perhaps major importance. Fruit trees commonly set a heavier crop when placed under a degree of stress. We hope that this is significantly involved here; less precocious commercial Gwen set could then mean that the trees are developing a larger and stronger framework for future better production. Among avocados, the Gwen would be unusually subject to stress even preceding its expected heavy production, because of its smaller tree and its upright form that gives less ground shade and mulch retention. Surely, calculated yields of 19,000 pound/acre set just one year after topworking and 44,000 set a year later are too high for the good of young trees. And our trees were damaged. The reason is confounded among the very heavy set itself, the tree stress that is postulated to have contributed to that set, and the cutting down of the windbreak on the windward side, exposing the trees to Santa Anas that are annually severe at SCFS. For 1987, the experimental Gwens set at a rate of "only" just over 30,000 pounds/acre. We did not have time for systematic fruit counts in autumn 1988, but this 1989 crop is about the same as that of the previous year.

Finally, possible explanation #1, cross-pollination, reasonably contributed also to the higher SCFS Gwen yields as contrasted with most commercial plantings. We will discuss that topic later in the paper.

However, we have seen and also had reports of similar precocious, heavy Gwen set on various non-UC properties in southern California. An example would be the Virgil Hardin

grove north of Fallbrook. Topworks completed about August 1, 1984 — and so with hardly half a growing season — actually set a fair crop spring 1985. Then spring 1986, the trees set at least as heavily as any UC trees have ever done. (Alas! the next winter, before fruit harvest, the trees were devastated by the severe freeze.)

Earhart Grove

Most commercial Gwen trees are topworks, but some are nursery trees. The only nursery-tree grove that we have examined is that of John Earhart in Pauma Valley, managed by Warren Currier. In early December 1988 we made fruit counts on a sampling of trees planted spring 1985. Fruit size was already large, and, from our experience elsewhere, would mature on these young trees at about a 12 oz average. With spacing at just over 12x12 feet, and an estimated mean of 110 fruit per tree, one obtains a *computed* yield of well over 20,000 pounds/acre. This computed yield is more than twice the long-term average of *mature* Hass trees, and many times the expected per acre yield of Hass trees this young.

However, this high performance is from trees that do not confirm our earlier explanation of heavy UC Gwen set because of tree stress. These Earhart trees have obviously had superb care: they are vegetatively vigorous and lush. Mineral nutrition must have been excellent and irrigation optimum — there was almost no tip-burn even in the late fall pre-rain season. Even the fruits were unusually attractive. The trees may have been somewhat slower than UC Gwen nursery trees to come into production, but now they clearly combine splendid tree condition with outstanding fruit set.

We also could find here no support for another suggested cause of the heavy UC yields: cross-pollination. We suspected that there would be old Fuerte trees in the vicinity, but a hunt turned up no tree of opposite ("B") flower type close enough to the Earhart Gwens that we would expect substantial fruit-set benefit.

However, the remaining two postulated UC set advantages were also present at Earhart's. Evidence of tree cutting, whether for budwood or height reduction, were very few. And the grove is at higher elevation than most Pauma avocados, permitting cold air drainage these past chilly two years.

Finally, the Earhart Gwens have two kindred favorable aspects that we think are significant: mulching of the trees when first planted; and leaving the skirts down to the ground on older trees to retain leaf litter-mulch, plus added straw mulching of exposed ground by the tree. We believe that the former helps to get the tree off to a good start, and that the latter maintains a healthier and more productive tree. We believe that the advantages of both well outweigh the drawbacks, but have commonly been overlooked because they are not obvious. Again, the superior management of the Earhart grove is indicated.

Figure 2. Straw mulching to enhance tree performance: ***left,*** *eight months from planting;* ***right,*** *20 months from planting. Nursery trees, John Earhart.*

Cross-Pollination

We suggested above that cross-pollination of the Gwen trees probably accounted in part for their very heavy UC sets. This is reasonable because every variety that we have tested in southern California has had enhanced fruit yields when exposed to a potential cross-pollinator.

