

Computers and the Avocado Grower

Brooks Lyman

Mr. Lyman is a retired R & D engineering manager from Pitney Bowes. He took early retirement in 1976 to grow avocados in Vista, CA. A confirmed computer buff, he readily admits his enthusiasm for growing things has diminished as the challenge is gone as well as the 360 degree view from his home. His threats to sell the grove, nevertheless, are not to be taken too seriously.

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The profile of an avocado grower, based on my analysis of surveys conducted by Avocado Grower magazine (now California Grower), reveals a person with a far better education and substantially greater income than the typical American consumer. He is likely to be a professional as well. This profile also happens to fit that of a typical computer owner, or prospect, very nicely. It is safe to assume, therefore, that many avocado growers are already computer owners or plan to be one in the near future. Furthermore, the chances are even that the grower will be the owner of an IBM system or "compatible" since more than half of the systems sold to date are of this type. This paper should be of interest to them and, it is hoped, to others as well,

Even "computer illiterates" now know that it is unnecessary to program computers in order to put them to practical use. Thousands of off-the-shelf programs - software — exist, in varying degrees of complexity and cost, for virtually every conceivable application. Others are appearing as rapidly as they can be written while the cost continues to decline and user friendliness continues to increase. Competition is fierce! Even now a few are appearing that take tottering steps toward the ultimate technology, artificial intelligence. Some programs permit composition of music and simulation of entire orchestral sounds. Some respond to spoken commands or give instruction by speaking to the operator. This paper, however, avoids these exotics and speaks to the humdrum programs most of us are already aware of.

Volumes have been written on how to buy a computer — essentially, select the program(s) you want and then find a machine which runs them. The advice is sound enough but it should go one step further. Consider the programs themselves with *great* care. Don't fall into the trap of avoiding one which you're told is complicated or difficult to use. To be sure, some are absurdly difficult and should be avoided. Your dealer, however, should be told that you are willing to spend the time to learn a more complicated program *IF* it will do more of the things you want and there is another which is simpler but does not have the same features. Why? You will find that it will not be long before even a very complicated program will become second nature to you. In other words, don't be intimidated by complexity!

Having said this, I will proceed to tell you the programs I use which will cause some

knowledgeable users to smile. My problem is that I did not have the benefit of such advice years ago and now I am stuck. My newer programs, however, are chosen with infinitely greater care!

As an absolute minimum the avocado grower will have use for a word processing program for writing letters; a database program for storing data as in a file cabinet; some way to generate "reports" (which could be a part of the database program); and perhaps a graphics program to produce charts, graphs, etc.

You probably appreciate the need for word processing. Once you've written letters with a computer you will understand why users sneer at a typewriter. You may have a more vague understanding of the need for a database. After all, filing cabinets are going to be around for a long time still. But graphics. What for?

I purchased an IBM look-alike after using a very reliable Apple III for years. The change was made simply because Apple decided to abandon the model I was using. The result was that manufacturers stopped developing new devices (hardware) to enhance our orphans, and they stopped developing new software as well. I made the change with great reluctance but, in retrospect, I should have done it sooner. The system I purchased, a Kaypro PC configured to work like an IBM XT, runs virtually every program from the tens of thousands written for its granddaddy. Like many machines, mine came "bundled" with a number of programs included at no extra charge. The word processor that was tossed into the package was WordStar, the industry standard, which is now yielding to Word Perfect, a far superior choice. Along with it were a number of minor programs, most of which were tied in some way to WordStar.

It happens that WordStar had enjoyed an enviable reputation for years as a word processor. Most secretaries who work with a computer use WordStar, and it is still being taught in most computer schools as *the* program to know. This may be OK for a secretary, but it is not necessarily so for us growers. It is what is known as "command driven" as opposed to "menu driven". Command driven programs require learning a mini language. Instructions given to the machine to print a document, for example, consist of a sequence of characters entered from the keyboard, such as "[^]KP". WordStar has scores of such combinations, most of which have no logical connection with the actual result to be achieved. Menu driven programs, on the other hand, display "menus" of numbered options on the screen from which the operator may choose. If "PRINT" is numbered "1", then pressing a "1" will cause the printer to do its thing. If "2" is "SAVE", then pressing a "2" will put the information which you see before you (and is in the machine's memory) onto a diskette or some equally permanent location. Obviously, command driven programs are much easier to use. There is one hitch, however; it takes time to display the menu on a screen, so menu driven programs are inherently slower to use. Significantly so. There are hybrids, however. Some programs give you the best of both worlds. They can be used via menus and, if you have been patient and learned the commands, permit bypassing the menus and used with commands whenever you wish. I have gotten such a program recently called Pro Design 2 (more about this later) which demonstrates the command speed versus the menu convenience rather dramatically. Enough about word processing. Everyone will find uses for it.

