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An international cooperation and resource center established to support the development of effective systems and training for project design and management in developing countries.

U.S. Department of Agriculture
Office of International Cooperation
and Development
Technical Assistance Division

IN
COOPERATION
WITH

U.S. Agency for International
Development, Bureau for Development
Support, Office of Rural Development
and Development Administration



DEVELOPMENT PROJECT MANAGEMENT CENTER

The Center operates under an agreement between A.I.D. and U.S.D.A. with funding from A.I.D. project 096, Project Management Effectiveness. The Center's full-time staff provides consultant services and technical materials to LDC institutions. The Center also maintains a skill bank of consultants with expertise and prior experience in various areas of project planning and implementation who are available for short- or long-term assignments. With its location within the Technical Assistance Division of the U.S. Department of Agriculture, the Center is able to draw upon a wide variety of agricultural specialists to complement its work. In addition, through the A.I.D. project, the Center has a collaborative relationship with the National Association of Schools of Public Affairs and Administration and can draw upon a wide range of development administration specialists.

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Proceedings from
the Practitioner Workshop on

M I C R O C O M P U T E R S
A N D
A G R I C U L T U R E
M A N A G E M E N T
I N D E V E L O P I N G
C O U N T R I E S

June 3-4, 1982
Washington, D.C.

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PROCEEDINGS OF
MICROCOMPUTERS AND AGRICULTURE MANAGEMENT
IN DEVELOPING COUNTRIES: PRACTITIONER WORKSHOP
Washington, D.C.
June 3 & 4, 1982

Prepared by:
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I. INTRODUCTION

In recent years the international development community has become increasingly concerned over the "implementation gap"—the inability to transform national policies and program designs into self-sustaining development benefits. Poor management, the inefficient mobilization of human and material resources for the accomplishment of desired results, is now recognized as a basic cause of this so-called implementation gap.

In many development efforts, the intelligent acquisition and use of information is cited as a key variable in successful program management. This is especially true in the agriculture and rural development sectors where program personnel typically operate in widely dispersed locations under harsh conditions. The recent emergence of readily accessible, low-cost personal microcomputers now offers the potential to drastically alter the technological information processing and decision making technology in developing countries. Examining the usefulness of microcomputers in agriculture management to date and reflecting on whether the technology they represent could, if appropriately supported, serve to partially close the implementation gap is the focus of an ongoing research and development effort in the Development Project Management Center (DPMC) in the USDA.

The DPMC research effort on Microcomputers and Agriculture Management is jointly sponsored by the Technical Assistance Division of OICD in USDA and the Office of Multisectoral Development in the Science and Technology Bureau of U.S. AID. The effort includes: a review and documentation of current and potential microcomputer applications in developing country agriculture management; a short microcomputer practitioner workshop; and the development of a "Manager's Guide to Microcomputer Acquisition and Use." The research is being carried out over a twelve-month period, ending September 30, 1982.

The workshop element of the research, entitled "Microcomputers and Agricultural Management in Developing Countries", was held on June 3 and 4, 1982 in Washington, D.C. Participants included individuals whose responsibility and experience involved the application and support of

microcomputers in development. Approximately thirty-five persons attended, representing various offices of AID, USDA, the U.S. Bureau of the Census, as well as private companies and consultants associated with these agencies. (A list of Workshop Participants is included in Attachment A).

II. WORKSHOP SCOPE AND FORMAT

The workshop was designed to provide an opportunity to exchange experiences and discuss the potential implications of microcomputer technology for agriculture and rural development. Workshop objectives included:

1. Reviewing microcomputer experience in developing countries in two management related areas:
 - the management of development programs and projects
 - the management of agricultural institutions
2. Identifying important technical and institutional factors which constrain and facilitate the acquisition and use of microcomputers in development management
3. Assessing the policy and human resource development implications of microcomputers for donor agencies and developing countries
4. Determining the strategies or activities that should be emphasized to support the intelligent use of microcomputer technology in developing countries

Workshop topics were addressed through case study presentations, panel discussions, microcomputer demonstrations and synthesis sessions. There were substantial opportunities for sharing personal experience, addressing key issues and making general observations. (See Attachment B for the Workshop Agenda: schedule, session titles, and presenters.)

III. PROCEEDINGS SUMMARY

The opening remarks set the general tone of the workshop. It was noted that the work of Talcott Parsons, Norman Weiner, and Max Weber led to the introduction of systems thinking in the social sciences. In this context, understanding the concept of "information" and how to harness its enormous potential is a subject of immediate concern. The introduction of the microcomputer and its impact on information processing—at and between all levels of society—should be examined as one of the intellectual challenges of our times. The June 3 and 4 practitioners' workshop was viewed as representing a step in this process.

A. Day One Review

The first small group sessions focused on two project management case studies involving microcomputers in Tanzania, Peru, Tunisia, and Yemen. Specific applications included: economic feasibility studies; village survey data analysis and report documentation; project monitoring at regional and national levels; and word processing. Readily accessible microcomputer processed information permitted local level developing country personnel to make better quality and more timely project decisions. Survey data were also analyzed with a faster turn-around time than had previously been possible.

Two other case studies focused on microcomputer applications in agriculture institutions—the Ministry of Agriculture in Kenya and a multicountry Remote Sensing for Agriculture project. There were several common themes in the cases. One centered around the complex environment in which the institutions operate and the lack of timely, quality information that managers have been using in decision making. The general inaccessibility to relevant information separates the manager from the work context and contributes to a distrust of the formal information that is available. Secondly, the manager often is not aware of linkages between better decisions and actual performance improvements in the work setting. These factors help to explain the widespread use of "Management by Blueprint" approaches in many institutions. Often the focus is on indictment, not on improvement; on finding deviants, not deviations.

A more correct perspective on management is to view it as an adaptive science. This implies: 1) an interaction between the definition of a problem situation and its betterment; 2) the ability to learn and adapt during implementation; and 3) more direct involvement of responsible persons in improvement efforts.

