Steps in the implementation of a micro-computer approach to the management of animal disease information

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Summary: The stages in the design, procurement and implementation of a micro-computer-based animal health information system are described. The scenario presented is that of a national Director of Veterinary Services taking his first steps in the computerisation of an epidemiology unit, but sub-national and international issues are also discussed. The administrative and management aspects are considered and the need to incorporate computers into a carefully designed and appropriate information system is emphasised. The principles of the specification of initial systems and their subsequent development are described; suggestions are made for the procurement and continuing support of both hardware and software.

KEYWORDS: Animal health - Computerisation - Epidemiology - Information - Micro-computers - Planning.

INTRODUCTION

Population pressures, new policies and new disease challenges demand greatly improved information if animal health services are to be run with a high level of technical and economic success. Fortunately, the advent of the new generation of powerful but robust and inexpensive micro-computers means that directors of veterinary services can now have ample facilities to enter, check, collate, analyse and store health, production and administrative data and to generate reports in the format required for a range of end-users.

The computer itself supplies no solutions and must be part of a carefully designed system for the generation and use of animal health information. The decision to use micro-computers offers a chance both to review information requirements and set priorities.

The typical situation which is considered here is that of the Director of Veterinary Services in a developing country who is aware of the potential role of micro-computers in the planning and implementation of his service but who needs advice on how to proceed.

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Although the title of the paper refers specifically to "disease" information, it is impossible to consider this in isolation. Knowledge of the presence of a disease is only of value if the extent of the disease can be estimated, and this requires information about the non-diseased population. Even estimates of the biological importance of a disease, its incidence, prevalence and persistence, is of only limited value in the context of a national veterinary service. To be of any real use in planning, information about the health of animals must be linked with information about the effects of the state of health on productivity, and this must be measured in financial or economic terms.

Where it is necessary to clarify points in the discussion, names of makes and models of hardware and software are given. These represent widely used brands at the time when the paper was written (June 1990), but should not be taken as an endorsement for any specific system. Even the technical specifications detailed here may change in a few months. The principles of specifying a system, however, will remain the same.

The suggestions made herein are based on experience of several years in a number of different working situations; even so, they may not always correspond to the experiences of others working in the same field. It has not been possible, in the space available, to treat every aspect of the subject in depth, and any correspondence would be most welcome.

**STEPS IN THE ESTABLISHMENT OF AN INFORMATION SYSTEM**

The steps taken to define and install a computer-based information system follow much the same pattern as any well-planned project, and can be summarised as follows:

- Determining both the priorities for collecting information and who will use it. On a national scale this usually means redefining and modifying a system that has been in place for some time; on a smaller scale it may involve setting up a completely new system;
- Defining the flow of information;
- Identifying areas where the management of information will benefit from computerisation and others where a manual system will be better;
- Drawing up a work plan, making a list of the people who will need to be involved and the training they will need to be given;
- Specifying and procuring the computer system;
- Installing the system and initiating training. If the system is large it is advisable to install it in modules; installation and training may therefore proceed in several stages;
- Working with the system over a period of time and gradually increasing the volume of information flow; monitoring the efficiency of people and the computers and making any necessary adjustments to the methods of handling information.

It would make extremely dry reading to take each of these in turn and set out a list of recommendations; besides, as every situation is different, it would be impossible to anticipate each one and give helpful guidelines. Instead, the paper will
take the form of a case study. An imaginary country will be used as the basis for the discussion; parts will seem familiar to almost every reader because the case study is a composite portrait, made up of real experiences on three continents. An imaginary but typical working group is formed to set up a computerised information system for the Veterinary Service and every debate and decision will be chronicled.

Considerable effort has been made to present situations which cover the most important and controversial aspects of the subject. The recommendations in the following sections give a fairly accurate estimate of the work that would be required in most veterinary services but it would be a mistake to regard them as a blueprint. Local conditions can play a large part in determining the scale of operations, the time taken to complete each stage, and the assistance and training required from outside. Every country needs to be assessed individually.

It may appear that the discussion moves beyond the scope given by the title. This is deliberate. If it does nothing else, this paper should make it clear that a micro-computer system cannot be defined without reference to every aspect of the management of information; inevitably, many areas of work of the Veterinary Service come under review when an information system is installed.

DESCRIPTION OF UTOPIA

The country in question is Utopia, a name chosen not for its common usage, meaning "ideal world", but in deference to the strict definition which means any imaginary world. Utopia has two provinces, North and South, each divided into four administrative districts. Much of the country is rural, with approximately 2,000 small villages scattered throughout. There are two large towns, the capital, Bigtown, in South province, and the provincial capital, Northtown, in North Province. Cattle, sheep, goats and poultry are kept but, because of the influence of Islam in the north and frequent outbreaks of swine fever in the past, there are very few pigs. In North Province, herds and flocks tend to be larger and many of the herders are transhumant. There are a few commercial ranchers who own large tracts of land and who form a powerful political lobby because of their large contribution to exports. In South Province, animals are kept in smaller groups and settled, mixed farming is the general practice. A number of producer cooperatives exist, of which the most organised and vocal are the dairy cooperatives supplying the capital. The total cattle population of the country is approximately 2 million, and there are about 4 million sheep, 2 million goats and 3 million poultry.

THE VETERINARY SERVICES AND THE VETERINARY EPIDEMIOLOGY AND ECONOMICS UNIT

The Veterinary Services form part of the Department of Animal Production and Health and are headed by the Director of Veterinary Services (DVS) who is based in the Ministry of Agriculture, located in the centre of Bigtown, in South Province. In each Province, there is a Provincial Veterinary Officer (PVO) who reports to
the DVS. In each of the 8 districts there is a District Veterinary Officer (DVO) who reports to the PVO of the province. The Central Veterinary Laboratory (CVL) is in the South, located 10 km from the capital. It was built six years ago to replace a much smaller laboratory and is managed by one veterinarian with three others heading different diagnostic sections. There is a second, smaller laboratory in Northtown, headed by the PVO.

A year ago it was decided to form a Veterinary Epidemiology and Economics Unit (VEEU) to advise the DVS on animal health policy, monitor and implement animal health programmes, and provide reports for national and international institutions. The siting of this unit proved to be highly controversial. The DVS wished the unit to be situated close to his own office so that he could consult with the staff daily and immediately advise them of significant animal health issues. The staff of the CVL, however, took the view that the bulk of data used by the Unit would be generated by the laboratory and that the Unit should therefore be situated at the laboratory. The DVS pointed out that the success of the Unit depended not only on its relationship with the laboratory but, perhaps more importantly, on its relationship with the field services and the producers. Much valuable data would relate to livestock populations and their productivity and to the link between production and disease. He also offered to make available transport, equipment, staff and financial resources which would be solely under the control of the head of the VEEU. The view of the DVS prevailed and the Unit was allocated three offices in the Ministry of Agriculture. The VEEU is staffed by two veterinarians and there is a plan to add a livestock economist to the staff. Although a suitable person has been identified, he is presently away on a two-year Master's degree course.