An example is the Hass. It has been shown (Vrecenar-Gadus and Ellstrand, 1985) by electrophoretic isozymes that nearby Bacon trees can increase Hass set 50% or more. We have repeatedly expressed concern that the grafting over in Hass groves of Bacon trees (because of collapsed market for Bacon fruit) may well result in less total Hass fruit in spite of a larger number of Hass trees.

Is Gwen set less or more affected by cross-pollination than Hass? We simply don't know. To get evidence, in spring 1987 we grafted pollinators into Gwen trees in the groves of Ted Herlihy and Harry Richards, south of Fallbrook. We grafted-in Bacon, Fuerte, and Whitsell branches.

These three pollinators are of "B" flowering type. That is, in warm weather their flowers are female-functioning in the afternoon and male — shedding pollen — in the morning when "A" types like Gwen (and Hass, Pinkerton, etc.) are female-receptive and need pollen to set fruit. There is evidence that more cold-hardy pollen helps the young fruit to stick, hence our use of Bacon and Fuerte. Whitsell was included with the hope that it would have an expanding, major commercial future; which now seems unlikely.

A year after the initial grafting, some pollinator branches flowered. No fruit counts have

as yet been made in the Richards grove, but counts were made at Herlihy's in October 1988. The controls averaged a stingy 49 fruits per tree. (The trees have been cut back rather severely.) Both Whitsell and Bacon had poor graft take; Whitsell, at 33% graft success, averaged 65 fruits per Gwen tree. Bacon pollinators (50% take) averaged 81 fruits and Fuerte (93%) averaged 92 fruits. These very preliminary results suggest that a successful graft about doubled the Gwen set in that tree. But this year, even the increased set was disappointing for Gwen.

Compare these results with the heavier set on much smaller trees *without* pollinator provision at Earhart's. One can tentatively advance three hypotheses. First, under favorable conditions, Gwen will set heavily without cross-pollination. Second, if Hass requires cross-pollination most places to produce enough for a variety to remain commercially viable, the Gwen just possibly will overbear if given both favorable environment and cross-pollination. Third, where Gwen set is not outstanding, check the cultural factors that have been discussed; if they are all sound, try pollinators.

Tree Size

By fall 1986, the spring 1984 Gwen topworks averaged 12.6 feet tall and with a 6.0 foot diameter (Bergh *et al.,* 1987). By fall 1987, average diameter had increased to 7.1 feet, but mean height had actually declined, to 12.0 feet. This reduction is due to the weight of set fruit. Combining height and spread, total Gwen tree volume is less than $^{1}/_{4}$ that of the similarly replicated Hass trees topworked at the same time.

However, these trees are under the UC conditions of heavy Gwen set. Our impression is that Gwen is a moderately vigorous grower, not greatly less than Hass, Fuerte, Bacon, or Zutano, but that our very high Gwen productivity has sharply limited tree growth. Where there is less Gwen set, the trees are in fact clearly larger. Will they settle down to heavy bearing and so limit future tree size? We think so, but we cannot be certain.

The John Earhart nursery-tree planting is of interest in that it combines fruit set comparable to UC's with tree care superior to ours. The trees are indeed distinctly larger than ours at that age, as well as healthier. At just over 12x12 spacing, they will apparently go only 5 or 6 years from planting before crowding becomes a concern. We usually prefer a planting distance that will not require thinning for 9 or 10 years, which would seem to favor somewhat wider Gwen spacing.

Fortunately for the Gwen, it has two spacing-crowding advantages. First, its precocity — as demonstrated again here at Earhart's — means that it can economically justify a spacing distance that will necessitate tree thinning sooner than with most varieties. Second, its fruit production is reduced less than with most varieties by branch pruning; so tree thinning can be delayed by judicious branch shortening without as much harm to Gwen productivity.