Microcomputer technology provides some of the means to address the needs of an adaptive management approach. One is the provision of user-oriented, low-cost and timely information. Several examples were given where microcomputers are allowing decisions to be made in days rather than months. In both case studies, managers felt that they had gained more control of the actual work situation by being able to analyze alternatives and better understand the implications of particular decisions. It was also noted that the transfer of

microcomputer technology is facilitated by involving decision makers and addressing relevant and specific on-the-job needs. Respect is needed for the potential user's attitude towards the microcomputer since some fear or skepticism is encountered.

Finally, there is as yet no articulated theory or understanding of how microcomputer technology can be employed to improve institutional management. The entire process is new, dynamic, frustrating and chaotic; it has the potential for changing our views of management in the same way that the phone changed our manner of communication.

Following the case study presentations, the results of the DPMC survey of microcomputers in development were reviewed. Seventy-six microcomputer applications have been documented to date using one hundred twelve microcomputers in thirty-three developing countries. The majority of these applications, forty-four, are project-related. The survey also reviews personal, U.S. AID Mission and developing country ministry or agency applications. (See Attachment E for a copy of the survey results.)

An overview of the May 1982 Michigan State University conference on Microcomputers and Programmable Calculators in Agriculture Research in LDC's highlighted agricultural research projects currently using microcomputers. A similarity of key issues and lessons learned was noted between this workshop and the MSU conference. However, the present workshop's focus on management issues was seen as both unique and timely.

At the end of Day One, a synthesis was made of lessons from the management case studies, the DPMC survey, and personal experience of the attendees. The major lessons are summarized below (See Attachment C for the entire list):

- * Microcomputer **HARDWARE** is durable and reliable if the paramount problem of "dirty" electrical power supply and other environmental factors are considered and appropriately handled.

- * Off-the-shelf microcomputer **SOFTWARE** with built-in flexibility is or soon will be available for most development program and institutional management applications such as program analysis and report generation, financial accounts and records, word processing, and project monitoring and evaluation.

- * In **INTRODUCING** a microcomputer into a project or organization attention should be given to the mode of introduction, the appropriateness of the desired applications, and the local support/maintenance capacity. The mode or method of introduction should be collaborative and accompanied by technical assistance. Initial acceptance of the microcomputer is facilitated by beginning with applications that have the following characteristics--problem-oriented, time consuming, ongoing routines, and being carried out manually. The

choice of a particular microcomputer should depend heavily on available local support and maintenance capacity.

* Microcomputers are being successfully USED in two management related areas: (1) to improve policy analysis, program operations and staff productivity, and (2) to reorient and alter the basic structures of institutions, thereby permitting the democratization of information and the decentralization of information processing capacity. However, microcomputers also increase the possibility for the misuse of information in organizations. Microcomputers are not a substitute for good internal management policies and procedures.

* As a new TECHNOLOGY, microcomputers are qualitatively unique in their ability to be "user-friendly" and "interactive". The mystification and intrigue that accompanies a microcomputer, along with their low cost and high versatility, suggests that the technology will quickly spread throughout the developing world.

B. Day Two Review

On day two the workshop highlighted panel discussions on microcomputer policy and human resource issues, several microcomputer development management applications and a concluding session.

The topic of the first panel discussion was public agency policy on the acquisition and use of microcomputers in development. This panel discussed the impact of the microcomputer in AID, and reviewed AID's operational policies and procedures. Several issues were raised. One concern was whether the "ownership" of equipment after project completion is the responsibility of the AID Mission, the host country or the contractor. This led to some second-level issues: e.g., in the case of eventual host country ownership, there would be a need for emphasis on the transfer of the technology and host country personnel training on microcomputers. Another issue concerned agency restrictions on the types of data that should be processed on a microcomputer. Certain agency data is highly sensitive and should not be generally accessible outside the agency; e.g., financial information at the program and project level. If people begin to process this information on a microcomputer, are they causing internal security problems? From the project level viewpoint, the need for timely information which has not heretofore been available needs to be considered. Finally, and probably most importantly, is the recognition that the agency needs some type of policy concerning information processing, decentralized access to project information and professional assistance in acquiring and using microcomputers.

The focus of the second panel was on the human resource development implications of microcomputers. To date, the microcomputer is probably the best interactive learning tool available. Given the increasing availability of user friendly training software, the microcomputer acts

as a self-motivator for use by individuals and small groups. Secondly, an effective way to increase organizational awareness of microcomputers is through the use of "trainer/facilitator" consultants with microcomputer expertise. These consultants could provide multi-level training in specific applications. Finally, the informal network found within each organization will probably be the main source of information on microcomputers and their acceptance; this network should be recognized and supported.

Several microcomputer demonstrations were programmed into the workshop, each relating to one or more of the four topic areas. These demonstrations included a description of a university training program in computers for developing country officials, an Egyptian agricultural model for policy decision-making, and a financial programming model for use by AID missions.

The final session of the workshop was devoted to developing an action agenda. Attendees were asked to consider the strategies or activities that should be emphasized or deemphasized in support of the intelligent management use of microcomputer technology in developing countries. The list of participant suggestions stemming from this dialogue is found in Attachment D with highlights presented below:

- * A U.S. Government unit should be chartered immediately to proactively support the intelligent acquisition and use of microcomputer technology in developing countries. The first step in this process is to establish a mechanism for linking microcomputer technology users in developing countries with U.S. private and public sector users and suppliers.

- * The U.S. public sector should initiate and facilitate applied research on microcomputers in developing countries to better understand the nature of microelectronics technology transfer, the factors that facilitate and impede this transfer, and the areas—both managerial and technical—in which microcomputers can be most effectively applied to improve the performance of development institutions and programs.

- * Donor agencies, including AID, need to develop an internal policy on information that includes microprocessing technology as an integral component. In addition, agencies should develop guidelines facilitating the appropriate acquisition and use of microcomputers in development work.

- * Public and private support services should be initiated for foreign microcomputer users including documentation of recent developments, competency training, and technical assistance.