The application of databases may not be quite so clear to the uninitiated. Figure 1

shows one of the ways we use PFS: File in connection with our grove. (Date Base 3 is a far better program than mine, but substantially more difficult to use. I find "File" adequate nevertheless.) You will notice that there are a number of "items" in capital letters terminated with a colon. Imagine figure 1 without any data following those colons. This would be called a "template". The template is "designed" by the user and displayed later whenever new data are to be saved, So, in this illustration I have entered a date, water meter readings, numbers for relative humidity, low temperature for the previous night, etc. I do this on a daily basis. *Some* of the blank spaces are calculated by the computer itself and entered automatically. "TOT, GALS CONSUMED" and "GALS/HOUR/TREE" are good examples. Whenever that record for the day is "saved", the program tells the computer to calculate the data I have specified. It does this instantly and displays the result in the location I designated. It will be obvious, therefore, that if something goes wrong with the irrigation system and we use more or less water than I am accustomed to seeing displayed, it is safe to assume that there is a problem out in the grove which had better be investigated. (Such monitoring will NOT detect a single clogged emitter, but is fully capable of detecting broken lines, changing water pressures, and similar catastrophes.) Early in the days of my monitoring in this manner I detected a constantly increasing change in water consumption throughout the entire grove. Investigation showed that the diaphragms in our emitters (the first Bowsmiths sold) were disintegrating. This was the first report to Bowsmith and the Snow Irrigation Company that their devices had a glitch, were failing, and would probably do so throughout the industry. They did!

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          DATE: 86/09/02
    OLD METER READING: 371200
    NEW METER READING: 374577
    IRRIGATION BLOCK: 2       RELATIVE HUMID: 73       MIN NIGHT TEMP: 59
      RAIN TODAY: 0
    TOTAL RAIN: 0.1401
TENSIO METER #1 12": 10       #1 24": 16
      #2 12": 4               #2 24": 20

HOURS IRRIGATED #1:
HOURS IRRIGATED #2: 8.08
    FERTILIZED:
      GALS/TREE #1:
      GALS/TREE #2: 197.34
TOT. GALS CONSUMED: 25259.96
GALS/HOUR/TREE #1:
GALS/HOUR/TREE #2: 24.42

MINS. 5  10  15  20  25  30  35  40  45  50  55      CONVERSION :
HOURS .08 .17 .25 .33 .42 .50 .58 .67 .75 .83 .92  MINS TO HOURS:

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
WATER                                     Form 45                         Page 1

F1-Help      F7-Calculate      Esc-Main Menu      F10-Continue

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Figure 1. Single page from daily "WATER file showing TEMPLATE, input data and calculated data.

Our "WATER" file is but one example of many such records we keep. Others which may be obvious include files on grove productivity, expenses (both for business and personal), materials (fertilizers, pesticides, where they were purchased, when and for how much), to name but a few. Have you ever wondered who charges the most and who charges the least for identical products? Do you have your productivity at your fingertips for any given year that you've been in operation? Do you know what the average temperature was for a given period to see what effect this had on production or fruit set? Would you like to know whether fertilizing weekly, monthly, or semi-annually makes a difference? With a bit of imagination, you can save information and recall it in combination with other data to arrive at some startling and very useful conclusions.

I mentioned that a graphics program might be useful to have. Data presented in graphical form are vastly easier to assimilate than columns of raw numbers. I recall visiting a gentleman who was using a very sophisticated control system in his grove. His computer was generating masses of data, so much data that no one could comprehend what it meant except in a very general way. Were these data displayed with the familiar squiggles of a graph, even a child could comprehend its significance at a glance. Essentially, business graphics programs collect data from files which may seem unrelated in themselves and combine them in a condensed fashion whereupon the user may draw unexpected conclusions. Figure 2 is a graph of water consumption in the grove by the month since last July. The graph, not surprisingly, shows that water consumption is greater during the hot, rain-free summer months; combines all the little

rainfalls into monthly totals; and displays those quantities as they occurred. Discounting that the trees are semi-dormant at this time, one sees graphically how much water is saved by varying amounts of rainfall.