Topworked trees naturally grow much more rapidly than nursery trees. This excess is largely upward rather than spreading, especially in varieties that are by nature either more dwarf or more erect. Tree spacing needs are determined by tree spread; so far, our UC Gwen topworks have averaged about the same spread as our nursery trees.

Tree Form

The Gwen tree tends to be upright. Ordinary nursery trees are moderately spreading and can be made more so (see **Height Control** below). More upright trees result from:

1) **Topworking.** Field grafting of established trees always results in a more erect form. The change is particularly striking with dwarf varieties like Rincón or Whitsell, but is significant for Gwen also.
2) **Shading.** Uprightness will be accentuated by reduced sun exposure, such as when alternate rows are topworked and the intervening mature trees are left. Even planting or grafting on a pronounced north slope can have some effect.
3) **Moderate bearing.** The Gwen trees at both the University of California at Riverside and the South Coast Field Station have set very heavy crops, which have limited tree growth and especially reduced height by bending down upward-reaching branches. But, for whatever reasons, most commercial growers have not experienced such heavy bearing, and their trees are taller.
4) **Budwood cutting.** As Gwen acreage expanded rapidly from a tiny base, the small commercial trees were often clipped for more grafting wood. Good wood is rarely the coarse uprights; it is commonly the firmer, more horizontal branchlets. So, budwood cutting easily becomes a form of pruning that pushes the trees into a more upright form.

The Vic Pankey Gwen grove near the south-east corner of the Highway 15-76 intersection has apparently been affected by all of the above: topworked in 1984 on Hass stumps, on a steep north slope, with limited early production (due partly to cold weather), and early budwood cutting. Set was good spring 1988, but many of the trees are alarmingly slim and tall, a few approaching 30 feet! Compare this with the average 12-foot height of our SCFS topworks of the same age. With their belated heavy set, will the Pankey trees now decline in mean height, as did our SCFS trees?

It is possible that the erect Gwen tree shape is most conducive to heavy per-acre fruit yield. Such shape permits a maximum of photosynthetic leaf surface exposed to sunlight.

Height Control

Trees reaching skyward like those of Pankey or elsewhere, invite remedial measures.

1) Be aware of the mentioned **greater height problems with topworks.**
2) **Avoid a severe north slope,** if practical.
3) If grafting every other row in a mature grove, **use control measures,** below.
4) **Topwork as low as feasible,** to both set the ultimate tree lower, and to permit easier shoot-tip pruning.
5) **Provide optimum care,** to encourage heavy, early set.
6) **Tip all upright stems.** From the start, all Gwen topworks should have the vertical growing tips removed after each growth flush (two or three times a year). This can

be done rapidly on young trees, pinching off between thumb and forefinger or thumb and knife blade. We suspect that this tipping is also desirable for nursery trees.

7) **Cut back upright stems.** Tipping from the beginning should build a good tree shape in the first two years or so. Tree erectness that still is a problem, especially from the absence of tipping, will need more severe heading. Cut back each vertical stem to a more horizontal branch, removing several inches to a foot or more.

8) **Consider vertical stumping** of any very slim and tall trees. Gwens should come back into fruiting unusually soon. Early shading and heavy budwood cutting are two situations that could make this drastic stumping a "necessary evil."

9) **A dwarfing interstock** may both reduce height and maximize production. We have begun tests with the Colín V33.

10) **Paclobutrazol** growth retardant may have the same two benefits. We think that present knowledge will permit the development of good commercial Gwen tree shapes at reasonable cost. With #9 and #10 above, we are exploring more exotic approaches.

Cold Hardiness

The last two test winters provided comparisons in many regions. As always, results were erratic and contradictory. In general, Gwen trees were hurt more than Hass — because the Gwens averaged much younger. With comparable trees, Gwens usually were injured slightly less.

However, the Gwen must not be regarded as a cold hardy variety and planted in cold locations. It is not dependably hardier than Hass. Its only clear advantage over Hass under freeze conditions is that, with similar injury, Gwen trees will usually bounce back and set a commercial crop a year or so sooner. This trait is another aspect of its quicker recovery from pruning.