The workshop concluded on a positive and encouraging note. Attendees expressed their thanks for being able to meet and share experiences with

other microcomputer practitioners. They urged that a proceedings report of the workshop be quickly prepared and widely distributed so that others would be aware of new developments and key actors in the process.

ATTACHMENT A:

LIST OF WORKSHOP PARTICIPANTS
(Organization, Address & Telephone List)

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ATTACHMENT B:

U S D A W O R K S H O P O N
MICROCOMPUTERS AND AGRICULTURE MANAGEMENT
IN DEVELOPING COUNTRIES

June 3-4, 1982
Workshop Agenda

- d a y o n e-----
- 0830 Welcome and Introductions (Room 1331/1333-S)
Morris Solomon
Norman Nicholson
Marcus Ingle
- 0915 Workshop Overview
Marcus Ingle
- 0945 Refreshments
- 1015 Case Studies of Microcomputer Project Management Applications:
Small Group Round One Review and Discussion
Charles Sweet (Case 1-Room 1331)
Sandra Bertoli (Case 2- Room 1333)
- 1100 Case Studies of Microcomputer Project Management Applications:
Small Group Round Two Review and Discussion
Charles Sweet (Case 1- Room 1331)
Sandra Bertoli (Case 2- Room 1333)
- 1145 LUNCH
- 1245 Case Studies of Microcomputer Management Applications in
Agriculture Institutions: Small Group Round Three
Carl Gotsch (Case 3- Room 3056-S)
Ron Steele (Case 4- Room 104A)
- 1330 Case Studies of Microcomputer Management Applications in
Agriculture Institutions: Small Group Round Four
Carl Gotsch (Case 3- Room 3056-S)
Ron Steele (Case 4- Room 104A)
- 1415 Refreshments
- 1445 Results of the USDA/AID Microcomputer and Agriculture
Management Survey: Presentation and Discussion (Room 1331-S)
Noel Serge
- 1530 Overview of the MSU Conference on Agricultural
Research and the Use of Microcomputers and
Programmable Calculators
Joseph Beausoleil
- 1600 Assessment of Potential Utility of Microcomputers in
Agriculture Management: Group Synthesis
Duncan Miller (Facilitator)
- 1700 End of Day

U S D A W O R K S H O P O N
MICROCOMPUTERS AND AGRICULTURE MANAGEMENT
IN DEVELOPING COUNTRIES

June 3-4, 1982
Workshop Agenda

- d a y t w o-----
- 0830 Overview of Day Two (Room 1331/1333-5)
Marcus Ingle
- 0845 Perspectives on Microcomputer Acquisition and Use:
Panel Discussion of Policy Issues
John Daly
Ralph Otto (Moderator)
Robert Smith
Emmy Simmons
William Ruotola
- 1000 Refreshments
- 1030 Demonstration #I: University of Connecticut's
Training Program entitled Computers for Management
in Development
Nancy Ruther
- 1115 Human Resource Implications of Microcomputer Uses
in Development Management:
Panel Discussion
Kenneth Kornher (Moderator)
Morris Solomon
Nancy Ruther
Daniel Creedon
- 1215 LUNCH
- 1300 Demonstration #II: Presentation by Futures Group of
the Egypt Agriculture Model
Steve Hawkins
- 1345 Demonstration #III: Academy for Educational Development
Simulation of Financial Management for Use by AID Missions
Kurt Moses
- 1430 Refreshments
- 1445 Participant Roundtable Discussion: Key USDA/AID
Issues and Next Steps
Marcus Ingle (Facilitator)
- 1615 Synthesis and Wrap-up
Marcus Ingle (Facilitator).
- 1700 End of Day

ATTACHMENT C:

Microcomputers and Agriculture Management in Developing Countries—DPMC Practitioner Workshop

Initial List of Lessons from Experience—June 3, 1982

1. Dirty power is a paramount problem for the use of microcomputers in developing country contexts.
2. Microcomputers have substantial potential applicability for use in development programs and projects—for planning, budgeting, implementation, and monitoring/evaluation.
3. Microcomputers are readily accepted by expatriate and developing country personnel.
4. A major problem surrounding the use of microcomputers in developing countries is the compatibility of hardware and software.
5. Microcomputers have substantial potential to alter the basic structures of institutions that acquire and use them.
6. In developing countries at this time, local networking of users is important.
7. Microcomputers can be very reliable in developing countries given that power and other environmental conditions are suitable.
8. A substantial and expanding amount of off-the-shelf or canned software is available for microcomputer use in developing countries.
9. Off-the-shelf software is most useful when it has built in flexibility for application in a variety of situations as does the Visicalc package.
10. In acquiring a microcomputer system, one should begin with a needs assessment of the users, then decide on software and then decide on hardware.
11. Decision makers need quick access to practical information coming from the microcomputer.
12. Adoption of the microcomputer occurs most quickly when the system is used to assist with the processing of ongoing, time consuming, and problematic activities, e.g. fast changing budgets or payroll procedures. (These types of activities make the best use of the computer's talents!)
13. The potential for introducing microcomputers in institutions is substantial when one begins by focusing on existing internal routines that are already being carried out manually.
14. Prior to introducing a microcomputer system, one should do an organizational diagnosis which examines authority relationships, modes of formal and informal communication, etc.

15. In addition to hardware and software, other resources—such as training and technical assistance—are required to gain acceptance of a microcomputer system by people within institutions.

16. Ways are needed to tell if microcomputer systems are being fully and appropriately used.

17. Potential microcomputer owner/users in developing countries need to have a minimum level of competency in system operations, maintenance and troubleshooting.

18. Eventually, each country should have its own microcomputer support facilities.

19. There is a need for a change agent to be associated with microcomputer systems in projects and institutions. This agent is required to keep abreast of new developments and suggest improved ways of using the microcomputer.

20. A microcomputer's first management application is likely to be in an area where institutional needs are high and political sensitivity to the involvement of microcomputer technician is low.