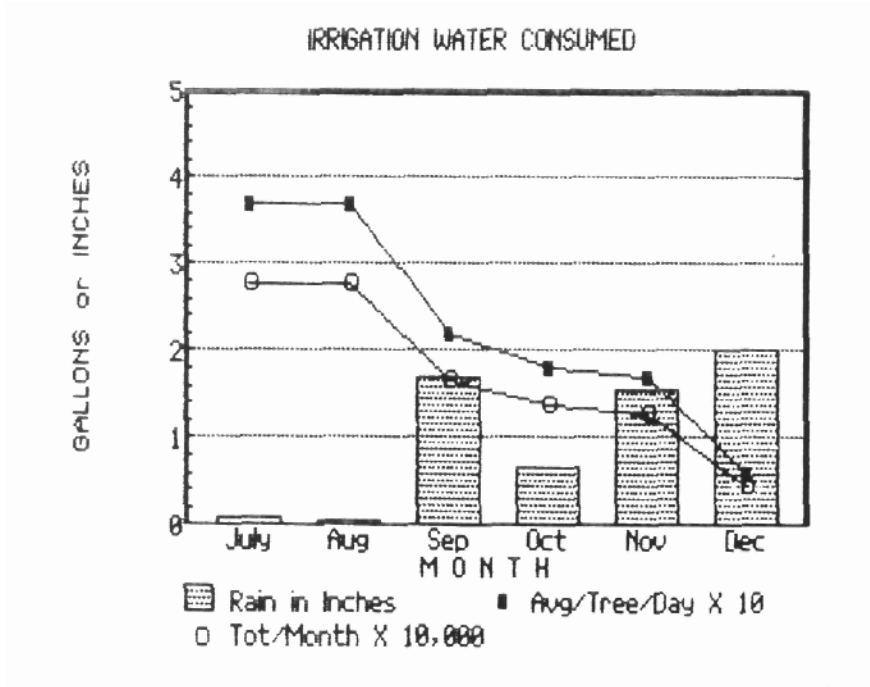


Figure 2. Consumption of water in grove plotted against rainfall for 2nd half of 1986. Compare with the REPORT shown in Fig. 3.

Notice that I have had to "normalize" the scales on the graph so that some data are not too large or small for the chart.

Reports, on the other hand, summarize data. It is equally easy to show the same data as on the graph in report form as in Figure 3. The data are the same, they are simply displayed differently. Some data are more easily understood in one form, others in another. Since both examples I've given are relatively uncomplicated, both are fairly simple to comprehend.

Other uses for reports might be to list how much has been spent for various supplies over a period of time. We could produce an average figure by month and totalize the entire expenditure. While this would be possible on a graph also, the graph might become quite confusing if there were a large number of items involved. Figure 3 illustrates a typical use for data in report form. In this case we have used the same data as in the graph to kill two birds with one stone. A more typical application of reports would be the summary of expenses for materials noted above.

IRRIGATION WATER CONSUMED					
YEAR	MONTH	MO AVG/TREE	DAILY AVG/TREE	GROVE MO. TOT	RAIN
1986	July	1105	37	276,258	0.101
1986	Aug	1106	37	276,416	0.040
1986	Sep	658	22	164,552	1.700
1986	Oct	552	18	138,135	0.650
1986	Nov	501	17	125,199	1.560
1986	Dec	173	6	43,264	2.017
Total:				1,023,824	6.068

Figure 3. Consumption of water displayed in report form. Compare with GRAPH in Fig. 2.

You may wonder why it is necessary to generate financial reports of that type. Since many of you undoubtedly use the services of a tax specialist at the end of the year, and it is true that the tax professional will do this little chore himself by wading through your records, don't you suppose that it might be a lot cheaper if you could simply present the summaries in report form? After all, these people are working on a hourly basis (everyone does in a sense) so a few minutes with your PC could save you a bundle — plus - the IRS is much more likely to accept your data if they see in an audit (ugh!) that you've got all your income and expenses properly organized.

