

PN-AR-838

ISNAR R39

Report to  
the Institute of Agricultural Research  
People's Democratic Republic of Ethiopia

# COMPUTER ACQUISITION AND DEVELOPMENT

The logo for ISNAR, featuring the letters 'ISNAR' in a bold, italicized, sans-serif font. The letters are black with a white outline, giving it a three-dimensional appearance.

International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on research policy, organization, and management issues, thus complementing the activities of other assistance agencies.

ISNAR has active advisory service, research, and training programs.

ISNAR is supported by a number of the members of CGIAR, an informal group of approximately 43 donors, including countries, development banks, international organizations, and foundations.

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March 1989

***ISNAR***

International Service for National Agricultural Research

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## I. INTRODUCTION

During the recent IAR-ISNAR Agricultural Research Management Workshop\*, the General Manager discussed with ISNAR staff the progress of the new IAR headquarters complex. He specifically mentioned the provision for computers - and wondered whether ISNAR could advise him on the types, quantities, and configurations which IAR should acquire.

At the conclusion of the workshop, the GM wrote to the Director General of ISNAR requesting assistance "in the study of the system needed for our programmes". He asked if ISNAR could send someone "before April...because we need advice on the floor plan of the data processing building which is under construction at this time".

ISNAR responded quickly to this request. On 8 February, it sent a telex that ISNAR was "able to send Byron Mook and Jon Sands...for about a week of consultancy...Byron and Jon...are available during the period 20 February to 4 March...The next earliest dates we can bring (them) together is early May."

On 9 February, the GM telexed back that "the wk beginning 20 Feb 89 is suitable". Mook and Sands arrived in Addis Ababa on Saturday, 18 February.

\* Debre Zeit, 23-29 January 1989.

## II. TERMS OF REFERENCE

At an introductory briefing on Sunday, 19 February, the GM said that IAR wanted advice from ISNAR on two subjects:

- (a) acquisitions (hardware and software), both for headquarters and for the research centers; and
- (b) floor plans and electrical installations to support computer use at the new IAR headquarters site.

With regard to the former, he said that the amount of money likely to be available was between US\$200,000 and US\$500,000. He wanted a draft budget which would include not only acquisitions but also service. He did not need training included since IAR had other monies for this purpose.

The GM was clear that his first priority for computer use was research. Since most research took place at the centers, he wanted ISNAR to emphasize the development of computer capacity there. The only major research activities which he foresaw at headquarters were likely to be in food science, agromet, and biometrics.

Beyond research, the GM also wanted to encourage the use of computers in management (planning, programming, monitoring, evaluation) and administration (finance, personnel, procurement/stores, property). We made the point that much of the hardware/software acquired was likely to go into performance of these latter functions - simply because of the scope of the routine jobs to be done.

Finally, the GM discussed publications (including the IAR library). Since the IAR Information Services Department already has several microcomputers, however - and since a program of further acquisition and training there is already underway - he asked ISNAR to give considerably less emphasis to this function.

### III. ACTIVITIES

During the course of the week (Monday, 20 February through Friday, 24 February), we visited the following departments, centers, and other organizations.

#### IAR Headquarters

The Office of the Deputy General Manager (Business and Development)

The Planning and Project Service

The Training and Manpower Development Service

Information Services (Documentation/Publications)

The Financial Services Department

    The General Accounts Division

    The Treasury Division

    The Budget Control and Cost Accounting Division

The Administration and Employees Services Department

    The Employment and Placement Division

    The Classification, Promotion, & Statistics Division

    The Property and General Services Division

    The Transport and Vehicle Maintenance Division

The Procurement and Supplies Services Department

    The Purchasing Division

    The Stores and Distribution Division

The Building Construction and Maintenance Services Department

#### Research Centers

Holetta

Nazreth (Conversation with Head, at IAR Headquarters)

Jimma (Conversation with Head, at IAR Headquarters)

Other Organizations

Addis Ababa University - Data Processing Center

The National Computer Center

ILCA (The International Livestock Center for Africa)

Philips - (Consulting Electricians for the new IAR Headquarters)

At IAR headquarters and in conversations with the officials of the research centers, we attempted to answer the following two related questions:

- (1) what are the major tasks being performed by the department or center;  
and
- (2) how might computers aid in the performance of those tasks?

On Saturday, 25 February, we had a final 2 1/2 hour briefing with the GM to report on the results of the week.

#### IV. MICROS VS. MINIS

The most basic issue on which the GM had asked us to make a recommendation concerned the type of hardware which IAR should buy for its new headquarters site.

Early IBRD project documents had seemed to imply a preference for a minicomputer with terminals. This apparent decision had been translated into building plans which called for a "data processing center". In his introductory briefing on Sunday, the GM had wondered about the desirability of establishing a "data processing department".

On the basis of initial visits to HQ departments, however, we rapidly became convinced that IAR should not acquire a minicomputer. Our recommendation - which we made to the GM at an interim briefing on Wednesday morning (22 February) - was that IAR should instead purchase a substantial number of microcomputers with various powers and capabilities.

We had six reasons for this recommendation (presented here in the order of importance which we attach to them).

- (1) Flexibility. IAR headquarters is responsible for performance of a wide range of jobs (management, administration, and some research). With microcomputers, it can tailor both hardware and software to the particular department/section in which a job needs to be done. Minis are much less flexible. The hardware is fixed and the available software much less varied.
- (2) Exchange of Data Between IAR Headquarters and Research Centers. Such exchange is in both directions now - and we expect it to grow significantly in the future. Scientists at the centers produce research reports which HQ publishes. Managers at both levels produce plans, budgets, and progress reports which must be shared.