21. Several areas of potential for management improvement represented by the microcomputer include:

a. Democratization of information—more widespread sharing of information

b. Decentralization of decision making through the local availability of data and analysis capacity

c. Use as a sophisticated gimmick that can help change management styles and operations

22. Since the mystification effects of microcomputers are very high in developing countries, consideration should be given to building self-destruct mechanisms into their applications. That is, there is substantial danger at this juncture that the microcomputer technology will be misused and ways are needed to minimize this.

23. Initial technical assistance is very important to the introduction of the microcomputer.

24. It is easy—especially with the introduction of complicated data collection and analysis efforts—to underestimate the support, training, and start-up time resource requirements associated with microcomputers.

25. There is a need to identify the role that the private sector in developing countries should be playing with regard to microcomputer acquisition and use, e.g., training, software provision, maintenance, spare parts, etc.

26. There is a need to understand what developing country interests and needs are with regard to acquiring and using microcomputers for their development programs.

27. The decentralized information processing capacity represented by microcomputer technology allows users to go beyond the capability or quality of the data. There is a possibility for misuse of information.

28. On the other hand, more decentralized information processing allows for the emphasis to be placed on significant relationships within the user community and permits the integration of formal and informal information.

29. In understanding how microcomputer technology is transferred, we need to review and learn from other experience.

30. In discussing the use of microcomputers in program management, we need to distinguish between three different sets of actors:

- a. Donor agency project officers
- b. Contract personnel with management functions
- c. Host country project managers

31. In considering microcomputers, one should not overlook their hidden costs:

- a. Customized software may be required
- b. Minimal skill levels are required (Driver's license needed?)
- c. There are recurrent costs associated with maintenance and repair

32. The cost of microcomputer hardware and software is not currently a major constraint. However, there are policy and procedural difficulties associated with acquiring systems.

33. The support costs for microcomputers can be quite high.

34. In introducing a microcomputer into a developing country at this time, one should build in redundancy of hardware, software, and human resources ("wetware").

35. Managers and administrators need to learn how to interpret and use information in decision making before access to more information will make a substantial difference in performance. Beware of the tendency to equate information processing capacity with management improvement! Just having a microcomputer should not be equated with getting more or better work done.

36. There should be an evaluation of the impact of microcomputers on program management based on experience in the developing

countries to date.

37. Given AID's renewed interest in policy analysis, do microcomputers offer a new and qualitatively different way to deal with macro level decisions? Can microcomputers be used to speed up and focus the activity in this important area?

38. Even with a microcomputer in an organization, there is no substitute for good, solid internal management procedures and policies.

39. In the decentralization/centralization dialogue going on in several donor agencies, the policy on acquisition and use of microcomputers may be the factor that tips the balance on whether decentralized operations can be initiated and sustained. Microcomputer technology offers the potential to provide decentralized units with a reasonable source of information processing capacity that is required for assuring accountability and responsive decision making.

40. The criteria for successful introduction of microcomputer technology would include:

- a. Problem-oriented, opportunity-seeking agents in place
- b. Interest in providing data to higher organizational units
- c. Absence of threat
- d. Ability to tailor the technology to local situation

41. The "mode of transfer" or the way the microcomputer technology is introduced into a program setting is critical to its initial adoption and continued use.

ATTACHMENT D:

WORKSHOP SUGGESTIONS ON STRATEGIES AND ACTIVITIES IN SUPPORT OF
MICROCOMPUTER APPLICATIONS IN DEVELOPING COUNTRIES

1. AID and other donors should develop a broad policy or information that includes microcomputer technology as a component.
2. Consistent yet flexible guidelines should be developed and widely disseminated on microcomputer acquisition, introduction, use, and integration with other systems and technologies.
3. In supporting the transfer of microcomputer technology, a balanced focus is required regarding hardware, software, and user organization needs and resources.
4. The private sector -- both in the U.S. and developing countries -- should be encouraged to play an active role in introducing microcomputer technologies, developing human resources for its use, and consulting on appropriate applications. Start-up subsidies should be considered for multipurpose microcomputer enterprises in developing countries.
5. One way to promote the rapid expansion of microcomputers is to provide them for word processing while making other technical, educational, and managerial applications packages readily available.
6. Within AID, require all projects funded at more than U.S. \$20 million to include a microcomputer calculated sensitivity analysis.
7. Establish one or more units within AID--linked to the private sector--to assist Agency personnel and developing country institutions to acquire and make intelligent use of microcomputer technology. This unit should perform a clearinghouse function, and actively support the development of links between developing country users and U.S. suppliers/servicers.
8. AID should document microcomputer applications to encourage their transfer where appropriate.
9. AID should initiate additional applied research on the benefits and costs of microcomputer technology, particularly within the institutional context of development programs. Part of this effort should involve the development of a conceptual framework for examining and assessing the microcomputer technology transfer process.

10. AID should assist development personnel to use micro-computers in an "adaptive management" or learning process manner. This involves the provision of several complementary support services including competency training, dissemination of successful applications, and the active networking of practitioners and associations.
11. Immediately, a study should be initiated on the microcomputer electrical power issue. The study should document low-cost, reliable power options available to developing country microcomputer users.
12. AID should document management and technical areas where microcomputers can be rapidly, and cost-effectively used, and assure that software packages are available for these applications. In this, careful attention should be given to resource allocation and dislocation issues.
13. Microcomputer technology offers an exciting potential for dealing with policy analysis, policy making, and policy implementation. Priority attention should be given to applied microcomputer research in the policy area.
14. The private sector, in the U.S. and abroad, should be encouraged to develop immediate linkages with potential public and private sector microcomputer users in developing countries. As a first step a series of joint workshops should be held to inform private companies of the emerging global demands, and the U.S.'s area of comparative advantage.
15. Immediately, AID should move to provide Mission and AID/Washington microcomputer staff with information on recent microcomputer developments. Options include instituting a newsletter, a clipping service, or a special section in the Front Lines.
16. AID should consider sponsoring, possibly in conjunction with the World Bank and USDA, an international conference on "Microcomputers and Development". This multi-purpose conference would serve to share experience in various sectors, link the potential user and supplier agents, and carve out a more detailed set of proposals for future U.S. involvement and support in the micro-computer technology area.