While the general objectives of the VEEU have been defined, in initiating a discussion of the more detailed objectives it becomes obvious that a radical review of the national animal production and health information system is required. At the same time, an information management system based on micro-computers can be built in. A small working party is formed, chaired by the DVS and including the Deputy Director (Disease Control), the Deputy Director (Livestock Production), the head of the VEEU and the head of the CVL. The working party is in contact with the chairman of the association of ranchers, representatives of producer cooperatives and local computer suppliers.

The discussion and subsequent implementation proceed as described in the following stages.

**DETERMINING INFORMATION PRIORITIES, DEFINING THE FLOW OF INFORMATION AND IDENTIFYING THE ROLE OF COMPUTERISATION**

**Existing priorities**

As the working group examines the existing activities of the Veterinary Service, most of the work of the Service is seen to concern the implementation of current health programmes. These programmes fall into three categories:

a) Control of major epidemic disease, including detection of outbreaks of specific
diseases and requirements for the demonstration of disease status, including the compilation of reports for international institutions. This is handled as follows:

- Suspected outbreaks of notifiable diseases are advised by telephone or the most rapid alternative. Records are kept in the Ministry of Agriculture;

- The country has been subject to mass vaccination against rinderpest for the last five years. As no clinical cases have been reported in that time, however, it is seeking to withdraw vaccination, implement a programme of surveillance and declare provisional freedom from rinderpest disease in accordance with draft OIE guidelines. Strategic vaccination is carried out against FMD. Information pertaining to the vaccination campaigns is contained in the monthly reports of the DVOs to the DVS;

- Monthly reports from DVOs are submitted through the PVO, including reports of disease outbreaks and of such activities undertaken as vaccinations and minor surgical procedures. These are summarised annually in a report to the DVS;

- In each of the laboratories (in Bigtown and in Northtown), each laboratory section (Bacteriology, Parasitology, Virology, Serology, Pathology) produces a monthly report of work done and test results obtained for the head of the laboratory. He collates this information to produce an annual report for the DVS.

b) Wide scale control of endemic disease

The major endemic diseases which are subject to control measures are the tick-borne diseases. Dip tanks are sampled and acaricide concentration is measured; this is sporadic, however, and the turn round of information is too slow to have a beneficial impact on the programme.

c) Monitoring of the livestock population

An annual census of livestock is carried out by sending enumerators to villages and collating the information on the mainframe computer in the Ministry of Planning. Results are normally published within two to three years.

Newly perceived priorities

The conclusion is reached that the existing information system is inadequately focused and that the new system should generate essential information required for improved management of the Department.

The existing disease reporting system is a passive one, relying solely on information received of actual outbreaks. Because there is no active surveillance, it is unlikely that an accurate estimate of the level of disease is provided. There is no investigation of sub-clinical disease or of the healthy population; animal health is not considered in relation to its effect on levels of production. Furthermore, no attempt is made to estimate the success of either of the vaccination campaigns. Feedback of information to those supplying data has also been inadequate and must be improved.

The newly defined system is as follows:

a) Disease reporting

The reporting of major epidemic diseases is considered to be appropriate; although data on outbreaks will be accumulated, there is no role for computerisation in the active control of outbreaks.
There is vigorous debate on the desirability of computerising the considerable backlog of routine reports. Owing to imperfectly defined diagnoses, frequent gaps in the records of individual districts and the lack of a valid statistical basis for the collection of information, the decision is taken not to process data of unknown quality. Because the reports vary in quality, they do little more than record the level of activity of the DVOs and certainly cannot be used to estimate incidence and prevalence rates. The working group concludes that it is far more important to initiate the collection of high quality data for well-defined purposes. The only part of the routine report data that might be usefully computerised would be a summary of confirmed laboratory diagnoses from which disease distribution could be plotted on a map.

b) Surveillance for epidemic diseases

A short list of diseases to be subject to active surveillance is identified. These are diseases already subject to an active control policy, principally rinderpest and foot and mouth disease. The campaign for each disease will include clinical examinations and sero-survey. The data from both types of survey can be conveniently held on the computer and, in the case of rinderpest, will satisfy both national and international requirements.

c) Monitoring of endemic disease control

Computerisation of the cattle dipping programme is seen to offer a number of advantages, but a complete reorganisation of its supervision is required. The Department will insist on the submission of monthly dipwash samples against a threat of non-payment of field allowance. The laboratory testing of samples will be streamlined. Data will be analysed by computer; reports, including comparison of performance of different dips and districts, will be returned to field staff within a week.

d) Health and production monitoring

In order to generate information on production diseases and to relate this to the level of productivity of animals, a regular monitoring campaign is to be initiated which will involve monthly visits to a representative sample of herds and flocks in each province. Details of the production and reproduction of individual animals will be recorded, and blood and faecal samples taken at appropriate intervals. The data will be held on computer and monthly reports will be submitted to the DVS.

e) Research and development

This is to include both detailed investigations of particular problems, highlighted by routine health and production monitoring, and on-farm trials of proposed intervention measures. The amount of data generated will probably be small; although the data can be conveniently analysed by computer, the working group does not consider the drawing up of any detailed plans to be necessary.

In addition, the VEEU will be responsible for producing simulations of the production effect of disease on animal populations and for economic assessments of existing and proposed strategies to improve animal health.

f) Management of laboratory data

A comprehensive set of manual records is already kept at each of the two laboratories; the regular compilation of these into reports, however, occupies a great deal of staff time and the resulting summaries cannot be easily related to any of the
field reports. A phased introduction of a computerised system designed to manage the laboratory data is decided upon. Initially, the system will be installed at the CVL, and only when it is well-established will it be duplicated in Northtown.

**DRAWING UP A WORK PLAN IDENTIFYING PERSONNEL NEEDS AND TRAINING REQUIREMENTS**

With reference to the newly defined set of information requirements, a detailed work plan, encompassing not only work done on the computer but also all of the related work of the units where computerisation is proposed, now needs to be drawn up. The personnel requirements can be determined from this, and thereafter the computer system can be specified.

Use of a Ministry of Commerce mainframe computer, on which there is spare capacity, is rejected early in the discussion. Previous experience gained while attempting to analyse livestock census data on the mainframe showed that there was a loss of control to the management team of the computer, that the turn-round time of work was slow and that the available software was inflexible.