An IAR using IBM-compatible micros and standard, task-specific software will have a big advantage in facilitating such exchange of information. An IAR with a mini at HQ and micros at the centers would not be nearly as efficient.

- (3) Cost. Competition in the microcomputer market is much more intense than in the one for minis. As a result, prices for comparable hardware capabilities are lower and are continually dropping. Similarly, the range of commercially-available software packages for research, management, administration, and publications for micros is much more extensive than for minis.

- (4) Service. Maintenance for micros is simpler than for minis. Technicians are more plentiful, and usually charge less. We believe that such advantages are more than likely to outweigh the fact that an IAR commitment to micros obviously means that it will have more machines to service.
- (5) Future Upgrades. An addition to a micro, to increase its capability, is easier and almost always cheaper than a comparable upgrade to a mini.
- (6) Power. A powerful micro today - such as the one we recommend for the Financial Services Department - is more powerful than a mini of 3/4 years ago.

## V. SYSTEM DESIGN

Whichever conclusion we had come to on hardware - micros or minis - a second basic issue on which the GM had asked for a recommendation concerned floor plans and electrical installations at the new headquarters site. The new HQ is actually not one structure but several. It consists of six main blocks (for Management, Administration, Finance/Audit, Training, Documentation/Publications, and Information). All but the Information block at the entrance are composed of two or more single- or double-storied buildings. All blocks are connected by covered walkways.

At a meeting on 20 February with the IAR engineer in charge of construction, we learned that no provision had been made to connect the six blocks with computer cable. Even though electrical wiring had already been installed, we understood that there was still time to lay new conduits if required.

Our judgment is that interconnection of the six blocks should be done now - and therefore that such conduits should be laid as soon as possible. We have two reasons.

- (1) Efficiency. Different departments at HQ must share information. Senior managers need access to both financial and administrative data, financial managers need personnel data, procurement managers need financial data, etc.

If IAR does indeed decide in favor of micros (as recommended), but does not install cables, support staff can at least still carry floppy disks between blocks and buildings. But as the amount of information with which IAR deals grows, we think that cable connections are an obvious and much more efficient solution. Even if IAR were to decide to acquire a mini (not recommended), terminals in offices around the HQ complex would still have to be connected to it or else staff would have to carry hardcopy between blocks and buildings.

- (2) Cost. The site is still under construction. But once buildings are finished and landscaping begun - hopefully within 4-6 months - the costs of digging ditches and breaking plaster to lay conduits are likely to be considerably higher than if the conduits were laid now.

All the above notwithstanding, we recognize that all the interconnections which we recommend will not be used immediately. The spirit of our recommendation is that of a hedge against the future. Even if only some of the interconnections are used - and those only within 10-20 years - the investment now will still have been worthwhile.

We have considered two basic types of computer cabling layouts for the HQ site.

- (1) A RING Network. In such a topology, all computers in a network are connected in one ring. All signals on the network travel all around the ring and, therefore, through each computer.
- (2) A STAR Network. In this topology, one computer in a network serves as a focal point. All computers (or terminals) in the network are connected to this focal point with individual cables.

We cannot say at this point which topology will suit IAR best 5-10-20 years from now. Our recommendations, therefore, preserve both options. The cost of this strategy is hardly more than the probable future cost of closing one of the options now.

The following specifications deal primarily with the conduit (or pipe) in which computer cable can eventually be installed. We recommend only the conduit at this time. Once the conduit is in place, cable can always be "fished" through it later with minimum disturbance to occupants of the buildings.

#### Conduit Between Blocks

We recommend that the six main blocks noted above be connected in both RING and STAR configurations. The two more distant blocks (Workshops and Stores) need be provided with a STAR connection possibility only. All conduits should be of PVC pipe with a free internal diameter of at least 10 cms.

- (1) RING Topology. The order of the connection should be Block A to D to E to B to Information to C to A. (Blocks as identified on "Site Plan Coordination Plan and Location Map", Number 91-86-AR-1).

Conduit should be laid in a manner that minimizes the total circumference of the ring.

Connection at each of the six blocks should be in a distribution box similar in size and placement to a large telephone switch box.

All pipe joints should be well-sealed to maintain waterproofing.

- (2) STAR Topology. The focal point of the star should be the Documentation/Publications Block (Computer Building). All five other main blocks - plus the Workshops and Stores blocks - should be connected to it.

Two connections in this topology are identical to those in the RING topology - i.e. the connections of the Documentation/Publications Block to its nearest neighbors (Management, Training). They do not need to be duplicated.

Again, connection at each of the blocks should be in a distribution box similar in size and placement to a large telephone switch box.

### Conduit Within Blocks

Each floor of each building within a block should have a sub-distribution box that is connected to the main block distribution box (described above).

On each floor, a perimeter conduit should connect this sub-distribution box with each office.

- (1) Connection from the main block distribution box to the sub-distribution boxes on each floor should be by a conduit of at least 2.5 cms. internal diameter. All bends should be of large radius - or, alternatively, access boxes should be provided at abrupt bends.
- (2) The perimeter conduit on each floor should be in the form of a loop leaving from and returning to the floor sub-distribution box. This conduit should have at least one access box per office; large offices may have more than one. All bends in the conduit should be of large radius - or, alternatively, access boxes should be provided at abrupt bends.

### Electrical Power Stabilizers

Much of the electronic equipment that IAR plans to install at the new HQ site is sensitive to fluctuations in line voltage. (Copiers, printing equipment, and testing equipment, as well as computers).

The installation of power stabilizers will help to protect such hardware. Such stabilizers can be installed at three different levels.