June 3, 1982

**SURVEY OF MICROCOMPUTER AND AGRICULTURE MANAGEMENT
IN DEVELOPING COUNTRIES: A PRELIMINARY ANALYSIS**

Presented at the Joint USDA/AID Workshop

By Noel Berge
USDA/DPMC Consultant
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Washington, DC.

A. INTRODUCTION

In late 1981 the Development Project Management Center (DPMC) in the USDA initiated a research effort aimed at documenting and disseminating developing country experience with microcomputers in the area of agriculture management. One component of this effort was an initial survey of microcomputer use in USAID missions and developing country institutions. A summary of the survey findings are presented below.

The survey methodology was designed to gather the most obvious and well-known microcomputer applications. The main sources of information included: (1) Responses to an AID/Training and Development Division cable on microcomputer applications and (2) Responses to interviews with more than 100 persons associated with USAID and USDA funded development programs. The information was classified along a series of dimensions as presented in the attached tables. A description of the classification scheme is appended to the tables. This survey will be updated periodically over the next several months. The results will be incorporated in the final report due in September, 1982.

B. SUMMARY OF FINDINGS

The survey yielded a total of seventy-six (76) known applications in development projects.^{1/} The information was sorted into one of four user levels: 1)project; 2)mission; 3)personal; and 4) host country. The frequency of use by each level can be approximated by

^{1/} Those familiar with the use of microcomputers in developing countries feel that the total number of microcomputers being used is underestimated. The information presented here has been reviewed by many persons and is indicative of the probable level and use of microcomputers, but does not reflect the total universe. The microcomputer universe to-date is probably two to three times greater than that reflected in the survey data.

analyzing the data contained in columns one and two:

- o Projects 44
- o Personal 13
- o Mission 18
- o Host Country 8

There is considerable overlap between "personal" and the "project" and "mission" categories since personal computers are often used in the latter two categories. Project use is clearly the major application to-date.

Microcomputer applications have been confirmed in thirty-three countries. Countries are grouped into four regions: 1)Asia; 2)Africa; 3)Near East; and 4) Latin America/Caribbean. The number of countries with known microcomputers and the total quantity of microcomputers in each area is as follows:

Region	Number of Countries	Number of Microcomputers (Approximate)
o Asia	5	36
o Africa	16	52
o Latin America and Caribbean	9	19
o Near East	3	5
Total	<u>33</u>	<u>112</u>

These are only approximate, as mentioned before, but do reflect the distribution between countries and the quantities known to-date.

It is interesting to note that certain countries have created local networks of microcomputer users. This seems to be the case in both Nepal and Tanzania where there exists between ten and twenty known microcomputer users. (In both cases, the network includes users working for USAID, USDA, FAO and/or the IBRD.) These networks generally focus on the use of a single type of microcomputer.

The total number of microcomputers is one hundred twelve (112). The distribution of microcomputer by brand name reveals that there are ten to fifteen known different brands in use. (See column four.) The distribution of microcomputers by major brands is:

- o Apple 43
- o TRS80 15
- o Northe Star 11
- o Others 43

As mentioned previously, there seems to be a discernible pattern among the users of microcomputers by brand and country. It appears that these patterns emerge because of local environmental considerations such as

the need to share information and assist in troubleshooting/maintenance.

The columns on the second set of pages relate to the types of software in use and specific project applications. The majority of the software being used is "off-the-shelf" rather than "custom" designed. The major types of off-the-shelf software are word processing, electronic worksheets (i.e., Visicalc) and some form of data base management system. The areas of application can be best understood by reviewing the columns that contain the names of the general areas of use. It appears that the average user concentrates on the use of software for either word processing, some form of mass data storage and manipulation of data for reporting, or the monitoring.

The major field of microcomputer project use to-date is statistical analysis for research. This is also the area where custom software is most common. It should be noted that off-the-shelf software is now available and being used for statistical analysis at the project level. However, large-scale statistical analyses still rely on custom software.

