Microcomputer Use in Experimental Aquaculture: Hardware Requirements, Part 1: Microcomputer and UPS

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This article is not meant to be another contribution to the sometimes fierce discussion about the pros and cons of the use of microcomputers in fisheries science. Recent issues of NAGA and FISHBYTE contain a series of articles that deal with this question.

In science, microcomputers are going to be with us for quite some time in the future. They have lost a good deal of their original glamour and now are being reduced to what they really are: powerful tools, rather worthless in the hands of the inexperienced, but producing good results when used with professionalism both in scientific and technical respect.

Writing about microcomputer applications in fisheries science has become quite fashionable (this article proves it!). While many of these articles are commendable attempts to introduce more sophisticated means of data recording, management and analysis to the computer novice, hardly any contribution ever deals with an indispensable prerequisite of actually becoming a computer novice, i.e. acquiring a computer to work with.

Most authors simply assume that the reader has the appropriate computer system and, therefore, do not bother wasting many words about hardware requirements. However, the inner life of microcomputers is not necessarily part of the average scientist's curriculum, and chances are to find computer users who do not know much more about their system than where to turn on the machine and how to load a program (which they then might use quite efficiently)!

The problem gets even worse when scientists are suddenly confronted with the request to specify exactly what kind of computer should be purchased for use in their department. If he/she is not a frequent reader of some computer magazine or otherwise had a chance to gather information on this topic, one should not be too much suprised if the system finally acquired proves inappropriate for certain tasks at a later date.

Based on experiences made with computer training at scientific institutions in Thailand, and thus emphasizing on the needs of scientists in general, the author will start this series of articles with some background information for the purchase of hardware. Part 1 concentrates on the microcomputer, while Part 2 will be dedicated to the chaotic situation reigning on the (dot matrix) printer market. Later, in a third contribution, the reader will be introduced to some general-purpose software packages that can readily be applied to data processing in experimental aquaculture.

Even though it is tried to keep this introduction as general as possible the reader should be aware that certain recommendations are clearly influenced by the author's personal preferences. Other authors might have different suggestions. These differences simply reflect the fact that by using microcomputers, a scientist is usually given a wide choice of different approaches. Which one to take is a very personal decision.

As already mentioned, before indulging oneself in the realm of microcomputers, one has, of course, to buy some "hardware". Hardware basically consists of a microcomputer, connected (where necessary) to a UPS, and a printer. The microcomputer should run the appropriate software and the printer should produce a readable printout of what is displayed on the screen. This sounds simple, but might, in reality, create the first headaches. Chances are that adding more pieces of hardware - like plotter, modem, mouse, etc. - will increase the headaches proportionally.

Entering an ordinary computer shop with no clear idea of what computer system to buy can easily result in an "Alice in (Computer-) Wonderland" experience. Though the kind of vendor has become rare who thinks that running a demonstration program explains everything, one cannot necessarily expect an ordinary computer sales (wo)man to be experienced in the selection of hardware that is fit for use in the environment of a research institute.

In order to assist in the selection of appropriate hardware, this article will introduce the scientifically oriented reader to some general aspects worth being considered when purchasing a microcomputer. In the second article of this series, printers will be the major topic, while the third article will give an overview of software appropriate for use in experimental aquaculture.

The Microcomputer

Seen as a stand-alone unit, there are no such as "bad" or "good" microcomputers on the market (not considering, of course, some cheaply manufactured "no name" imports from S.E. Asia!). However, when it comes to make the machine work with another component, i.e. a program ("software"), a printer, or any other piece of hardware, one might encounter serious problems because of the incompatibility between the systems.

In the absence of a generally agreed standard of how computers operate and communicate with other hardware, every computer manufacturer is free to adopt his own operating system. Fortunately (for the computer user), the enormous market power of IBM has made IBM-PC with its MS-DOS operating system a quasi-standard for microcomputers. Nowadays, computers are commonly classified whether they are "IBM-PC compatible" or not.

Even though there are very fine machines among the "non-compatibles", purchasing a "compatible" (or the real IBM-PC, of course) has the advantage that a vast amount of readily available software can be run on such a computer without requiring tedious installation procedures. It has furthermore the advantage that the exchange of data and specialized programs between scientists is greatly enhanced, as chances are good that other colleagues also use IBM-PC compatible microcomputers.