- (1) At the transformer house, to serve the entire HQ site. We understand that ILCA has adopted this approach.
- (2) At the main electrical panel for each block.
- (3) At the electrical socket in each office for each major piece of equipment.

We do not have a recommendation between these three alternatives. The first would obviously guarantee that all equipment would be protected. The final decision, however, should probably depend on cost and availability.

## VI. BASIC HARDWARE CONFIGURATIONS

Different hardware configurations are appropriate for different scientific and management functions. Described below are four configurations. We believe that IAR should acquire a limited number of each.

### Configuration No.1

Central Processing Unit:	80286	Desktop
Hard Disk:	40MB	3.5"
Floppy Drive :	3.5"	
RAM:	1Mb	
Video Adapter:	Hercules Compatible	
Math Coprocessor:	--	
Monitor:	Monochrome	
Printer:	9-Pin	80 Columns

This configuration is suitable primarily for:

- (1) management/administration at research centers; and
- (2) training at IAR headquarters.

### Configuration No.2

Central Processing Unit:	80286	Desktop
Hard Disk:	40MB	3.5"
Floppy Drive :	3.5"	
RAM:	1Mb	
Video Adapter:	VGA	
Math Coprocessor:	80287	
Monitor:	Color	
Printer:	9-Pin	132 Columns

This configuration is suitable primarily for:

- (1) statistical analysis at research centers; and
- (2) management/administration at IAR headquarters, for data of moderate size and complexity.

Configuration No.3

Central Processing Unit:	80386	Desktop/Floor
Hard Disks:	2 x 80Mb	3.5"
Floppy Drive :	3.5"	
RAM:	1Mb	
Video Adapter:	VGA	
Math Coprocessor:	80387	
Monitor:	Color	
Printer:	9-Pin	132 Columns
Tape Backup (Internal):	40Mb	Cartridge

This configuration is suitable primarily for:

- (1) management/administration at IAR headquarters, for data of large size and complexity.

Configuration No.4

Central Processing Unit:	80286	Portable
Hard Disk:	20Mb	3.5"
Floppy Drive :	3.5"	
RAM:	1Mb	
Video Adapter:	--	
Math Coprocessor:	--	
Monitor:	LCD (Backlit)	
Printer:	9-Pin	80 Columns

This configuration is suitable primarily for:

- (1) heads of departments, to be used for both (self-) training and general management.

## VII. BASIC SOFTWARE CONFIGURATIONS

Different software programs are appropriate for different scientific and management functions.

We believe that IAR should standardize on one program for each of its major applications. Such a strategy would not imply that individual scientists or managers could not use other programs for specific purposes. It would only mean that the agreed-upon programs should be used whenever communication between different parts of the organization were necessary.

One of the advantages of having a limited set of standard programs is training. For the few programs selected, IAR would be able to acquire supplementary manuals, guidebooks, on-screen tutorials, and perhaps even videotapes. Short courses could be organized. Perhaps most important, scientists and managers would be able to help each other through the initial stages of computer use.

We recommend that the following programs be considered by IAR. Version numbers listed are current. At the time at which IAR orders, later versions may be available.

- (1) For word processing. WORDPERFECT VERSION 5.0. Most of those secretaries in IAR who are doing word processing now are using WORDPERFECT. It is the biggest selling word processing program in both North America and Western Europe.

In addition, the Amharic word processing software now being developed by the National Computer Center is based on WORDPERFECT.

- (2) For spreadsheets. SUPERCALC5. SUPERCALC5 is one of the two/three largest selling spreadsheet programs. Its advantages over the industry-standard, LOTUS 1-2-3 Version 2.01., are that it is easier to use, has better graphics, and can handle more complex tasks - all while maintaining compatibility with 1-2-3 files.
- (3) For simple databases. REFLEX VERSION 1.14. This program is easy-to-use, fun, and powerful enough for most small database applications. ISNAR is using it in-house and in the development of program budgeting systems in Sri Lanka, Bangladesh, and the Sudan.
- (4) For more complex databases. PARADOX VERSION 3.0 or RBASE FOR DOS VERSION 2.1. These programs are two of the highest-rated relational database packages. They are moderately easy-to-use and, once mastered, are able to handle very large datasets. A big advantage of PARADOX for IAR is that it is able to read REFLEX files directly and is able to generate its own presentation graphics. Along with one other very comparable program, DATAEASE, PARADOX and RBASE have supplanted the previous industry-standard, DBASEIII+/IV.

- (5) For statistical analysis, SYSTAT/SYSGRAPH, SPSS, or SAS. Each has advantages and disadvantages. We recommend that IAR make its own evaluation.
  - (a) SYSTAT/SYSGRAPH. The highest-rated statistics program in terms of ease-of-use and graphics capability. We have not been able to find any users in Ethiopia.
  - (b) SPSS. An industry-standard. Full-featured and well-documented. At the same time, expensive and copy-protected.
  - (c) SAS. Lower-rated, but the main statistics program used by ILCA.

An additional possibility is MSTAT. This program has been written specifically for agricultural research. Its advantages are its "custom-made" approach and the fact that it is already in use at some centers in IAR. Its disadvantage is that it is not as full-featured as the three packages noted above. MSTAT offers basic designs and analytical routines for field experiments which can be most useful to experienced researchers. In the hands of more inexperienced scientists, however, the danger is that it may lead to choices of designs and routines simply because they are there. As with all the packages indicated, therefore, good biometric advice is a necessary complement.

- (6) For accounting. There are many general accounting programs on the market. Most of them can be easily adapted to suit IAR's internal financial management requirements. A key requirement is the ability to read and write datafiles for other software used at IAR.