Survey Table I: Microcomputer Country & Hardware

REC#	ORG. LEVEL (8)	SPECIFIC NAME (30)	COUNTRY (10)	HARDWARE (10)	SOURCE (8)	FIELD (5)	INTENDED USER (15)
1	POTENTIAL	RURALELEC;RICE RES INST	A/BGD	TRS80(12)	AID/OIT	AG/RD	UNKNOWN
2	PERSONAL	MISSION CONTROLLER	A/INDO	APPLE2	AID/OIT	ADMIN	ADMIN
3	POTENTIAL	MISSION	A/INDO	APPLE/1-2	AID/OIT	ADMIN	ADMIN
4	PROJECT	AG PLAN' & ADMIN PROJ	A/INDO	APPLE3/1+1	AID/OIT	AG	TECH & ADMIN
5	PERSONAL	MISSION(2)	A/NEPAL	APPLE2/4	AID/OIT	UNK	SELF
6	PROJECT	UNK	A/NEPAL	SOL	AID/OIT	UNK	UNK
7	PROJECTS	VARIETY!	A/NEPAL	APPLE2/11	AID/OIT	UNK	UNK
8	PROJECTS	VARIETY	A/NEPAL	CANONBX1/2	AID/OIT	UNK	UNK
9	PROJECTS	SEVERAL	A/NEPAL	EXIDY9DRC	AID/OIT	UNK	UNK
10	PROJECTS	UNK	A/NEPAL	HP9825	AID/OIT	UNK	UNK
11	PROJECTS	VARIETY	A/NEPAL	HP9835/2	AID/OIT	UNK	UNK
12	PROJECTS	SEVERAL	A/NEPAL	TRS80/2	AID/OIT	UNK	UNK
13	MISSION		A/PHIL	WANG130	AID/OIT	IMPL	ADMIN
14	PERSONAL	MISSION	A/PHIL	ATARI800	AID/OIT	UNK	SELF
15	PROJECT	REMOTE SENSING	A/PHIL	N.STAR	MAMU	AG	RESEARCH
16	POTENTIAL	MISSION OFFICER	A/SRILANKA	APPLE2	AID/OIT	UNKNOWN	SELF
17	MISSION	IBID	AF/CAMERON	APPLE2	AID/OIT	ADMIN	ADMIN
18	POTENTIAL	SAFGRAD/NAT'L CEREALS PROJ	AF/CAMERON	UNKNOWN	AID/OIT	AG	RESEARCH
19	PROJECT	AG MGMT&PLAN' #6310008	AF/CAMERON	N.STAR/2	AID/OIT	AG	TECH.
20	POTENTIAL	PROJECT:MAJOR CEREAL IMPROVEMENT	AF/EGYPT	UNK/2	MAMU/MSU	AG	RESEARCH
21	POTENTIAL	PROJECT:DAI(FIRM)	AF/EGYPT	OSI?	MAMU	PROJ.	STAFF
22	PROJECT	CATHOLIC RELIEF(PVO)	AF/EGYPT	APPLE2/3	MAMU/MSU	ADMIN	ADMIN
23	PROJECT	MSU AG. SURVEY	AF/EGYPT	TRS8011/1	MAMU/MSU	AG	RESEARCH
24	HCM	HEALTH	AF/KENYA	WANG2200NVP	MAMU/MSU	UNK	UNK
25	PROJECT	GOTSCH FOOD SECURITY	AF/KENYA	APPLE	MAMU	AGR	UNK
26	PROJECT	KENYA AG. RESEARCH INSTIT.	AF/KENYA	WANG	MAMU/MSU	UNK	UNK
27	POTENTIAL	PROJECT:REMOTE SENSING	AF/LIBER.	N.STAR	MAMU	AG	RESEARCH
28	HCM		AF/MALAWI	APPLE2	AID/OIT	UNKNOWN	UNK
29	PROJECT	AGRICULTURAL RESEARCH PROJECT	AF/MALAWI	HP-85/2?	AID/OIT	UNKNOWN	UNK
30	PERSONAL	MISSION EMPLOYEE(SDPRO)	AF/MALI	TRS801	AID/OIT	ABOVE	SELF
31	PROJECT	INST FOR RURAL ECON	AF/MALI	TRS801	AID/OIT	UNK	UNK
32	PROJECT	RAMS 682-0211	AF/MAURIT	HP85	OIT	TECH	TECH
33	HCM	MIN. OF PLANNING	AF/MOROCCO	APPLE2/2	AID/OIT	POP	PLANNERS
34	HCM	HCM HEALTH	AF/MOROCCO	APPLE2/2	AID/OIT	H/POP	TECH
35	PROJECT	REMOTE SENSING	AF/MOROCCO	N.STAT	MAMU	AG	RESEARCH
36	POTENTIAL	MISSION	AF/NIGER	APF1000	AID/OIT	UNK	SELF
37	POTENTIAL	MISSION	AF/NIGER	APPLE2	AID/OIT	UNK	SELF
38	POTENTIAL	HEALTH	AF/NIGER	APPLE/ETAL	AID/OIT	UNK	UNK
39	PROJECT	ONERSOL MENERGY PROJECT	AF/NIGER	HP?	AID/OIT		PLANNERS
40	HCM	MIN FOR PLANNING	AF/RWANDA	APPLE2	AID/OIT	POP	PLANNERS
41	PROJECT	LOCAL CROP SURVEY RESEARCH	AF/RWANDA	CROMEMCO3	AID/OIT	AG	RESEARCH
42	PROJECT	AG SURVEY AND ANALYSIS	AF/RWANDA	CROMEMCO3	AID/OIT	AG	RESEARCHERS
43	PROJECT	SOMIVAC	AF/SENEGAL	TRS80111/2	MAMU/MSU	AG	RESEARCH
44	PROJECT	SODEVA/REGION DEV ORG.	AF/SENEGAL	TRSI/1	MAMU/MSU	AG	RESEARCH
45	HCM	MIN OF AG & FORESTRY	AF/SL	N.STAR HOR	AID/OIT	AG	RESEARCH
46	MISSION	IBID	AF/TANZ	APPLE2	AID/OIT	POP	PLANNERS
47	MISSION	UNKNOWN	AF/TANZ	APPLE/2	MAMU	ADMIN	ADMIN
48	PERSONAL	UNK	AF/TANZ	APPL 2	AID/OIT	ADMIN	SELF
49	PROJECT	ARUSHA RURAL PLANNING	AF/TANZ	OSI&PDF	AID/OIT	AG	MGHNT
50	PROJECT	LIVESTK MKTING	AF/TANZ	SEE NOTE	AID/OIT	AG	RESEARCH
51	PROJECT	REMOTE SENSING	AF/TUNIS	N.STAR/2	MAMU	AG	RESEARCH
52	PROJECT	SAFGRAD FARMING SYSTEM	AF/U. VOLTA	TRS801&3/4	AID/OIT	AG	RESEARCH
53	PERSONAL		AF/ZAIRE	APPLE/2	MAMU	UNK	UNK
54	PROJECT	UNKNOWN	AF/ZAIRE	APPLE2	AID/OIT	UNK	SELF
55	PERSONAL	POSS PROJ WK	DAMASCUS?	APPLE	OIT	ADMIN	ADMIN
56	HCM	CENSUS WORK	LA/COSTARICA	APPLE/?	MAMU/MSU		