Because of the physical distance between sites, holding VEEU and CVL data on one site will be extremely inconvenient. The heads of the VEEU and the CVL are very anxious to keep control of their own data and they make the valid point that, if data processing is to be routine and efficient, the computer operators in each unit must have free access to the machines. They agree that some of the data will be of interest to both units, but feel that each unit should be independent and that each site should have its own computer system. If there is a need for data exchange, floppy disks can be sent between sites. Where telephone connections are very reliable, modems can be attached to computers and data transferred down the telephone line. Unless the transmission is very clear, however, there is a danger that data will be corrupted during the transfer. For Utopia, which has frequent disturbances in telephone communications, this would be very impractical.

At this stage, the need for expert assistance becomes evident. The only member of the Veterinary Services with any real computer experience is the livestock economist of the VEEU, who is away on training and has never managed a micro-computer system. A major donor, who has already been approached for funding to develop the VEEU, agrees to fund a short visit from an expert to advise the working group, which adjourns for several weeks while the visit is organised.

On the arrival of the expert, the heads of the VEEU and the CVL each produce a work plan for their units. The plans are quite detailed and are discussed below. Because none of the hardware and software is in place, deciding exactly how long it will take to enter and process data is difficult; estimates are therefore made based on the time taken to fill in the existing paperwork and on experience of similar systems in other countries. The work load will be substantially increased at first because a number of new systems are to be put in place; as a consequence, keeping very detailed paperwork until the computer systems and programs are working well will be necessary.
Work plan for the VEEU

The work of the VEEU is considered by activity with reference to the list of newly perceived priorities. Each activity is split into field work and office work; office work is divided into manual work (paperwork) and computer operation (see Table I).

**TABLE I**

*Work of the VEEU*

The work time shown relates to the veterinarians, livestock economist and office staff. Field assistants will be assigned as necessary.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sub-activity</th>
<th>Man-days per month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Field</td>
</tr>
<tr>
<td>Disease reporting</td>
<td>Notifiable diseases</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DVO reports</td>
<td>0</td>
</tr>
<tr>
<td>Epidemic diseases</td>
<td>Clinical surveys</td>
<td>6 (1)</td>
</tr>
<tr>
<td></td>
<td>Sero-surveys</td>
<td>12 (2)</td>
</tr>
<tr>
<td>Endemic diseases</td>
<td>Diptanks</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Health and productivity</td>
<td>Monitoring</td>
<td>15 (4)</td>
</tr>
<tr>
<td>Research and development</td>
<td>Trials</td>
<td>8 (5)</td>
</tr>
<tr>
<td></td>
<td>Modelling</td>
<td>0</td>
</tr>
<tr>
<td>Reports/analysis</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Training/maintenance</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Total man-days</strong></td>
<td></td>
<td>43</td>
</tr>
</tbody>
</table>

1) Two-veterinarian team plus field assistant and driver, twice-yearly surveys.
2) Two one-veterinarian teams, plus field assistants and drivers, annual survey for rinderpest and twice-yearly for FMD.
3) Most of field work done by field services staff; VEEU has a training and supervisory role.
4) VEEU sets up work in new districts, trains staff of field services and then acts in a supervisory role. All data processing done by VEEU.
5) All figures for Research and Development are rough estimates.

**Personnel and training requirements for the VEEU**

Assuming that each person works 20 days per month, the work detailed in Table I should occupy 2.5 people in the field and 3.5 people in the office. The veterinarians will divide their time evenly between field and office; one more veterinarian must be assigned to the Unit to cover the field work. The livestock economist is expected to work about two-thirds of the time in the office and the rest in the field, but will spend time on non-routine surveys. It is decided that four field assistants will be assigned full-time to the VEEU, and two clerks designated for office work and computer operation. For the first year, an extra clerk and two extra field assistants will be provided; the proposed new activities will be introduced gradually.
Computer training will need to be provided both for the clerical staff and the veterinarians. The livestock economist is already receiving training as part of the Master’s program; he will ultimately be responsible for the management of the computers, but will need to be initiated into the use of any specialised programs. In addition, all of the senior staff will need training in epidemiology and statistics so that they can design studies and interpret the data.

The obvious route to basic computer familiarisation would be to use local computer suppliers. Unfortunately, they are not expert in the specialist software that will be needed by the VEEU; for this it will be necessary either to send staff away or to recruit an expert with the necessary skills to run a training course. Given that basic familiarisation is an extremely small part of the total training, consistency and provision of the initial training by the same people, would seem advisable.

A decision is made to conduct the computer training in two stages. A preliminary course will be run by a consultant to check the installation of the computer and familiarise all of the VEEU staff with the basic functioning of the software they will need to start work. Over a period of two years the senior staff will be released for training overseas; during this time the consultant will return for a short visit to check that all is well. The veterinarians will be responsible for improving the skills of the clerks.

Because the Veterinary School of Utopia does not teach Epidemiology at postgraduate level, the veterinarians in the VEEU will need to be sent overseas for three to four months.

**Work load, personnel and training requirements of the CVL**

The situation of the laboratory is quite different from that of the VEEU in that it is a well-established unit.

Very detailed records on procedures and results of tests carried out are kept by each section. This part of the recording system will not be suitable for computerisation because, for one thing, most of the details are neither summarised nor even referred to on a routine basis and, for another, the logistics of making a computer available to the same lab staff who currently keep the paper records are impossible.

There are, however, certain parts of the records which are regularly required for consultation and summary, including samples submitted, names (although not details) of tests carried out, major test results (positive for brucellosis, negative for rinderpest) and diagnoses. These records will be very well-suited for computerisation. At present the lab submits quarterly reports to the DVS, but a proposal for monthly reports (so far resisted for reasons of time) has been made. The Director of the CVL estimates that, at present, compiling and typing each report take each of the heads of section, with some small assistance from technicians, about a week, and the Director himself requires a further two to three days: a total of approximately 28 man-days.

The visiting expert, after detailed consultation with heads of section, estimates that to enter into the computer the data extracts needed, for compilation of reports will take about two man-days per week for all sections. Printing of reports will take about two days, allowing for corrections. The total time for each quarterly report will, therefore, amount to approximately 22 man-days. If monthly reports are needed, the time taken per quarter will only increase to about 28 man-days; only report printing time, rather than extra data entries, will be required.
The above estimates make clear that ultimately no more time will be consumed with the introduction of computerisation and, in the end, there may even be a saving of time. Initially, however, the systems will need to be run in parallel, probably for a period of two reports. This means that 22 extra man-days a month will need to be found.

Fortunately, a young laboratory assistant, recently arrived and not yet fully employed, seems bright and interested and the decision is made to train him in data processing. He will collect data from each section and do the bulk of the keyboard data entry. The computer work will be supervised by the head of Bacteriology, who has an interest in computers and whose work schedule is fairly steady so that he will be able to allocate specific periods each week to the computer work. When the system is well-established, one person from each section will be trained and made responsible for transferring the data from that section onto forms, and perhaps even for computer data entry.