ISNAR recommends ACCPAC PLUS, the highest-rated general accounting program. ACCPAC PLUS can run on a network and can read and write many other datafile formats (including SUPERCALC5). It is modular - that is, it consists of a number of different components, each of which can be ordered and used separately. ISNAR believes that four such modules would be most useful for IAR: General Ledger, Accounts Receivable, Accounts Payable, and Inventory Control and Analysis.

- (7) For inventory and stock control. A high-capacity database like RBASE FOR DOS is suitable, though an off-the-shelf program specifically designed for inventory management might be preferable. The "Inventory Control and Analysis" module of ACCPAC PLUS (described above) is likely to be appropriate.

- (8) Microcomputer Management Utilities.

- (a) NORTON UTILITIES, Advanced Edition. A program which is usually able to "unerase" files which have been mistakenly deleted from disk. Also useful for hard disk organization and the speeding-up of disk operation.
- (b) FASTBACK PLUS VERSION 2.01. A program which significantly decreases the time required to create a backup copy of data on a large harddisk.
- (c) SPINRITE VERSION 1.2. A program which is able to identify bad sectors on a hard disk and even (in most cases) to repair them.

- (d) BROOKLYN BRIDGE VERSION 2.0. A program which allows files to be transferred between computers. Most useful when one computer has a 5¼" floppy drive and another has a 3½" drive.

It is obviously not necessary for each new machine to be equipped with each program. As an economy measure, we have put together the following five software configurations, one of which should be purchased to go with (almost) every machine.

Configuration No.1 (For General Management):

WORDPERFECT  
SUPERCALC5  
REFLEX

Configuration No.2 (For Specialized Management):

WORDPERFECT  
SUPERCALC5  
REFLEX  
PARADOX VERSION 3.0 or  
RBASE FOR DOS

Configuration No.3 (For Research):

SUPERCALC5  
REFLEX  
PARADOX VERSION 3.0 or  
RBASE FOR DOS  
SYSTAT/SYSGRAPH, SPSS, or  
SAS

Configuration No.4 (For Accounts):

WORDPERFECT  
SUPERCALC5  
REFLEX  
PARADOX VERSION 3.0 or  
RBASE FOR DOS  
ACCPAC PLUS  
    . General Ledger  
    . Accounts Receivable  
    . Accounts Payable  
    . Inventory Control and  
      Analysis  
NORTON UTILITIES  
FASTBACK

Configuration No.5 (For Service):

WORDPERFECT  
SUPERCALC5  
REFLEX  
PARADOX VERSION 3.0 or  
RBASE FOR DOS  
NORTON UTILITIES  
FASTBACK  
SPINRITE  
BROOKLYN BRIDGE

VIII. DEPLOYMENT

HARDWARE DEPLOYMENT -- Numbers

LOCATION vs. FUNCTION

		FUNCTION			
		Management	Research	Training	ALL
		-----	-----	-----	-----
L O C A T I O N	Centers	11	24	0	35
	Headquarters	22	3	6	31
	ALL	33	27	6	66

HARDWARE DEPLOYMENT -- Percents

LOCATION vs. FUNCTION

		FUNCTION			
		Management	Research	Training	ALL
		-----	-----	-----	-----
L O C A T I O N	Centers	17	36	0	53
	Headquarters	33	5	9	47
	ALL	50	41	9	100

## VIII. DEPLOYMENT OF HARDWARE/SOFTWARE - BY DEPARTMENT/CENTER

LOCATION	FUNCTION	CONFIGURATION HARD/SOFT	DEPARTMENT/CENTER	OFFICE	HARDWARE COSTS	SOFTWARE COSTS
Center	Management	1 1	Adet	Management		
Center	Research	2	Adet	Research	2437	638
Center	Research	2 3	Adet	Research	3204	
				SUBTOTAL	8845	1548
						2186
Center	Management	1 1	Awassa	Management		
Center	Research	2	Awassa	Research	2437	638
Center	Research	2 3	Awassa	Research	3204	
				SUBTOTAL	8845	1548
						2186
Center	Management	1 1	Bako	Management		
Center	Research	2	Bako	Research	2437	638
Center	Research	2 3	Bako	Research	3204	
Center	Research	2 3	Bako	Research	3204	1548
				SUBTOTAL	12049	1548
						3734
Center	Management	1 1	Holetta	Management		
Center	Research	2	Holetta	Research	2437	638
Center	Research	2 3	Holetta	Research	3204	
Center	Research	2 3	Holetta	Research	3204	1548
				SUBTOTAL	12049	1548
						3734
Center	Management	1 1	Jimma	Management		
Center	Research	2	Jimma	Research	2437	638
Center	Research	2 3	Jimma	Research	3204	
Center	Research	2 3	Jimma	Research	3204	1548
				SUBTOTAL	12049	1548
						3734

DEPLOYMENT OF HARDWARE/SOFTWARE - BY DEPARTMENT/CENTER - continued

LOCATION	FUNCTION	CONFIGURATION HARD/SOFT	DEPARTMENT/CENTER	OFFICE	HARDWARE COSTS	SOFTWARE COSTS	
Center	Management	1 1	Kulumsa	Management	2437	638	
Center	Research	2	Kulumsa	Research	3204		
Center	Research	2 3	Kulumsa	Research	3204	1548	
				SUBTOTAL	Kulumsa	8845	2186
Center	Management	1 1	Melka werer	Management	2437	638	
Center	Research	2	Melka werer	Research	3204		
Center	Research	2 3	Melka werer	Research	3204	1548	
				SUBTOTAL	Melka werer	8845	2186
Center	Management	1 1	Nazreth	Management	2437	638	
Center	Research	2	Nazreth	Research	3204		
Center	Research	2 3	Nazreth	Research	3204	1548	
Center	Research	2 3	Nazreth	Research	3204	1548	
				SUBTOTAL	Nazreth	12049	3734
Center	Management	1 1	Sheno	Management	2437	638	
Center	Research	2 3	Sheno	Research	3204	1548	
				SUBTOTAL	Sheno	5641	2186
Center	Management	1 1	Sinana	Management	2437	638	
Center	Research	2	Sinana	Research	3204		
Center	Research	2 3	Sinana	Research	3204	1548	
				SUBTOTAL	Sinana	8845	2186
Center	Management	1 1	Sirinka	Management	2437	638	
Center	Research	2 3	Sirinka	Research	3204	1548	
				SUBTOTAL	Sirinka	5641	2186