A typical all-purpose microcomputer, therefore, should have at least the following configuration:

- IBM-PC compatible
- MS-DOS operating system, version 3.0 or later
- 2 disk drives, 360 KB formatted
- high resolution monochrome monitor, green or amber
- 640 KB main memory on board
- monochrome graphics card
- parallel printer port
- IBM-AT style keyboard
- clock/calendar with battery back-up
- operation manual.

The monochrome graphics card is a recommendation based on the experience that color graphics are usually of little value to scientists, while the eyes will definitely benefit from the higher resolution of the monochrome graphics card. Most of the presently available graphics programs can be installed to work with a monochrome graphics card. (Many of the computer games, though, can not be started with a monochrome graphics card; but is that really a disadvantage?)

However, if money is no constraint, one can equip the microcomputer with an **Extended Graphic Adapter (EGA)** and an EGA monitor, thus obtaining high resolution in text and graphics mode together with brilliant colors.

It will be noted that the above given list does not include a fixed disk drive, even though computers with a 20-Megabyte fixed disk drive are nowadays available at very competitive prices.

A fixed disk drive (or hard disk) is indeed a piece of equipment that considerably speeds up operation and makes data handling much more convenient. There is also a clear tendency in software development towards relatively large and complex programs that are distributed on sets of three, four, or even more diskettes. Using them on a floppy based system often means to not fully utilize all of their features. Some software like the new LOTUS Manuscript or the statistics package SPSS PC+ cannot be used at all without a hard disk.

However, a hard disk is a somewhat ambiguous affair when a computer is handled by (let's be honest) more than one user. This invariably requires one person permanently in charge of the computer. He/She has to be quite familiar with the DOS operating system and its command structure in order to do the "house-keeping". House-keeping means to correctly install software, keep some order in the data file management and to take care of regularly backing up the hard disk.

More important, however, it means to set up a system that gives every user convenient access to the installed software while at the same time preventing as much as possible an accidental erasure of programs or data files stored on disk. There is software available to support such a system, but, as already mentioned, this requires quite an experienced computer user who is willing to invest a considerable amount of time in a work that has as much to do with scientific research as cleaning test tubes.

A computer that includes the specifications given above would not necessarily reflect the lastest development in microcomputer technology, but could rather be considered a reliable "workhorse". It will allow a scientist to carry out a good deal of his data processing without going through the frustrating experience of incompatibility between computer and software.

UPS

Hardly anybody using microcomputers in industrialized countries has bothered to think what is happening to one's work on the computer if there is a power failure. This simply is such a rare event that there is no resaon to worry about.

However, in many countries of the less industrialized world computer users have to cope with the permanent threat of a sudden "black-out" or heavy voltage disturbances in the mains. Because such work done on a computer is only saved permanently when it has been stored to a disk, any power failure will result in a loss of everything that has been done since the last time a SAVE-command has been issued.

Frequently saving to disk is, of course, a way to minimize possible losses, but it considerably slows down operation. A much better solution to this problem is to have the computer connected to an **Uninterruptible Power Supply (UPS)** instead of plugging it directly into the mains. A UPS basically consists of a large-sized battery that delivers a constant voltage to the computer independent of disturbances in the incoming voltage. Depending on the size of the battery and the power consumption of the computer, it also allows continuation of operation during a complete power failure for another ten to twenty minutes. This is usually sufficient to shut down the system in the normal way, thus making sure that all work can be safely stored to disk.

Following are some specifications that have to be considered to make sure to obtain the right equipment:

- appropriate voltage (220, 110 volts)
- input overload protection (against sudden surges in the mains)
- output load rating must correspond to power requirement of connected computer (e.g. 150-250 watts)
- UPS output should have a short-time overload capacity, as some operations on the computer (like writing to a disk) demand briefly a higher power consumption. Rule of thumb: 40% overload for 2 minutes; 150% overload for 0.4 seconds.

Though not an indispensable piece of equipment the purchase of an UPS should always be considered when a computer is going to be used in an area with unreliable power supply. The many hours of work that are *not* lost because of power failures will quickly make up for the comparatively high costs of purchase.