Computer training will be necessary for both the head of Bacteriology and the laboratory assistant who will be entering data. Neither can be spared for overseas training, so they will both attend the initial familiarisation course with the VEEU staff and will, in addition, receive a week of specialist training in software appropriate for the laboratory data. They will need two further training sessions within the first year of operation of the system.

The combined training schedule for the VEEU and the laboratory is summarised in Table II.

**TABLE II**

*Computer training schedule for VEEU and laboratory*

Activities are shown in the order in which they should take place and are expected to be completed within two years

<table>
<thead>
<tr>
<th>Activity</th>
<th>Staff involved</th>
<th>Location</th>
<th>Time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarisation</td>
<td>All staff</td>
<td>Utopia</td>
<td>1</td>
</tr>
<tr>
<td>Initial training</td>
<td>VEEU staff</td>
<td>Utopia</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Lab staff</td>
<td>Utopia</td>
<td>1</td>
</tr>
<tr>
<td>Specialised training</td>
<td>VEEU head</td>
<td>Overseas</td>
<td>6</td>
</tr>
<tr>
<td>Follow-up 1</td>
<td>VEEU staff</td>
<td>Utopia</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lab staff</td>
<td>Utopia</td>
<td>1</td>
</tr>
<tr>
<td>Follow-up 2</td>
<td>VEEU staff</td>
<td>Utopia</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lab staff</td>
<td>Utopia</td>
<td>1</td>
</tr>
<tr>
<td>Specialised training</td>
<td>Economist</td>
<td>Overseas</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>– Veterinarian 1</td>
<td>Overseas</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>– Veterinarian 2</td>
<td>Overseas</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

In addition to the computer training, each of the 4 senior staff will need training in epidemiology, and the veterinarians in statistics.
Training for the staff of the Northtown laboratory is not considered at this stage, as the staff of the Veterinary Service are expected to provide such training. This will take time but will require no carefully planned schedule or leave of absence.

**SPECIFICATION OF THE COMPUTER SYSTEM**

**Software**

This is perhaps the most crucial part of the specification and should always be discussed before choosing the computer.

In order to specify suitable programs it is essential to know what types of data processing will be done. The information system of the Veterinary Service in Utopia will need to:

- **a)** store data from:
  - surveys of clinical disease (rinderpest and FMD)
  - sero-surveys (rinderpest and FMD)
  - dipwash analysis
  - health and productivity monitoring
  - laboratory submissions and tests;

- **b)** produce summary statistics of the above data on a regular basis to be used in reports;

- **c)** carry out statistical analysis beyond what is required for routine reports to determine relationships between health and productivity;

- **d)** store and analyse data from trials;

- **e)** produce maps of disease distribution;

- **f)** carry out economic calculations related to health and productivity data;

- **g)** run simulation models;

- **h)** attach, if needed, computers to such laboratory instruments as ELISA readers so that results can be stored directly in the computer without the need for manual entry.

Most of the data management requirements listed here fall within the capabilities of four standard types of program; namely, the database, the spreadsheet, the specialised statistical package and the word processor.

Categories a) and b) will best be handled by a **database management program**. This type of program is very good at storing large quantities of data and allows sorting of data, searching the database for entries which fulfil particular criteria and printing selections of the data. A good database should also allow calculations to be made on the data. These will include transformations of data (adding values together, multiplying them, allowing continuous data to be put into groups) and calculation of statistics (means, totals, standard errors, contingency tables, t-tests, etc.) and
production of summary tables (e.g. how many times each diagnosis was made during 1988). It should also allow non-routine reports to be designed by the operator.

For data which will be collected on a routine basis, particularly if data entry is to be done by an operator who did not actually record the data, a customised data entry system is very useful. This normally includes a screen which resembles the field record forms, as well as some error-checking facilities to reduce typographical errors (e.g., to verify that figures are within a sensible range, that a date of sale or death entered for an animal does not precede its reported birth date, that only permitted codes are entered for test results). If regular reports are to be produced, a set of customised output forms and a very simple routine for producing them should be established for convenience.

Both of the above require a **customised database system**, produced by programming around a standard database. Many databases have a programming facility which makes this possible. While it is easier to use a database programming language than to program from scratch in a language such as Pascal or BASIC, expertise and a very good knowledge of the database are still required.

In the case of the VEEU and the laboratory, customisation of databases will be a serious consideration. In particular, the production and health monitoring carried out by the VEEU and the management of laboratory data lend themselves to customisation of a database. Choosing a database which will support the necessary programming work will be important, but even more crucial is finding a programmer with the computer skills, understanding of the work of the Veterinary Services and the ability to support the Veterinary Services staff while the system is being established. Choice of the programmer or programming team will be paramount; choice of the database will follow naturally from their experience and preference.

Category c) work may also fall within the province of a database. If more advanced statistics are required than those which can be handled by a database, a specialised **statistical program** into which data can be transferred may be needed. Such programs, however, because they are generally expensive and require a thorough understanding of statistics for proper use, should only be used in consultation with a statistician. Category d) may benefit from a statistical package. For some types of analysis, small and inexpensive statistical programs are available which specialise in particular types of calculation. If the person running the trials has experience of a package of this type, he may prefer to keep using it.

So many programs are available for survey and trials work that building up a very large library is easy. Unfortunately, every program has its own internal logic and set of commands, and each new program has to be learnt. There is a clear limit to the number of programs that one operator can thoroughly understand. For the VEEU to acquire such a number of programs that none is fully used by the operators will be self-defeating. An additional consideration is the fact that, although data can usually be passed from one program to another, this is not always a straightforward process. In the case of the VEEU, none of the potential computer operators has done analysis on micro-computers and what types of analysis will be needed is not initially clear. It will be more sensible to work with a database initially and later to find a good statistical package if one is needed.
Category e) will need a mapping program. Such programs vary enormously in capability, complexity and cost. The most sophisticated are geographical information systems which combine a database with the ability to draw maps, shade in areas according to certain criteria, plot distributions of observations and even produce contours from a range of readings at different points. They require very powerful computers, are expensive and difficult to learn. The data generated by the Veterinary Service are unlikely to be of sufficiently high quality to justify such a system. Much further down the scale are programs which will shade in areas of a pre-drawn map according to observations entered into a very simple database. An alternative to the latter is a graphics program, which allows the user to “draw” the points or shaded areas directly onto a computerised map. The disadvantage of this is that maps are not connected to a database and are therefore not automatically updated. Whichever type of program is used, maps will have to be digitised; that is, the co-ordinates of lines and points will need to be entered into a computer file. Digitised maps are commercially available for a few countries, but if the computer files for an area cannot be bought they can be created, either commercially or by using specialised hardware.