DEPLOYMENT OF HARDWARE/SOFTWARE - BY DEPARTMENT/CENTER - continued

LOCATION	FUNCTION	CONFIGURATION HARD/SOFT	DEPARTMENT/CENTER	OFFICE	HARDWARE COSTS	SOFTWARE COSTS
Headquarters	Management	2 2	Administration	Transport		
Headquarters	Management	2 2	Administration	Personnel	3204	1087
Headquarters	Management	2 2	Administration	Property	3204	1087
Headquarters	Management	4 1	Administration	Head/Secretary	2900	638
				SUBTOTAL Administration	12512	3899
Headquarters	Research	2 3	Agromet	Head/Secretary	3204	1548
				SUBTOTAL Agromet	3204	1548
Headquarters	Research	2 3	Biometrics	Head/Secretary	3204	1548
				SUBTOTAL Biometrics	3204	1548
Headquarters	Training	1	Computer	Training	2437	
Headquarters	Training	1	Computer	Training	2437	
Headquarters	Training	1 5	Computer	Training	2437	1400
Headquarters	Training	2 5	Computer	Training	3204	1400
Headquarters	Training	2 5	Computer	Training	3204	1400
Headquarters	Training	3 5	Computer	Training	5523	1400
				SUBTOTAL Computer	19242	5600
Headquarters	Management	2 2	Construction	Construct/Maintenance	3204	1087
Headquarters	Management	4 1	Construction	Head/Secretary	2900	638
				SUBTOTAL Construction	6104	1725
Headquarters	Management	2 1	DGM (Business)	DGM/Secretary	3204	638
				SUBTOTAL DGM (Business)	3204	638
Headquarters	Management	2 1	DGM (Res Supp)	DGM/Secretary	3204	638
				SUBTOTAL DGM (Res Supp)	3204	638

DEPLOYMENT OF HARDWARE/SOFTWARE - BY DEPARTMENT/CENTER - continued

LOCATION	FUNCTION	CONFIGURATION HARD/SOFT	DEPARTMENT/CENTER	OFFICE	HARDWARE COSTS	SOFTWARE COSTS
Headquarters	Management	2 1	DGM (Research)	Secretary	3204	638
Headquarters	Management	4 1	DGM (Research)	DGM	2900	638
				SUBTOTAL DGM (Research)	6104	1276
Headquarters	Management	1	Financial Serv	Treasury	2437	
Headquarters	Management	1	Financial Serv	Budget Control	2437	
Headquarters	Management	1 2	Financial Serv	General Accounts	2437	1087
Headquarters	Management	3 4	Financial Serv	General Accounts	5523	4455
Headquarters	Management	4 1	Financial Serv	Head/Secretary	2900	638
				SUBTOTAL Financial Serv	15734	6180
Headquarters	Research	2 3	Food Science	Head/Secretary	3204	1548
				SUBTOTAL Food Science	3204	1548
Headquarters	Management	2 1	GM	Secretary	3204	638
Headquarters	Management	4 1	GM	GM	2900	638
				SUBTOTAL GM	6104	1276
Headquarters	Management	2	Planning	Planning	3204	
Headquarters	Management	2 2	Planning	Projects	3204	1087
				SUBTOTAL Planning	6408	1087
Headquarters	Management	2 1	Procurement	Purchasing	3204	638
Headquarters	Management	2 2	Procurement	Stores	3204	1087
				SUBTOTAL Procurement	6408	1725
Headquarters	Management	2 2	Training	Head/Secretary	3204	1087
				SUBTOTAL Training	3204	1087
				GRAND TOTAL	201543	60013

All costs in U.S.Dollars

## IX. SUPPLIERS

We are clearly not in a position to recommend particular suppliers. When IAR does come to the point of making a decision, however, we believe that it should take the following considerations into account.

- (1) Cost.
- (2) Start-up support. In the case of large orders, some suppliers are willing to send a trainer/technician to assist in unpacking and initial installation.
- (3) Service. Some suppliers look actively for a continuing relationship with a client - and therefore may include at least a short-term service contract in the hardware/software purchase price. Such a contract can cover:
  - (a) repairs to components sent to the supplier; and/or
  - (b) periodic visits to the client for interim maintenance and further training.
- (4) Training. Really part of after-sales service. Some suppliers have an in-house training department, the services of which are available to clients on agreed-upon terms.

The most important general consideration for IAR to bear in mind when choosing a supplier is that microcomputers are "a buyer's market". We recommend that IAR consult ILCA on the experience which it has had. We understand, for example, that ILCA has made particular use of the following two suppliers:

TRANSPUTEC Computers Ltd  
Transputec House  
21 Horn Lane  
London W39NJ  
Telephones: 01 992-2179 or 01 993-5734  
Telex: 265871

CGNET Services  
680 Waverley St  
Palo Alto, CA 94301  
Telephone: (415) 325-3061  
Telex: 4900005788 cgn ui

## X. SERVICE

Service for microcomputers can be divided into two categories: hardware service and software service. The former includes primarily mechanical and electronic maintenance. The latter covers initial installation of programs, resolution of difficulties arising from hardware/software interactions, and updating of programs.