REC#	ORG.	LEVEL(8)	SPECIFIC NAME(30)	COUNTRY(10)	HARDWARE(10)	SOURCE(8)	FIELD(5)	INTENDED USER(15)
57	MISSION		IBID	LAC/BOL	IBMS110	USDA/MAMU	UNK	UNK
58	PROJECT		INTEGRAL COOPS	LAC/BOL	IBMS110/3	USDA/MAMU	COOP	ADMIN
59	PERSONAL		MISSION-T.DAVID JOHNSON	LAC/COL	TRS80	AID/OIT	UNK	SELF
60	MISSION		IBID	LAC/DR	TRS80II	AID/OIT	ADMIN	STAFF
61	PERSONAL		MISSION	LAC/DR	APPLE2	AID/OIT	MANY	SELF
62	PERSONAL		MISSION	LAC/DR	TRS80I	AID/OIT	MANY	SELF/WORK
63	POTENTIAL		PERSONAL/PROJECT	LAC/EDUC	UNK	OIT	UNK	PERSONAL
64	POTENTIAL		PROJECT:INT.RD 518-T-039	LAC/EDUC	UNKL	OIT	AG	ADMIN
65	PROJECT		REMOTE SENSING:AID	LAC/EDUC	N.STAR	MAMU	AG	RESEARCH
66	PROJECT		CRSP-BEANCOMPEA	LAC/EDUC	APPLE	OIT	UNK	UNK
67	POTENTIAL		PERSONAL	LAC/GUAT	UNK	OIT	UNK	PERSON
68	HCM		FAMILY PLANNING ASSOC	LAC/HON	APPLE2	AID/OIT	POP	PLAN'+TRN
69	PROJECT		NUTRITION#522-0124	LAC/HON	PERTEC	AID/OIT	NUTRI	PLANNER
70	PROJECT		MISSION CONTRACT	LAC/HON	CROMECON	AID/OIT	UNK	UNK
71	PROJECT		REMOTE SENSING	LAC/JAM	N.STAR	MAMU	AG	RESEARCH
72	PERSONAL		MISSION	LAC/PANAMA	ATARI800	AID/OIT	ADMIN	ADMIN
73	POTENTIAL		MISSION	NE/JORDAN	APPLE2	AID/OIT	MANY	STAFF
74	POTENTIAL		PROJECT:REMOTE SENSING	NE/SUDAN	N.STAR	MAMU	AG	RESEARCH
75	PERSONAL		MISSION OFF.	NE/YEMEN	ATARI800	AID/OIT	UNKNOWN	SELF
76	PROJECT		LOCAL RESOURCE FOR DEV.	NE/YEMEN	APPLE2/2	AID/OIT	PLAN'	PLANNERS

Survey Table II: Software Applications

TABLE NEW 2 REPORT (ALL RECORDS)

1.

REC#	SW1(8)	SW2(8)	SW3(10)	SW4(15)	SW5(20)	SW6(20)	NOTE(30)
1	UNKNOWN						NEW RADIO SHACK DIST/MAINT SER
2	WP/WP	APLOT/		DTP/DIS	V/PRO FINANAL	DBM/PERSONNEL	WIKING ON ADD'L APPLIC!
3	FINANAL			LIN REG-STATDATA	GRAPH/PROINPLFINANAL	PROJ EVALUATION	GETS WANG;3APPLE REPS THERE
4	V/	WP/WP	LP/	PROJ EVAL			IOWA STATE U IS CONTRACTOR
5	V/	WP/	DBMS/	C/RPTANAL&STOR	GEN OFFICE DUTIES	C/FIN&LOGIST MGMT	
6	UNK						NAMASTE APPLE CLUB
7	UNK						SOURCE
8	UNK						NAMASTE APPLE CLUB
9	UNK						NAMASTE APPLE CLUB
10	UNK						NAMASTE APPLE CLUB
11	UNK						NAMASTE APPLE CLUB
12	UNK						NAMASTE APPLE CLUB
13	SORT/		MATH PACK/SECURITY/				HAVE MINI FOR ADMIN/PROJ USE!
14	WP/	MAILIST/	DBMS/				
15	STATPKG/	WP/	DATA ENTRY				
16	UNKNOWN						
17	V/	WP/WP	REPORTING DATA PROCESSING				
18	UNK						
19	AG STAT						USDA DEVELOPED SW!
20	WP/	DBMS/	STAT ANAL/DATA COLLECTION	EXPERM.STATIONS			
21	UNKNOWN						DAI:SAID MANY MORE THERE!
22	WP/	V/			MONITORING 50 PROJ.	FISH PRODUCTION ANAL.	
23	WP/RPTS.	STAT/DATA C/DATA CLEAN	C/STAT.RES.SYSTEM	SCALE/MANUF.BUS.			
24	UNK						
25	V/	WP/	DBMS/		FOOD POLICY MODELING		SAID MORE THERE!!
26			DATA ANALYSIS				
27	STATPKG/	WP	DATA ENTRY				
28	UNK						AID DONATED
29	UNK						UNIV/FLORIDA CONTRACTOR
30	WP/	LP/	REG/	SAHEL STAT DB			SEVERAL AID FIN MINIS IN CTY.
31	UNK						BY PERDUE U
32							INPUT OUTPUT MODEL
33					DEMOGMODEL &SOCECON	PREDICTION	RAPID PROJECT
34					ISIS/EPIDEM24DISEASE		ISIS COPYWRITE PEND.
35	STATPKG/	WP/	DATA ENTRY				
36			ELEC FILE/PER. FIN/				
37	UNK						
38	UNK						EXTENSIVE INTEREST!!
39					DES&MODEL/HEATINGSYS		
40					RAPID DEMOG. MODEL		
41	UNK						LINK POSS WITH UNIV
42	UNK						POSS LINK/MINI AT CENSUS
43	C/CBA	C/DATANAL	C/RAINFALLV/FARM BUDGET		C/ANMAL WT PREDCTION	STATPAK/FSRSURVEYANAL	
44					C/FIELD AREA CALCUL.		
45					AG STAT ANALYSIS		WITH REMOTE SENSING PROJECT
46			RAPID MODEL				
47	WP/						HEARD SYSTEM INCOMPAT PROB!!!
48	V/	DBMS/	WP/		PARTICIPANT FILES		
49	DBM/	STATANAL			VILLAGE PROFILES DB		
50					VISITREND/PLOT/	ANAL LIVESTK GRADINGUSE MISSION APPLE2!	
51	STATPKG/	WP	DATA ENTRY				
52			ACCT PKG/		C/VILLAGE SURVEYDATA		MICH.ST U&FAO HAVE SW/APPLE!
53	UNK						BILL T VISIT SAID EVEN MORE!
54					HC WORKER SALARIES		
55	DBM/	WP/			PROJ DISBURSE. DBMS		
56	UNK	CORVAS NTKW!					