Category f) will benefit from the use of a spreadsheet. This is a type of program, initially developed for financial work, that specialises in the sorts of calculations used in budgets and economic appraisals. Good spreadsheets will also allow graphs of their data to be plotted and will produce high quality printouts which can be included in reports.

All of the reports produced will benefit from the use of a word-processing program. Modern word processors offer not only the capability of storing and editing large reports but also very advanced facilities for printing documents, so that it is possible to produce work of a quality similar to commercially typeset documents. A more advanced type of word processor, known as a desktop publisher, offers almost unlimited possibilities for defining page layout and the appearance of printed characters; it is much more difficult to use, however, and in general is only appropriate for organisations producing a great deal of educational and publicity material.

Category g) will require the use of specially programmed models if they are available; if not, they will need to be written with a programming language, a spreadsheet, or the programming facility of a database or advanced statistical package.

The choice of software for the veterinary services can be summarised in Table III. Customisation of the databases will require outside help and will therefore need to be done in stages. Under ideal circumstances, customisation should be considered if time is not later to be wasted in reorganising the data. As an example, the rough plan of the work needed to customise the VEEU health and production database is shown in Table IV. The programming team will also assist in the analysis of data collected over three to four years, with the Veterinary Services staff gradually taking over more and more of the work as they acquire the necessary skills.

The plan shown in Table IV is fairly optimistic. Any problems in the field work, or misunderstandings during data-entry, will mean that more interim stages will need to be added.
TABLE III

Software for the veterinary services

<table>
<thead>
<tr>
<th>Computing activity</th>
<th>Type of software</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical disease surveys</td>
<td>Database</td>
<td>Programming needed to customise the database</td>
</tr>
<tr>
<td>Sero-surveys</td>
<td>Database</td>
<td>For all of the above it may be necessary to provide a specialised statistical package, but this can only be determined by experience</td>
</tr>
<tr>
<td>Diptank readings</td>
<td>Database</td>
<td></td>
</tr>
<tr>
<td>Health and productivity monitoring</td>
<td>Database</td>
<td></td>
</tr>
<tr>
<td>Trials data</td>
<td>Database</td>
<td></td>
</tr>
<tr>
<td>Laboratory data management</td>
<td>Database</td>
<td>Programming needed to customise the database</td>
</tr>
<tr>
<td>Maps of disease distribution</td>
<td>Mapping program</td>
<td>Cheap program; initially not a geographical information system</td>
</tr>
<tr>
<td>Economic calculations</td>
<td>Spreadsheet</td>
<td></td>
</tr>
<tr>
<td>Simulation models</td>
<td>Specially written models</td>
<td>If not available they will need to be written from scratch; possibly using a spreadsheet, more likely a programming language</td>
</tr>
<tr>
<td>Report writing</td>
<td>Word processor</td>
<td></td>
</tr>
</tbody>
</table>

The number of computers

The work detailed in Table I is expected to employ two computers full time (39 days per man-month). Some word-processing time is included in the time allocated for reports, but there will certainly be extra word-processing and administrative work not included in the original plan. To accommodate the work load, the VEEU will require a minimum of two, ideally three, computers.

The lab has a smaller requirement for data processing; even allowing for some unplanned use, one computer should be sufficient. The director of the lab accepts this but prefers two smaller, cheaper computers to one more expensive machine, as he anticipates a need for administrative data processing. At this stage it is difficult to justify the purchase of two computers for the laboratory except for reasons of security; if one breaks down, the other can carry on. The head of the VEEU suggests that, as all the testing of sero-survey results will be done at the lab, perhaps the database for sero-surveys could also be held there. The VEEU will send one of its members to the lab on a regular basis to run the sero-survey database and, at the same time, to try to solve any problems that the laboratory staff are having with their computer work.

There is no real need to specify the Northtown laboratory computer since it is likely to be at least 18 months before it is required; however, the DVS intends to approach the Ministry of Planning and an outside donor for funds and considers it prudent to present a complete budget.
TABLE IV

Duration of inputs for customisation of database and analysis of data

<table>
<thead>
<tr>
<th>Activity</th>
<th>People involved</th>
<th>Time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production and health monitoring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment of database structure</td>
<td>Programmer with</td>
<td>2</td>
</tr>
<tr>
<td>Provision of guidelines for operators</td>
<td>VEEU staff</td>
<td>20</td>
</tr>
<tr>
<td>Data entry</td>
<td>VEEU staff</td>
<td>2</td>
</tr>
<tr>
<td>Correction and analysis of data</td>
<td>Programmer with</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>VEEU staff</td>
<td>26</td>
</tr>
<tr>
<td>Data entry</td>
<td>VEEU staff</td>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Data entry continues throughout year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correction and analysis of data</td>
<td>Programmer with</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>VEEU staff</td>
<td>4</td>
</tr>
<tr>
<td>Customisation of data entry screens</td>
<td>Programmer with</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>VEEU staff</td>
<td></td>
</tr>
<tr>
<td>Field testing – 1</td>
<td>VEEU staff</td>
<td>1</td>
</tr>
<tr>
<td>Adjustments to screens</td>
<td>Programmer</td>
<td>2</td>
</tr>
<tr>
<td>Customisation of reports</td>
<td>Programmer with</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>VEEU staff</td>
<td></td>
</tr>
<tr>
<td>Field testing – 2</td>
<td>VEEU staff</td>
<td>1</td>
</tr>
<tr>
<td>Adjustments to reports</td>
<td>Programmer</td>
<td>1</td>
</tr>
<tr>
<td>Production of a manual</td>
<td>Programmer</td>
<td></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of data/drawing up of guidelines for ad hoc analysis</td>
<td>Programmer with</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>VEEU staff</td>
<td></td>
</tr>
</tbody>
</table>

The make of computers and printers

To ease the problems of training and maintenance, all systems are to have very similar component parts and only a limited range of manufacturers will be used. There is an IBM agent in the capital; although new, he appears to have a good supply of spare parts. He also sells Epson printers and several cheaper, but less robust, makes. There is also another computer supplier who sells less well-known brands very cheaply. At first the cheaper hardware is very tempting because it might be possible to buy more, or to spend the extra money on more software. In making the decision, three factors are considered very carefully; namely, robustness of hardware, the speed with which it can be repaired and compatibility with software.

The cheaper brands offered in Bigtown do not include any from well-established manufacturers with a reputation for quality, and the decision to buy the more expensive and robust brands is clearly indicated. An additional consideration is that
the more expensive machines will be compatible with all of the software that the Veterinary Department is likely to use. The question of compatibility of computers with software, which needed to be examined very carefully even two or three years ago, is no longer a real issue, as most makes are now IBM compatible. The compatibility of printers with word-processing and graphics software is still an important factor, as setting up software to communicate with a printer can cause a great deal of frustration.