There is clearly some overlap between these two categories. When a problem with a micro arises, it is seldom obvious initially whether the problem is with hardware, or software, or with both.

By the end of 1989, IAR will be settled in its new HQ and will likely have taken delivery of a large number of micros. The highest management priority regarding computers then will be the implementation of a coherent service strategy. We believe that development of such a strategy should begin now.

### Hardware Service

IAR has three obvious options for this category of service:

- (a) to contract it fully to an outside agency;
- (b) to conclude a cooperative arrangement with an outside agency, under the terms of which hardware service responsibilities would be shared; or
- (c) to create a full in-house service capability.

We have identified four types of agency which might meet IAR's requirements for either "a" or "b".

- (1) A public (government) organization. The only one which we were able to find with the capacity to service micros was the National Computer Center (part of the Ethiopian Science and Technology Commission).

The NCC concludes service and training contracts for micros with both organizations and individuals. Its current hourly rate for service is 150 Birr.

- (2) A private organization. We heard of only one in Addis which markets its microcomputer service expertise. We cannot make a judgment about its capabilities, however, because our tight schedule did not permit us to visit.

It is: The Bureau for Electronic Computer Services, P.O.Box 2369, Addis Ababa. Telephones: 44-77-84 and 15-84-31.

- (3) A seller of computer hardware. The following large companies are represented in Addis: IBM, NCR, and HP. Again, our tight schedule did not permit visits.

A problem with this option is that such a vendor usually services only its own brand. Further, hourly service rates are unlikely to be much lower than those charged by the NCC.

- (4) ILCA. It has more than 100 micros now, has set up its own internal service capability, and is located adjacent to the new IAR HQ site. We visited ILCA - and were impressed with the ways in which it manages its micros.

A potential problem with this option is that ILCA service personnel already have more than enough to do.

Recommendation. Our recommendation regarding HARDWARE service has three parts.

- (1) Development of an in house service capacity. Resources required would be modest.
- (a) One full-time technician. Such an individual could come either from within IAR or could be recruited from outside. He/she should have had basic training in electronics, as well as some practical experience with computers. His/her main jobs would be the diagnosis of problems and the replacement of defective parts.
  - (b) A service room for this technician. A location in one of the main blocks, near most of the computer users, would be best. We believe that one of the small offices in the "Computer" Wing of Block D would be excellent.
- (2) Conclusion of a technical support agreement with ILCA. Such an agreement would have two objectives.
- (a) ILCA would assist in the training of the IAR service technician. We believe that much of this training could be accomplished on-the-job by having the chosen individual work with ILCA staff on the service of ILCA's own micros.
  - (b) ILCA would undertake to advise this technician when problems arose about which he/she was uncertain. Such support would probably be greatest in the first two years, when IAR was still getting its own service program firmly established.
- (3) Conclusion of repair agreement with an international computer dealer. Such an agreement would cover repairs which could not be done in Ethiopia. The most logical dealer would probably be the same one who supplied the micros in the first place.

(ILCA has an agreement of this kind with TRANSPUTEC. ILCA technicians diagnose problems, solve them quickly with available replacement parts if possible, make whatever repairs they can themselves, and send most defective parts to the UK for repair).

### Software Service

We believe that this function is one which IAR must definitely perform itself.

As noted above, there is some overlap between the categories of hardware and software service. A technician confronted with a microcomputer problem will often not know initially whether the problem is with hardware, or software, or both. If IAR is to establish its own small hardware service operation - as recommended - then it should complement that operation with one for software support as well.

Recommendation. Our recommendation regarding SOFTWARE service has two parts.

- (1) Development of an in-house service capacity. Once again, the costs are likely to be small.
  - (a) One full-time trainer/technician. This individual would probably best be recruited from outside IAR. He/she should most likely have a degree in computer science. He/she should be a good trainer and, most important, should be able to operate in a relatively unstructured job environment. Computer problems come in all shapes and sizes. His/her main jobs would be the installation of software, training of personnel, and trouble-shooting.
  - (b) An office for this individual. We believe that the best location would be in one of the small rooms in the "Computer" Wing of Block D. He/she would have to work closely with the hardware technician described above.
- (2) Conclusion of a technical support agreement with ILCA. As in the case of the recommended hardware service agreement, such cooperation would have two objectives.
  - (a) ILCA would assist in the training of the IAR trainer/technician. Such training would be particularly important for some of the more sophisticated database and statistics programs recommended in Section VII. ILCA uses several of these programs now.
  - (b) ILCA would undertake to advise this technician when problems arose about which he/she was uncertain.

### General Considerations - Standardization and Spares

We believe that IAR should standardize on one brand of microcomputer. If it does, trouble-shooting will be much easier because technicians will not have to be familiar with several different brands. Costs will be kept down because replacement parts for several different brands will not have to be stocked.

ILCA has informally standardized on one brand, TANDON. If IAR does indeed wish to standardize and if it does conclude service agreements with ILCA (as described above), it might wish to consider the same brand.

In any case, we recommend that IAR spend 20% of what it spends on the computers themselves on replacement parts. These spares should include keyboards, displays, display adapters, hard disk drives, floppy drives, printers, and cables. Most "repairs" can then be made quickly by the simple replacement of the defective part. (Annex 2).