There are programs you might use which do not fall into any of the above categories. A couple I have in mind are designed primarily to simplify the computer operator's work. I am thinking of the so-called desktop manager programs. These programs, unlike most, are stored in the machine's memory, as opposed to a diskette, while in use. Where accessing a program from a diskette can take a number of seconds, "RAM-based" programs can be accessed almost instantly. Furthermore, they can be accessed at any time — whether you are writing a letter, entering data, or some other procedure — by simply pressing one or two keys. The desktop program interrupts whatever you are doing and stands at attention ready for any command. The programs are named as they were because they put at your fingertips virtually every aid commonly found on a desk; calculator, calendar, clock, notebooks, etc.

Suppose you are deep in the process of writing a letter when suddenly you find the need to do a calculation for one reason or another. Without leaving the console, without disrupting your word processing program, you simply press a key or two and, presto, displayed on your screen, superimposed on your letter, appears the image of a conventional calculator. Enter the numbers you would have keyed into the real McCoy and you will see the same numbers flash onto the calculator displayed on your screen. When you are finished, press another key and, abracadabra, you are back where you left off. Similarly, you can access a calendar or memo pad on which you may leave little notes which popped into your head as you were working to be retrieved later when you

have more time. The desktop program bundled with my machine, POLYKEYS, will chime on the hour if you wish; can flash a message on your screen at the time you designated to remind you of some important appointment; can dial your phone through your keyboard; will display a calendar on which you may have "marked" important dates and; as goes the cliché, much, much more. Another RAM-resident program which I find almost indispensable is one called "Instant Recall". This little gem permits one to make as many notes to one's self as there is room in your system. Thousands, usually. When the note is entered or saved, you have the option of having your machine remind you of this bit of information by displaying it on the screen every time you access the program, but only on the day that you specified. While this is a useful feature, it can be applied differently. Suppose you are learning a new program which involves a number of commands which must be committed to memory. Simply press a special combination of keys, enter the keystrokes for a command you can't seem to remember together with a few keywords to describe its function. When the time comes to use the command, and you have once again forgotten it, access Instant Recall, enter one or more of the keywords, and, presto, there is the note displaying the command. Remember, this occurs in split seconds and without interfering with your task at hand.

While it is interesting that such a program exists, it is even more interesting that some are available at almost no cost. Thousands of useful programs have been written by individuals and placed in the public domain for anyone to use. User groups (computer clubs, if you will) have libraries of these programs for the asking. Typically one simply copies the program onto his own diskette and that is that. Many authors of software, however, include a little message in the program instructions asking for a donation if the recipient thinks the program merits it and he is planning on putting it to use. Making such donations for public domain software, obviously, is strictly voluntary!

Engineers and others similarly technically inclined will appreciate a program I am in the process of learning. For years I have wanted to make a computer map of the grove, display each tree on it together with the irrigation system layout and whatever other data I feel is pertinent to our operation. Programs capable of doing this were becoming available about when I retired, but were frightfully expensive. Thousands! Even today, the full-blown computer-aided design software is in the thousands. Some are appearing, however, which do a very creditable job of imitating their big brothers at prices comparable to word processors, databases, etc. Mine, called Pro Design 2, has capabilities that boggle the mind. Imagine putting a pair of dots on a screen and issuing the command "O" which produces a circle whose radius is equal to the distance between the original dots. Or, had you given the command "V" (for vector) the computer would have generated a line connecting those points. Now imagine "drawing" three dots followed by the command "A" for "arc". You guessed it: an arc would have been drawn whose length is the distance between the first two points and which bends in the direction of and whose height is equal to the distance from the third point. Understand that these are probably the simplest commands of a list of almost 175, most of which do exotic things such as calculate dimensions and place the dimensions on your drawing automatically — complete with arrow heads.

You will wonder how in heaven can all of the trees in a grove be shown on a map the size of a computer screen together with perhaps tree numbers, variety, emitter size, etc.