Gwen fruits have hung on better than nearby Hass fruits after a freeze. This is an advantage only if the fruit has not suffered hidden damage. If there is internal injury, the fruit is best on the ground so that it will not be mixed in with a sound commercial crop.

Gwen Weaknesses

All commercial varieties of all fruits have weaknesses of one kind or another. We sometimes refer to a specific variety as an "ideal" one; but this is only in overall comparison with its more inferior competitors. We know of no variety of any fruit that would not be improved if one could give it one or more superior qualities from otherwise inferior varieties. The Gwen has its share of imperfections.

1) **Tree height.** Gwen tree shape *may* be ideal for productivity, and its height *can* reasonably be controlled as indicated earlier. But that control will have its price in time-expenditure and may be neglected. Without height control, the ultimate Gwen tree can lose much of its picking-cost advantage over Hass.

2) **Fruit drop.** Gwen has tended to drop more fruit than does Hass. This has not so far been true where the trees have received superior care, as at John Earhart's. To the extent that drop can thus be prevented, it may require somewhat more expensive care — although there is cost saving by omitting skirting. To the extent that drop proves intractable, it will somewhat reduce Gwen yield advantage over Hass. After fruit reaches maturity, multiple harvesting can relieve the tree stress from large crops and reduce fruit drop risk. This early partial harvest can also permit the later fruit to develop, and can encourage larger subsequent fruit set.

3) **Fruit discoloration.** An occasional nagging problem has been unattractive black skin splotches after shipment and storage, or on ripening. Calavo shipment to the East Coast had this problem last year. The erratic appearance of the problem has led to a suggestion that it is due to juvenile fruit, or to freezing or chilling injury, or to inferior tree care, or to our not having yet learned the particular treatment needs of Gwen, or to some complex interaction. Flesh palatability is usually not affected, but salability can be.

4) **Short shelf life.** Somewhat related to the above, this refers to fruit discoloration too soon after ripening, say in two days instead of three. This appears to be due at least chiefly to the somewhat stiffer skin of the Gwen, so that it is ripe to eat a day or so before it feels as soft as a just-ripe Hass. Retailer and consumer education may be necessary. The stiffer skin should protect the flesh better.

5) **Green color.** This has three disadvantages. First, it shows the black blotches noted above, unlike the black-ripening Hass. (The opposite side of the coin is that this permits detection of any rot spots. Many consumers have unwittingly purchased partly rotted Hass fruit. At least one avocado expert, in Florida, has publicly concluded that black-ripening avocado varieties are therefore less desirable.)

   A second drawback of the green Gwen skin is that 80% of our production is now the black Hass, and so black is the standard and preferred in most of our markets. The Hass is a superb eating fruit — just as good as Gwen to most people. "What color do those delicious California avocados ripen?" "Black," to a large proportion of our consumers. Green will have a selling job to break in some places. (On the other hand, we are already selling about a hundred million pounds of other green-ripening varieties each year.)

   And a third green drawback: because Hass is now so dominant, many consumers expect the avocado to turn black as it ripens; they may not get around to squeeze-testing a fruit that stays green until it is past optimum. This is more of a problem for Gwen than for most earlier greens, especially the fall-early winter "thinskin" group, since Gwen resembles Hass more in terms of both appearance and season.

   One clear message: *never* mix Gwens in with Hass for your handler. Most sorters cannot readily tell the two varieties apart. It should be understood that the handler will not pay for mixed fruits of a second variety, or at least will pay only the lower price of the two.

   More generally, we can have a brighter economic future for the avocado by keeping our color options open, in this case open not only to the Gwen but also to other

superior greens that may be coming down the road. If and when greens become equally dominant, the argument must be applied in reverse. As the California avocado industry has explained to consumers from the beginning: *color* can help to indicate ripeness, *feel* is the final authority. A new variety will usually cause problems of one kind or another; it would be unwise to let such problems prevent varietal improvement.