## XI. TRAINING

Most IAR personnel have had very little experience with computers. There will therefore be considerable need for training as soon as the new machines arrive, as well as a continuing demand as staff use computers in their work.

We believe that an IAR strategy for training on the use of micros should deal with at least the following four subjects.

### Personnel

In the previous section of this report - on Service - we recommended the appointment of one "full-time trainer/technician". His/her main jobs would be the installation of software, the training of personnel, and troubleshooting.

We believe that the training which this individual would organize will probably be of two types: group and individual.

- (1) Group training will be particularly important in the first six months after the micros arrive. Fairly large numbers of staff will require start-up training in basic hardware procedures and in the standard software packages recommended. A few secretaries know WORDPERFECT now - but almost no staff are familiar with the fundamentals of spreadsheet (SUPERCALC) or database (REFLEX/RBASE) operations.

Such group training will be particularly important for staff from research centers. Since no single center is large enough to support intensive formal training on-site, the alternative is to bring groups of people from the centers into Addis. The microcomputer training/technician will be responsible for organizing such training events.

- (2) Individual computer training will be an important activity within IAR for the foreseeable future. Not only must new staff be trained, but the skills of existing staff must be continuously upgraded.

Such training is best organized on an "as needed" basis, both at IAR HQ in Addis and at the research centers. We expect that this form of training will constitute by far the biggest activity of the trainer/technician.

### Physical Facilities

The new IAR HQ will have a room which we think is ideal for microcomputer training. In the "Information Services" Block is a space now designated for "Computer". We have the following recommendations regarding this room.

- (1) That it be designated as the "Computer Training Room".
- (2) That it be equipped with six micros (as per the deployment list in Section VIII of this report).
- (3) That all recommended software - including on-screen tutorials - be loaded onto each machine.
- (4) That there be available in the room (or nearby) a supply of reference books regarding the software.
- (5) That the "trainer/technician" be given responsibility for management of this room.
- (6) That the room be used for both group and individual training (as described above).

We believe that the six machines identified for the room can serve two purposes for IAR: first, as training machines, and second, as backups (in case other machines in HQ break down). For the second reason, we have recommended that the room be equipped with Configuration 1, 2, and 3 hardware.

### Content of Training

Training on microcomputers will deal with three inter-related subjects.

- (1) Hardware use and care. The range of subjects to be covered includes everything from turning on a machine to routine cleaning of floppy disk drives.
- (2) Software use. Probably the most demanding and most time-consuming subject for the "trainer/technician". Staff will need to learn basic operations - and then will need continual support in moving on to new applications.
- (3) Applications development. Basically the setting-up of standard input and output forms for each major IAR user. The Classification, Promotion, & Statistics Division, for example, will need the services of the "trainer/technician" in maintaining at least one major database on IAR personnel - and then in producing the standard reports which both IRA management and higher public authorities need.

Such training will obviously be in most demand in the first one-two years after the first micros arrive.

### Support for Training

As in the case of both hardware and software service, there would seem to be a strong case for IAR/ILCA collaboration in microcomputer training.

Further, IAR may wish to choose a hardware/software supplier at least partially on the basis of whether that supplier is willing to provide training support. Such support could take the form of the training of trainers, actual participation in early group training courses, and provision of training materials. We know of at least some suppliers who are willing to provide support as part of the purchase package in large orders.

XII. ESTIMATED COSTS

US\$

Basic Hardware	201543
Supplementary Hardware - Annex 1	15000
Hardware Subtotal	216543
Spares (20%) - Annex 2	43309
Supplies (10%) - Annex 3	21654
Spares/Supplies Subtotal	64963
Software	60013
Software Subtotal	60013
GRAND TOTAL	341519

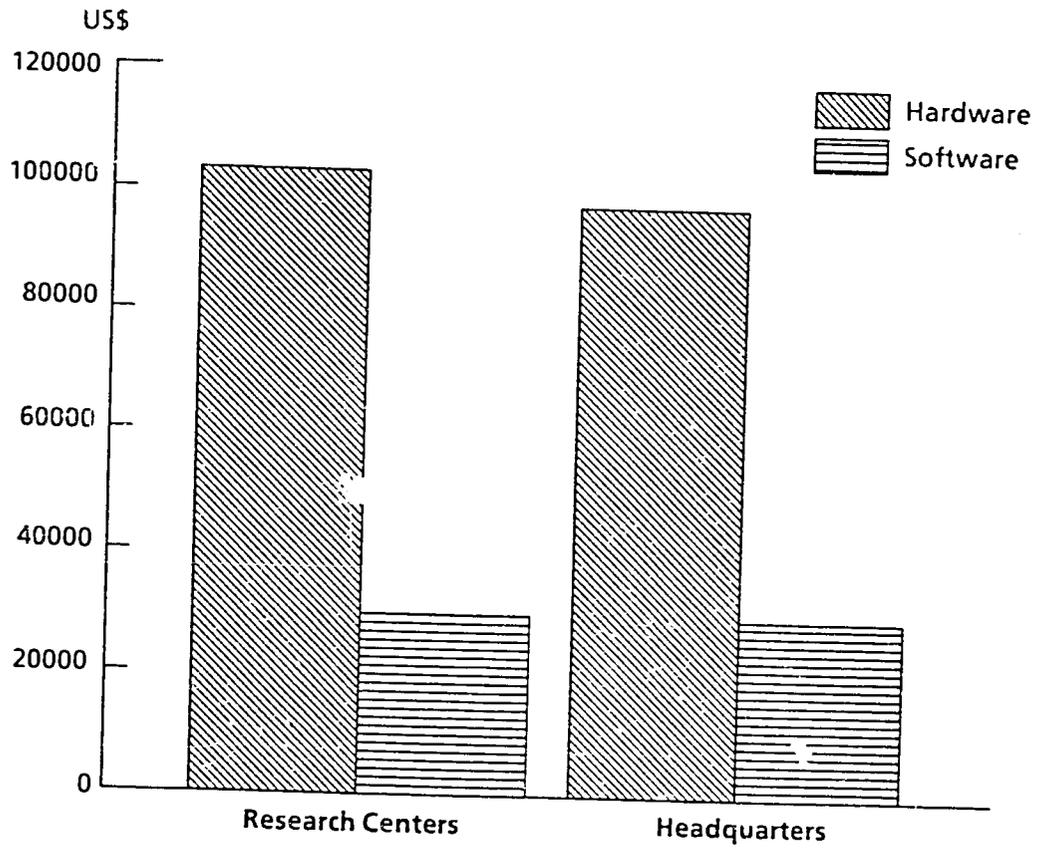
BASIC HARDWARE COSTS  
LOCATION vs. FUNCTION