Necessarily, each tree location will have to be reduced in size dramatically — and that is just what can be done. In my case, I am placing each tree (a rectangle for the moment) on the map to scale and correctly spaced on 15 x 20 foot centers. The initial rectangle is conveniently large. It is then reduced by whatever factor I choose, 1000 to 1 if I want, the program could not care less. Next, the instruction is given to repeat this pattern as many times as I want — representing one row. After all the rows have been generated similarly, it is a simple matter to select one at a time, enlarge it to a manageable size (full screen if you wish), enter the identification and pertinent data, then move on to the next. Naturally this is a time-consuming process but once completed — oh what benefits!

Suppose you are about to thin the grove. Over the years you have noted certain trees which are poor producers, are diseased, or are candidates for removal for any of a number of reasons. These trees could be marked on your map in a different color, say red. All of these red figures will show up on the map enabling you to visualize which trees, in addition to those marked, are to be thinned out to result in the best final arrangement.

Or, suppose you are troubled with a disease, or pests. Mark these locations in different colors on an overlay (transparency) which can be superimposed over your map or not, as you desire. Calling up the "root rot" overlay will show at a glance what your situation is at the moment. Call up the "gopher" overlay, and you will see patterns where the little scoundrels are most likely to reappear. These are areas which need watching. When completed, our map will be the equivalent of an aerial view of the grove which is being updated constantly. Can't you think of ways to put such a tool to use? Figure 4 illustrates the power of enlarging or shrinking a symbol. The example shows only a 5 to 1 reduction. A greater reduction, speck sized, might leave you wondering whether all the data were there. A computer with the right programs *has* to make your work easier.



Figure 4. Trees are represented on grove maps by rectangles in which are included some identification and data. Below are those trees reduced by only a factor of 5.

So, why can't every one have a PD2, or a Poly Windows or Instant Recall? Years ago, computers had tiny memories. I have one right now which has only 8K. Some of you won't know what this means. Well, consider that practically every machine you buy today has at least 64K of internal memory. Many have 512K which can be expanded to the maximum, for the IBM PC type machine, of 640K. Competition is so great today that many machines, the Kaypro included, come with 640K as standard. One gentleman,

attending a user group meeting at which I was present, wondered how in the world one could ever use 640K. Very simple. Some of the more sophisticated programs (PD2 for example) require prodigious memories. In my case, 512K *minimum*. Add to this some 72K for Instant Recall and another 100K or so for Polykeys, and you can see that I have already exceeded my machine's capacity. (The solution, of course, is to not load all of the programs at once.)

The computer industry, like most others, is rampant with buzz words. One which appears with monotonous frequency is "laptop" which refers to small computers which are battery operated and can be carried about. Through a stroke of good fortune, I stumbled into a "deal" I could not refuse. The local Radio Shack store listed their TRS-100, one such portable, for \$300. Although not particularly interested in buying one, I inquired about them while I was in the store for another purpose altogether. The manager explained that he was clearing out *one* machine which had been concealed high on a shelf during a period when that model, with minimum memory, was declared obsolete and recalled. The depot where the other machines had gone months before advised the manager to unload this machine for whatever he could get. It was too late to return it. Since it was still hanging around when I arrived on the scene, and the price had been cut in half once again, I walked out of the store with a third computer under my arm and I have not regretted it for a moment since.

A little portable like this should have interesting applications for other growers who, I suppose, have the same kind of problems as I.

In the past I carried a clipboard and ruled pad for making notes whenever I was taking inventory or surveying the condition of the trees or for any number of reasons. This little machine, weighing but a few pounds, is quite similar to its bigger brothers. Stored in its internal memory are a word processor, a database, the BASIC language for doing your own programming if you wish, and, believe it or not, a 300 baud modem for communicating with the outside world via the telephone lines. I have written a few simple little programs which permit strolling through the grove, estimating the number, or pounds, of fruit on trees at random and entering these estimates through the keyboard. Later, when I am all done, the machine gets a command "TOTAL" whereupon it calculates the total and saves it in a file with the date. At some later time, it is a simple matter to redo the inventory and compare the latest with the others. Your skills can be sharpened by entering and checking the number of bins, or pounds, at picking time, and compared with the data which is always at your finger tips. Interestingly, if you were to have a modem for your principal computer, it is entirely feasible to transfer the data from your portable to be saved as part of your permanent records.

In summary, there are many applications for computers in the avocado grove. Hundreds, surely, I have not even considered. Once the equipment is available, it is a simple matter to implement them.