It has been suggested that color differences and variety mixtures are less serious for processing fruit. Not so: it is a real problem if, for example, some fruits mixed in with Hass became over-mature before blackening. Moreover, the second variety may process differently. In this connection, because Gwen does not turn all-black on ripening, it is less at risk of "contaminating" the finished product than a black Hass look-alike would be.

6) **Less smooth flesh.** Its pulp is not quite as fine-textured as that of Hass. Also, its pulp often does not look as uniform: there is slight discoloration paralleling the vascular bundles. Neither of these traits is serious — but they are not compliments!

7) **Leaf blow-off.** In our replicated SCFS plots, Gwen leaves blew off less readily than Whitsell or Esther leaves, about the same as Hass. Gwen fruits blew off more readily than our other two selections, and again about the same as Hass. However, in San Diego county, Ralph Peterson (Palmer, 1988a) and Tom Markle (Palmer, 1988b) both reported that Gwen leaves blow off more easily than Hass leaves. Markle also observed, unlike us, that Gwen fruits held on better in the wind than Hass fruits; we consider leaf-holding a more desirable attribute, because exposed fruits can burn or fail to develop properly, whereas leaves are needed for the next crop. In summary, we accede to the two commercial observations and suggest that, where strong winds are likely, Gwen be given windbreak protection. However, we question that in this regard Gwen is significantly different from Hass.

   A third aspect of wind injury is tree damage. At SCFS, Hass trees suffered more injury than the comparable Gwens. This could be explained by the more flexible or willowy Gwen branches, plus the smaller Gwen tree providing less of an individual barrier. Greater defoliation would also reduce wind resistance.

8) **Smaller grafting wood.** This is no problem for ordinary nursery- tree production. And it matters little when topworking on suckers or by smaller-scion bark grafts. But Gwen produces almost none of the thick scions needed for the formerly widely used notch ("saw kerf) stump grafting.

9) **Sunblotch danger.** The risk of infection with 'sunblotch' viroid has been largely banished from California commercial avocados, especially by the clean-tree Registration program. The original UC source of Gwen budwood was a registered tree, and none of the dozens of Gwens grafted from it at UCR or SCFS has ever shown sunblotch symptoms.

   But there are infected trees scattered throughout the industry; some are symptomless. And with the rapid expansion of Gwen acreage from a very small base, budwood has been cut from any available tree. Sooner or later, therefore, Gwen will be grafted onto infected trees, and every bud cut from such will transmit

the disease to the new trees propagated.

Before cutting any budwood, carefully examine the tree for sunblotch symptoms. Any tree showing symptoms should be removed immediately — before disease transmission to clean trees, by root grafting, cutting tools, or pollen. Registered trees as budwood sources should be commercially established as quickly as possible.

10) **Is it "temperamental?"** The remarkably precocious and heavy Gwen yields experienced at UCR and SCFS are associated with culture that is routine and in some respects inferior. But long-range huge production under these conditions is unproven and seems unlikely.

    Moreover, there is some evidence that fruit quality is jeopardized by tree stress. Elsewhere also, care limitations that resulted in stunted Gwen trees have sometimes caused undersized fruits with oversized seeds, and sometimes skin splotching on ripening. Gwen may be unusually susceptible to harm from poor care.

    The heavier Gwen production presumably means heavier tree nutrient drain and may make the tree more susceptible to stress from inadequate irrigation. Also, its upright growth makes it more difficult to develop the mulch-retaining skirt that we consider desirable for optimum tree health. Any aspect of culture that permits tree stress may be especially harmful to an unusually high yielder like Gwen. Moreover, it has been suggested that newly planted Gwens are more susceptible to arrested growth from sub-optimal care.

    If you can't ensure good tree care, you probably shouldn't be growing Gwens. (But then again, if you can't ensure good tree care, should you be growing avocados?)