		FUNCTION			
		<u>Management</u>	<u>Research</u>	<u>Training</u>	<u>ALL</u>
L O C A T I O N	Centers	26807	76896		103703
	Headquarters	68986	9612	19242	97840
	ALL	95793	86508	19242	201543

SOFTWARE COSTS  
LOCATION vs. FUNCTION

		FUNCTION			
		<u>Management</u>	<u>Research</u>	<u>Training</u>	<u>ALL</u>
L O C A T I O N	Centers	7018	23220		30238
	Headquarters	19531	4644	5600	29775
	ALL	26549	27864	5600	60013

Cost of Hardware / Software - by Location



### XIII. START-UP SUPPORT

When the new computers arrive at IAR, a considerable initial effort must be made to get them installed and running properly. This start-up effort involves a substantial commitment to training.

We believe that the start-up process has three components.

- (1) Unpacking, installation, and testing. These three inter-related functions must be performed by trained personnel. Hardware must be placed at the proper locations, connections must be made, and software installed and configured.

For the 35 machines located at research centers, such activities will require travel. We estimate that approximately two days per center will be needed (including the training of center personnel in routine maintenance and basic trouble-shooting).

- (2) Applications development. Computers are obviously useless without suitable software. Fortunately, most of the tasks for which IAR intends to use micros can be performed without significantly modifying the software packages recommended. As noted above, however - in the section on Training - an initial effort will have to be made to develop standard input and output forms for each major use and user.

Such applications development requires good understanding of both the tasks to be accomplished and the capabilities of various programs. Most initial uses are likely to be simple databases: for example, for personnel, property, stores, and vehicles.

As part of the start-up process, at least the skeletons for the formats required should be created. Technical expertise from outside IAR will be needed. One of the obvious benefits of such support will be in the training of IAR microcomputer personnel. In fact, we believe it essential that such formats be created in close cooperation with their ultimate users, i.e. IAR personnel themselves.

- (3) Policy development regarding microcomputers. Micros have to be managed. Rules regarding uses, users, and responsibilities have to be set and adhered to. We believe that IAR will want to think early about such subjects as:

- (a) access to the machines;
- (b) responsibilities for routine care and maintenance;
- (c) procedures for procurement of supplies;
- (d) requests for training and technical support; and
- (e) security.

As noted above - in the section on Suppliers - we believe that the hardware/software vendor which IAR chooses should provide much of this start-up support. There are two goals: installation of the new computers so that they can be operated efficiently, and training of IAR users and service staff in basic hardware and software operations.

ANNEX 1 - SUPPLEMENTARY HARDWARE

<u>Number</u>	<u>Item</u>
5	80-Column Printers (for Information Services)
4	Network Adapter Boards (for Financial Services)
1	40Mb Streaming Tape Backup Unit - external (for use within IAR HQ)
15	Uninterruptable Power Supplies (one per research center, one for Financial Services, plus extras)
2	Freelance Plus (graphics software)
3	Ribbon Re-inkers

## ANNEX 2 - SPARES

We recommend that the initial purchase of micros include a substantial number of spares.

The list below is a tentative one of minimum requirements. The supplier selected should amend the list as its experience dictates. Total expenditure for spares should be not less than 20% of the amount spent on basic hardware.

<u>Number</u>	<u>Item</u>
12	40Mb Hard Disk Drives
1	80Mb Hard Disk Drive
6	Disk Drive Controllers
5	80287 CoProcessors
10	3.5" Floppy Disk Drives
3	5.25" Floppy Disk Drives
5	VGA Video Adapters
8	VGA Color Displays
5	Hercules Compatible Video Adapters
5	Monochrome Displays
8	Keyboards
5	80-Column Printers
5	132-Column Printers
10	Print Heads
10	Printer Cables
2	4Mb Memory Cards for the 386 Machines
3	4Mb Memory Cards for the 286 Machines
350	256K Memory Chips (Replacements)

### ANNEX 3 - SUPPLIES

Computers - like all equipment - are useless without supplies. Automobiles need gasoline, oil, tires, etc.. Computers need paper, printer ribbons, diskettes, etc.

Again, the list below is a tentative one of minimum requirements. The supplier selected should amend the list as its experience dictates.

<u>Number</u>	<u>Item</u>
50	Boxes of 2500 Sheets Tractor-Feed Paper 80 Columns
100	Boxes of 2500 Sheets Tractor-Feed Paper 132 Columns
150	Ribbons (for 80-Column Printers)
200	Ribbons (for 132-Column Printers)
3000	3.5" Diskettes
200	5.25" Diskettes
150	3.5" Cleaning Diskettes
40	5.25" Cleaning Diskettes