The members of the working group are also encouraged to see all the available makes of computer and compare the keyboards. Although none of the party is an experienced typist, the high quality of the IBM keyboard is apparent. This may seem like a minor factor in the choice of a computer but is very important for the operators when they are putting in data.

The technical specification of the computers

A micro-computer, of whatever make and model, always contains certain basic components. The Central Processing Unit (CPU) is a silicon chip, etched with circuits, which does all of the calculations and organisation of data. For the types of data processing discussed here, the micro-computer must be IBM compatible and will therefore contain a CPU made by Intel. Several models of Intel CPU are available, including the 8088, 8086, 80286, 80386sx and 80386, listed in order from the slowest to the fastest. The CPU may be supported by a mathematical co-processor which calculates very quickly and is connected to a range of silicon chips which controls the other components of the computer.

The CPU needs working memory (Random Access Memory, or RAM), into which can be loaded (as required) the programs that give it instructions and the data on which it is to work. RAM, held in the circuits of silicon chips, can vary in size. The unit of memory is the kilobyte (approximately 1,000 characters) or the megabyte (approximately 1 million characters). The smallest standard memory normally supplied on computers for office use is 640 kilobytes.

Programs and data are stored permanently (with allowance for the fragility of the media) on a hard disk, held in the computer, with security copies on removable floppy disks or on tape. The unit of storage is the kilobyte or megabyte, with hard disks ranging from 10 megabytes to over 100 megabytes and floppy disks having a capacity of 360 or 720 kilobytes, 1.2 or 1.44 megabytes, depending on the technology of the disk drive in which they are used. To put this into perspective, a medium-sized PhD thesis or 1,500-2,000 survey records can be stored on a floppy disk of 720 kilobytes. Disks may be of two different physical sizes. Older models of computer and new copies of older machines have 5.25-inch floppy drives, which take relatively fragile disks of low capacity. The newer, 3.5-inch drives hold disks with a more robust construction of 720 kilobytes or 1.44 megabytes.

The important considerations in specifying a system are:

- the speed of the CPU
- the storage capacity
- the medium on which data will be backed up
- the size of the working memory (RAM)
the resolution of the screen

requirements to connect the computer to other equipment, such as a printer, a plotter, laboratory instruments, or to receive data from a data logger.

Three major types of data processing can be identified in the work of the Veterinary Services: database work, spreadsheet work and word processing.

The management of databases, i.e. large collections of data, will occupy a major part of the data-processing time. The handling of disease surveys, laboratory data and health and production monitoring will demand a large storage capacity and benefit from a fast CPU, although a large RAM is not necessary.

A rough estimate of the size of the databases for the VEEU work indicates that two computers each, with a storage capacity of 30 to 40 megabytes, will hold data of four to five years, accessible at all times. A third computer for administrative work need not have such a large storage capacity. As time goes on, older data will need to be “archived”; that is, copied onto floppy disks and removed from the hard disk. If needed, the archived data can be reloaded onto the hard disk but will no longer be continuously accessible. The laboratory database is not expected to be as large and should fit onto a 20- to 30-megabyte disk; the sero-survey database will similarly fit onto a 20-Mb disk and leave room for some other work, such as word processing.

Modelling and economic calculations, which will be done on spreadsheets or by using specially written models, do not need much storage space; they do, however, benefit from a fast processor speed, or from a co-processor and a large RAM. Both are expensive, but the cost of a reasonably fast processor can be justified in terms of the saving of professional time and frustration.

Operator comfort is paramount when word processing, and this depends greatly on the quality of the keyboard and the resolution of the screen. Keyboard feel is largely a question of personal preference, but a keyboard with a positive feel and keys that respond to even typing pressure and do not stick is generally both easier to use and more durable. The keyboard is normally dependent on the make of computer, however, and is not a matter of choice. The resolution of the screen depends on the density of dots of light (pixels); the higher the resolution, the greater the density of dots and the smoother the outlines of characters and lines. Smooth, continuous characters are easy to read; the “dotty” characters on low resolution screens cause more eyestrain. Several formats are available, of which the most common at the time of writing are, in order of quality, MCGA and VGA. An older format of good quality, Hercules, has a very high resolution but is not supported by all modern programs. Screens are available in monochrome (shades of grey, blue, green or brown depending on the make of computer) or colour. Colour screens are generally more expensive, but they can be very impressive for spreadsheet work and graphics.

The visiting expert suggests that a suitable configuration for the two main computers of the VEEU would be the IBM PS/2 Model 50z. Under other circumstances, machines from other manufacturers offering similar quality, reliability and specifications would be equally acceptable. The PS/2 Model 50z has:

- an Intel 80286 CPU, in the middle of the range for processing speed. The next appreciably faster CPU, the 80386, is much more expensive at the time of writing, although the price should drop considerably by 1991;
— a working memory (RAM) of 1 megabyte, of which 640 kb are available to programs. The minimum requirement to run the programs that the Veterinary Service will need is 640 kb. The work of the economist may require larger memory which will be built into the budget but not initially purchased;

— a 60-megabyte hard disk;

— a high density 3.5-inch floppy disk drive capable of reading and writing to disks with a capacity of 1.44 mb or 720 kb;

— a VGA monitor. This is a screen of very high resolution, suitable for graphics and capable of producing high quality text. A monochrome screen will be sufficient for the work of the VEEU;

— a parallel port suitable for communicating with most printers and a serial (RS232) port through which the computer can, if necessary, be connected with laboratory instruments.

For the VEEU administrative computer and the CVL the suggested configuration is the IBM PS/2 Model 30/286, which has the following specification:

— an 80286 processor
— 640 kilobytes of RAM
— a 30-megabyte hard disk
— a 3.5-inch floppy drive capable of reading and writing to disks of 720 kb
— an MCGA screen, which has a lower resolution for graphics than VGA but still produces very high quality text

— a parallel port and a serial port.

The combination of models will involve slightly more work in setting up the computers in the two units, but there will be no more difficulty in maintaining them. If necessary, moving the data on floppy disks between the models will be possible.

For the Northtown laboratory, which is several hours drive from the capital and subject to power cuts, a portable computer is suggested. The advantage of this format is that many have an internal battery which, when fully charged, will allow work of two to four hours, depending on the make and model. Even when it runs from the mains, a small transformer is needed to change the power from AC to DC; this acts as a barrier between the computer and the vagaries of the power supply. If the computer needs repair, it can be easily transported to the capital. There are only two drawbacks to this type of machine: that the screen is normally smaller, dimmer and more tiring to use than that of a desktop computer and that, being portable, it is also easy to steal.