11) **Lower price per pound.** Any new avocado variety can expect to sell at a discount until it becomes generally recognized and accepted in the trade. This will usually require a total annual production that is a significant proportion of the industry. Thus, even after its high fruit quality was acknowledged, the Hass in its early years sold at a discount to the then-dominant Fuerte.

    Similarly, the Gwen can temporarily expect to sell at some discount to Hass. That discount should at worst be outweighed by its greater productivity. And the size of the discount may be less than had been assumed. The consensus of the Gwen Growers Association board of directors is that any price reduction to the Gwen grower is a provisional concession to encourage handler attention during this introductory stage.

On the other hand, the Gwen appears to have several things in its long-range price favor:

a. Its slightly larger average fruit size than Hass.

b. Its greater size uniformity, especially its relatively few small fruits.

c. Its somewhat later maturity, toward the fall season when prices have been higher.

d. Apparently less yield alteration from year to year, permitting easier market development.

We have seen only one set of comparative commercial prices. These were for fruit sold winter 1988 (prices were higher later in the year). The grower reported the following totals and average returns per pound.

	Fuerte	Gwen	Hass
Pounds:	2,000	38,000	144,000
Price:	17.5¢	62.6¢	59.1¢

The slight Gwen price advantage is presumably due to its slightly larger fruit size. Relative prices may vary from handler to handler. We also know of only one picking cost comparison. Based on labor time required, the grower calculated his cost of picking per pound as 4¢ for Hass, 1¢ for Gwen (smaller tree, heavier set). Full-grown Gwens will cost more.

12) **Limited observation.** The Gwen is still very new. What counts is commercial experience. For Gwen, that is only beginning. There have already been both pleasant and unpleasant surprises; there probably will be more of both. The Gwen Growers Association welcomes all reports of grower experience and aims to share these with anyone interested.

The Gwen Future

The obvious comment is, "remains to be seen." Nobody knows as yet. On the whole, the early findings on its bearing, storing, shipping, selling, have been favorable; but the jury wants more evidence.

Regardless of how well it may do, we hope that the Gwen never becomes as dominant in the industry as the Hass now is. Even with some further northward expansion of the California avocado industry, we think that when one variety monopolizes 80% of the production, there is too much pressure for picking it both before and after its season of optimum maturity.

One scenario is that there will be two or three major varieties sharing the industry about equally and maturing consecutively. If the Gwen proves out as one of these, the second variety would be earlier maturing and the third later than Gwen. A suggestion is that the Hass might be the earlier variety, but we do not think that the two differ enough in season to make good complements. Also, we doubt that 'King Hass' is productive enough to meet the increasing future competition faced by the California avocado.

A better early fruit should be the Pinkerton. It is usually good to eat earlier than Hass and is a larger fruit. At both UCR and SCFS it has produced up to twice as much as Hass, on trees that are — presumably as a result — considerably smaller for easier picking. There is tentative evidence that Pinkerton set can be markedly increased by cross-pollination.

Reed for the third, late-maturing variety? Good production, but it gets uncomfortably large that late. We hope that among our new seedlings just reaching floodtide, clearly better selections will be found. In the meantime, we can all be thankful that the splendid Hass fruit is building goodwill for California avocados.

Literature Cited

1. Bergh, Bob, Bob Whitsell and Gray Martin. 1987. Avocado breeding—progress and prospects. Calif. Avocado Soc. Yrbk. (1986) 70: 79-90.
2. Palmer, Tom. 1988a. Lady Gwen—without clothes. California Grower 12(4): 22.
3. Palmer, Tom. 19882). Gwens in production. California Grower 12(5): 26.
4. Takele, Etaferahu. 1988. Economic trends in the California avocado industry. Coop. Ext. U. C. Div. Agr. and Natural Resource Leaflet 2356.
5. Vrecenar-Gadus, M. and N. C. Ellstrand. 1985. The effect of planting design on out-crossing rate and yield in the 'Hass' avocado. Scientia Horticulturae 27: 215-221.