REC#	SW1(8)	SW2(8)	SW3(10)	SW4(15)	SW5(20)	SW6(20)	NOTE(30)
57	UNK						
58	ACCT/				C/INV.CNTRLFRM/INPUT	C/DBM	CONT.DALE KEY
59	STATPAK/						
60	V/	PAYROLL/	GEN LED/	INV. MGMT	PROFILE PLUS/	MODEIISCRIPSET+DIC.	STRONG SUPPORTER MICROS!
61	V/	WP/	STATISTICS				USED ON PROJECTS
62	WP/WP		V/FINPLAN'DBM/		DIAGNOSTICS(?)		
63	UNK						
64	MONITOR	REPORT					
65	STATPKG/	WP			STAT DATA ENTRY		RON STEELE USDA
66					STATPKG SOCSCI/		OTHER PROJ HAVE;NO INFO
67							
68	STOPOP/						
69	SIM.LP/		ECON MODELS		MAP PRODUCTION/		
70			MODELING(BELOW)		NETWK&LOCATION ANAL		CONT 405 232 3962 OLK CITY
71	STATPKG/	WP	DATA ENTRY				
72	GRAPHICS/		STATUS RPTS		SEN ANAL PROJ COSTS		MISSION
73	RAPIDPOP		ECON ANAL PROJ TRACKING				
74	STATPKG/	WP	DATA ENTRY				
75	NONE						
76		WP/WP	DBMS/	ISIS/STATISTICS	ENG/ARABIC LIBRARY		CHEMONICS!DEV.SW PROGRAMS!!

HOW TO USE THE MICROCOMPUTERS AND AGRICULTURE MANAGEMENT SURVEY TABLES

Data was collected on known microcomputer applications to development programs and projects funded by AID. The data was analyzed using the categories contained in these tables. The categories used were:

1. Organizational Level
2. Name Specific
3. Country
4. Hardware
5. Intended User
6. Source
7. Field of Application
- 8-
12. Software And Applications
13. Note

The data in the tables is ordered alphabetically by Region and Country (Column Three(3)). The categories are presented in the tables in the columns that correspond to their number, counting from left to right. The first seven columns are contained on the first page of each record and Columns eight through thirteen are contained on the second page. The record number is used to identify each record on both pages.

The first column, Organizational Level, was divided into four subcategories:

- o Project
- o Personal
- o Host Country Ministry (HCM)
- o Mission
- o Potential-for future acquisition

The first four subcategories were sufficient to capture the range of organizational levels using the microcomputer. "Project" referred to any microcomputer that was being used directly with a development project, for example, to monitor financial information, track training participants or do budget analysis. "Personal" was used to classify any microcomputer that was identified as being used only by the individual for household use or games. This included personal finance, learning computer basics or personal mailing lists. "Mission" was used as a subcategory when the data stated uses within the AID mission as being the predominant uses made of the microcomputer. In each case, it was the over all use pattern that determined the classification of the microcomputer. The use of "Host Country Ministry"(HCM) was useful since a number of uses or applications were with a specific ministry. This is the case in the RAPID population awareness project. The use of "Potential" served to distinguish any known future acquisitions that were pending.

The second column, Name Specific, was used to fill-in any detail

relating to the organizational level using the microcomputer. This was useful whenever a specific project name was given that could be used for future reference. Another use of this column was to identify the Organizational Level when the first column contained the subcategory of "Potential." Between the first and second column, it is possible to gain a perspective of the known uses and applications of microcomputers to project mission, personal and host country ministry organizational levels.

Column Three was used to identify the region and country for each of the known microcomputer applications. The regions used were:

- o Asia (A)
- o Africa (AF)
- o Near East (NE)
- o Latin America and the Caribbean (LAC)

Abbreviations were used for each country with a unique designation based on its' spelling.

Column Four contains data on the type and quantity of microcomputers. Again, each type/brand has been identified by name: brand and/or model designation; for example, AFP or any variation of this refers to Apple computers model I, II or III which were sometimes specifically identified. Another popular model is the Tandy TRS80 which comes in various models. There are a number of different brands identified.

Column Five was used to identify the source of the data contained in each row. The major sources are coded and refer to several cables sent out by AID concerning microcomputer use, interviews conducted with specific project personnel and data gathered through secondary sources.

Column Six was used to identify the field of application. By field is meant the type of program or project category: nutrition, rural development, agriculture, education, etc.

Column Seven referred to the Intended User. This was the level or type of person mentioned as the probable user. For example, if the microcomputer was to be used to collect survey data, then the Intended user was "research" unless it was stated otherwise.

The second page of data on each record contains the information concerning the types of software and the applications.

The software is either off-the-shelf or custom. If it is off-the-shelf, then it is designated by its' popularized name whenever possible; e.g.,

- o Visicalc (V)
- o Word Processing (Wp)
- o Data Base Management System (DBMS)

Other off-the-shelf software is identified by name when possible. Custom software is shown as "C." In all cases, a slash mark, "/", is used after the software program whenever known: V/, WP/, or C/. Whenever possible, specific applications were identified;

furthermore, if the type of software used was known to be off-the-shelf or custom, then it was identified accordingly: WP/project reports; V/budget analysis, C/rainfall analysis.

the final column is strictly a "Note" column. This is where any additional information was put that did not seem fit elsewhere, but considered important enough to be mentioned.