The cost of a typical machine can be added to the budget, but there is no need to make a detailed specification at this stage. Because portables, though robust, do sometimes break down, it is advisable to have two machines. The computers are expected to have a 20-megabyte hard disk, a floppy drive and at least 640 kilobytes of RAM. The inclusion of fast processors will not be essential; as they are not to be purchased for a year in any case, the CPU is expected to be the 80286 model. The choice of machines with backlit screens is important. Portable computers have
flat screens; in all but the most expensive models, these are liquid crystal displays (LCD) (unlike the monitors of desktop computers, which are cathode ray tubes). An LCD screen with no backlighting can only be used with a good quality overhead light, but one with backlighting can be used even in the dark. The resolution of portable screens is quite variable; those made with “supertwist” technology, however, can be expected to offer a good resolution. The highest quality of flat screen is the gas plasma display, which consumes a great deal of power. Portables with a gas plasma display either have more than one battery, which makes them very heavy, or run only on mains power. The weight of the computer is a major consideration if it is to be carried long distances by hand, and newer models are becoming smaller and lighter; the smaller machines, however, tend to be more expensive.

Specification of printers

As they will be used to produce reports and must be capable of producing high quality print, each computer is to have an attached printer. The possibility of a laser printer is discussed at some length. Although it uses essentially the same printing method as a photocopier (namely, the application of powdered ink to paper with a charged surface and then heating to fuse the ink), this is a comparatively new technology for printers. The print produced is of very high quality, comparable to that in published books, and the printers are practically silent. There has been an enormous growth in the number of makes of laser printers; consequently, prices have dropped to a level that makes sharing them between two or three computers in an office a sensible proposition. They also appear to resist the conditions in tropical countries. They do, however, take a great deal of electrical power, an important consideration for a computer system backed up by any sort of power conditioning. For the VEEU, a laser printer would be feasible; for the laboratory, it would be somewhat too expensive. In addition, no agent in the capital has any experience of laser printers. The working committee therefore recommends dot matrix impact printers. As there is an Epson agent in Bigtown, the Epson LQ range of printers is chosen. These give a choice of letter or draft quality print and several font sizes and can produce bold print, underlining and graphics, all of which will be very useful in producing attractive reports.

Some of the work done on the computers, in particular any ad hoc analysis of data, will benefit from wide-carriage printers capable of taking 13.2-inch paper. Other work, notably report writing, will need only the cheaper, narrow-carriage printers taking 8.5-inch paper. To allow for all anticipated types of work and at the same time keep the budget within reasonable bounds, the decision is made to provide one wide-carriage and one narrow-carriage printer for each site in Bigtown and a narrow-carriage printer for Northtown.

Power supply

The country is subject to power cuts, even in the capital; more seriously for the computer, there are fluctuations in frequency and voltage of the power supply. The laboratory has a standby generator and the more sensitive instruments are attached to power conditioners. For the computer, the visiting expert recommends Uninterruptible Power Supply (UPS) Units, which will intercept power from the mains and supply the computer from a battery and inverter. He explains that it is important to have an “online” system, which always provides battery output, rather than an “offline” system which only switches to battery output in the event of a power cut.
The latter gives good protection against blackouts, but none at all against short duration high voltage fluctuations ("spikes") which can damage chips, or against prolonged periods of low voltage ("brownouts") which can cause more damage to the computer system than a blackout. For each computer plus printer, a 600 VA UPS system is specified. Worthy of note is that, had a laser printer been chosen, a UPS of twice the capacity would have been required.

Computer room

The climate is generally warm and, during dry periods, the temperature can reach 35 degrees C. Bigtown is in the wettest region of the country. During the long, wet season (there are two but the first only lasts for two or three weeks) humidity can surpass 80%. This is more of a potential problem than the heat. Computers can operate at the same temperatures at which people are able to do office work, provided the UPS unit has good air circulation and is not allowed to overheat. Damp air, on the other hand, can cause major problems: condensation on electronic components causes unpredictable errors in the computer and floppy disks grow mould in a damp environment. The solution in this case will be to site the computers in air-conditioned offices and keep floppy disks in plastic boxes with silica gel.

In this region, fortunately, there is no real problem with dust, which can damage disks and drives. In a country where there is a great deal of dust it is particularly important to keep disks in boxes, use air conditioning where practical and keep the door of the computer room closed. Air-conditioned rooms should be accessed through double doors to avoid ingress of warm, damp air onto cold machine surfaces.

If the operators are to use the computers with any enthusiasm, comfortable working conditions (adequate table space, chairs of the correct height with upright backs, lighting adjusted so that it is neither behind the screens nor shining directly on them, and storage for consumables and printout) must be provided.

Consumables

Although such items as paper, floppy disks, printer ribbons, plastic boxes for disks, silica gel, etc., can be obtained in the capital, they are very expensive and sometimes in short supply. The working group decides that a supply sufficient for one year of operation will be purchased with the computers.

The final specification and budget for the Veterinary Services computer systems is shown in Table V.

INSTALLING THE SYSTEM AND INITIATING TRAINING

To describe the data-processing activities of the Veterinary Services over several years could be a very prolonged process. The problems and setbacks make the most interesting reading, so only these will be chronicled.

A donor agrees fairly quickly to provide funds. A very detailed specification of equipment, down to makes and models and software producers, is drawn up. At first, only one computer will be provided for each site and the rest of the hardware after
### TABLE V

**Veterinary services computer systems: specification**

Costs are approximate FOB costs in Britain in mid-1990, converted to US$

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IBM PS/2 Model 50z plus monochrome VGA screen and keyboard</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>IBM PS/2 Model 30/286</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Portable computer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Epson LQ 1050</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Epson LQ 500</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>500 VA online UPS</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Total cost of hardware</strong></td>
<td></td>
<td>27,500</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The “quantities” of software refer to the number of computers for which the programs are licensed. Depending on the program this may involve several copies or a multi-user license</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Wordprocessor</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other software (e.g., for mapping)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost of software</strong></td>
<td></td>
<td>5,500</td>
</tr>
<tr>
<td><strong>Total cost of systems</strong></td>
<td></td>
<td>33,000</td>
</tr>
<tr>
<td><strong>Consumable items for a year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 Floppy disks</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>10 Printer ribbons</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Paper for printers, boxes</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Disk boxes with desiccant</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous items</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost of consumables</strong></td>
<td></td>
<td>2,000</td>
</tr>
</tbody>
</table>

Six to nine months. The donor insists on using standard procurement procedures and the necessary requisition orders are filled in. There is some delay in administrative procedures, but after six months the system is despatched.

The monitor and instruction manuals for one system are found to be missing on arrival; as the boxes are still sealed, it is concluded that they were never despatched. Only four boxes of floppy disks have been supplied, instead of the twenty ordered, and there has been some misunderstanding about software. Although the programs were listed in considerable detail in the specification, during the procurement other ideas have crept in and the word processor supplied is not the one ordered. This is very inconvenient, as the substitute program has a completely different set of commands and the person who will provide the training is not familiar with it. Even where the correct software has been supplied in the original packaging, it is on floppy disk and has not been installed on the hard disk.
Fortunately, a visiting expert will assist in installing the equipment and provide the first stage of basic training. The expert is able to set up all the parts of the system that have been supplied and to install and configure the programs in order to send the correct controls to the printers. Configuration of programs is a laborious process even for someone familiar with the system; it is almost impossible for inexperienced users. If equipment is ordered through a specialist procurer, it should be set up, configured and thoroughly tested before despatch, with details of the setup supplied to the users. Clearly, however, this service cannot be provided by a general procurement agency without specialised knowledge of the hardware and software.

Because of the delay in supplying equipment and the intervention of other commitments, the first visit is very short. The staff of both the VEEU and the CVL are initiated into disk management and the basic principles of a database management system. At the same time a rudimentary database is set up for the laboratory, another for the diptanks data, and the staff are trained to enter, back up, check and print data. The whole process takes about two weeks. The operators are left with many instructions but do not feel entirely confident.

A second visit is made six months later. All seems to be going well at first, but then errors and omissions begin to appear. The first indication of trouble is that the laboratory data are discovered to contain inconsistencies. Several people in the laboratory have shown interest in the computers and have been allowed to help with data-entry; unfortunately, they do not all understand the coding systems used and many very strange entries have been made. Eventually, it becomes necessary to go back through 300 sets of paper records and check each one against the computer screen. The training program is rapidly revised, with three days spent in correcting the data and emphasising the importance of careful data-entry and data-checking. This sort of error will be prevented once a customised system is in place, but until the laboratory has defined exactly what output it needs from its database, fixing the structure and customising the input will be a waste of time.

A third visit is arranged in another six months. Meanwhile, the VEEU and CVL staff have been very active and several hundred entries made. A simple database for records of clinical surveys has been added to the system so that, in total, three databases are now receiving data. During this time, the small supply of floppy disks has run out. The VEEU lacks a budget for consumable items and stationery; rather than purchasing disks locally, it decides not to back up data until new disks arrive. Several hundred entries, carefully checked and representing the work of many man-days, are not backed up and are at the mercy of the hard disk, which is the least reliable part of the computer. The visiting expert is very voluble on the subject and a rigorous backing up procedure is immediately introduced into the office routine.

The young laboratory assistant suddenly discovers an interest in the computer. He teaches himself to use a spreadsheet and a word processor and spends hours in calculating budgets and typing letters. His laboratory work suffers; whenever he is needed to run tests he is found tapping the keyboard. The head of the CVL perceives that the developing skills and interests of the young assistant will be of great benefit and relieves him of other duties so that he can concentrate on computing.

The program is now into its second year and the sero-survey for rinderpest, initially run on a small scale and analysed manually, is to be extended nationwide and analysed on computer. A set of data forms and a suitable program for storing the data have been obtained; these have been used elsewhere with some success. Discussion of the
The sampling procedure for the sero-surveys has been brief but the VEEU staff are confident that they understand what is required. One veterinarian goes to North Province to lead a field team there, the other supervises a team in the south. One of the veterinarians believes that purposive sampling is required and takes a great deal of trouble to find herds in out-of-the-way places that may not have been reached by vaccinating teams. The other chooses a random sample of herds from each of the districts in his area. The data are all entered into the computer and analysed. The results reveal that the vaccination teams in the north have not been doing their duty. A great many of the herds sampled have hardly any positive animals. The south, on the other hand, apart from a few small pockets of unprotected herds, shows a high prevalence of antibody. This is very interesting and provokes both discussion and accusations of incompetence. Only after very careful questioning is it revealed that the apparent difference can be attributed as much to the two different survey procedures as to any variation in the performance of the vaccination teams. It is an error that could occur in any survey, but is made harder to detect because of the belief that the analysis must be correct because it has been printed out by a computer.

The DVS decides that the reports he receives are both too frequent and too detailed. Producers have complained that they get no feedback in exchange for assisting the Veterinary Services. A decision is made to review the design and circulation of routine reports. Those for the DVS will be made more concise and more directly relevant to his role as a planner; time saved in this will be used to produce reports for circulation at district level and for farmers participating in regular surveys. It is also decided to introduce, on a pilot basis, the results of herd monitoring as a service to farmers to enable them to manage their herds more effectively.

CONCLUSIONS

At the end of the second year, the original working party meets again to review progress and draws up a list of important points summarising what they have learnt from their experiences in implementation.

- The exercise is not simply a matter of procuring computers; it is a question of defining the objectives and activities of the livestock information system and the role of computers within that system.

- It is preferable to start small to ensure that capabilities and ideas develop, and that investment is directed at clearly understood objectives.

- The time required for training should not be underestimated; people with natural ability should be identified and encouraged.

- Outside help is almost certainly needed to procure and establish a system. If the work pace and training are regulated to suit the abilities of the staff, the national unit will eventually become self-sustaining.

- Operating the computer is only one of the skills required. This must be combined with the ability to design and implement valid surveys, interpret data and understand what is meant by data quality.
Unless they are trained properly and can see that the computer is simply a tool, professional staff will spend far too much of their time at the keyboard.

If output from an information system is to be of value, it must be concise, timely and aimed at people who will make practical use of the information.

The needs of these end-users must be kept under constant review. Information is expensive to generate, particularly in terms of field costs, and the usual tests of cost-effectiveness should be applied.

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LES ÉTAPES DE LA MISE EN ŒUVRE D’UNE SOLUTION MICRO-INFORMATIQUE DANS LA GESTION DES INFORMATIONS ZOO-SANITAIRES. – A. McLeod et L. Tyler.


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ETAPAS DE IMPLANTACIÓN DE UNA SOLUCIÓN MICROINFORMÁTICA EN LA GESTIÓN DE INFORMACIONES ZOOSANITARIAS. – A. McLeod y L. Tyler.

Resumen: El artículo describe las etapas del diseño, la adquisición y la utilización de un sistema de informaciones zoosanitarias en microcomputadora. El caso presentado es el de la primera computarización de una unidad epidemiológica implantada por un director nacional de servicios veterinarios, pero también se comentan los problemas regionales e internacionales, así como la administración y la gestión. Los autores subrayan la necesidad de integrar las computadoras en un sistema de informaciones apropiado, creado cuidadosamente y describen los principios de la especificación de los sistemas iniciales y su desarrollo ulterior, presentando sugerencias para la adquisición y el mantenimiento del hardware y el software.

PALABRAS CLAVE: Epidemiología - Computarización - Información - Microcomputadora - Planificación - Sanidad animal.

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For further reading


