



IDRC-TS5e

Evaluation of the CARIS Pilot Project

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Introduction to Evaluation of the CARIS Pilot Project

Donald Leatherdale

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International Development Research Centre, Ottawa*

The concept of a Current Agricultural Research Information System (CARIS) was first formalized in November 1971, when the Sixteenth Session of the FAO Conference requested the Director-General of the Food and Agriculture Organization of the United Nations to submit a proposal relating to the exchange of information on research between member nations and institutions to promote the scientific and technological advancement of agriculture in developing countries. This recommendation was taken up with interest by the Consultative Group on International Agricultural Research, who proposed that, before proceeding to a worldwide system, a pilot project should be carried out to investigate comparative techniques and to assess the possible value of such a system.

The CARIS Pilot Project commenced in March 1972, under the leadership of M. Armand Thèvenin, who was seconded to FAO by the Government of France for this purpose. It was implemented with the same objectives as those proposed for a global system, which were to collect and disseminate information on research establishments and their current activities in the fields of plant and animal production, forestry, and inland fisheries. It was considered necessary to limit the scale of the project in two ways: firstly, to a single phase of data collection, with no activity in the area of updating the resultant information; secondly, to a single, suitably representative, geographical area.

The region chosen as best exemplifying the problems and working of a global CARIS was that of the West Africa Rice Development Association (WARDA), consisting of the nations of Benin, Gambia, Ghana, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo, and Upper Volta. Within the area covered by the WARD countries, there is wide variation in soils, climates, types of experiment station, and locally important crops. There are also two major languages for the description of research, English and French. It was felt as well that the operation of the CARIS pilot project would provide a further example of cooperation between the WARD countries, with data derived not exclusively from activities related to the improvement of rice cultivation.

The project was scheduled in four stages:

- (1) Planning and preparatory work on data collection;
- (2) Data collection: Questionnaires relating to 1555 projects were returned from 237 research establishments, and were translated into English or French, as appropriate;

- (3) **Data processing:** The information on research establishments and their ongoing activities was presented in two directories. One was in English and prepared by the Smithsonian Science Information Exchange (SSIE), using its own operational system. The other was in French and prepared by CARIS staff based at FAO, using a procedure set up for the purpose; and
- (4) **Evaluation.**

CARIS Evaluation Project

The evaluation of the CARIS pilot project was funded by the International Development Research Centre. Four main components were visualized:

- (1) *Input:* Evaluating the effectiveness of the methods and approaches that were used for collecting the data, both on research establishments and on research activities.
- (2) *Processing:* Assessing the comparative efficiency and effectiveness of the two systems that were used (SSIE and FAO/CARIS), and determining as far as possible their compatibility with other similar systems (such as AGREP of the European Communities and those of FAO and other United Nations agencies) and with such developing systems as the International Information System for the Agricultural Sciences and Technology (AGRIS).
- (3) *Output:* Evaluating the usefulness of the records and their printed outputs, and the effectiveness of the respective retrieval methods, in relation to the various needs of such groups of potential users as research workers, research administrators, and information centres.
- (4) *Future:* Recommending, by syntheses from the foregoing, possible approaches for the future development of CARIS from its intentionally restricted experimental phase to one covering research in all developing countries.

Dr O. Ojeaga Ojehomon, permanent representative of Nigeria to FAO, and M. Robert Lagi re, Institut de recherches du coton et des textiles exotiques, Paris, were appointed as short-term consultants by the Information Sciences Division of IDRC. Earlier data of value to these consultants were provided by M. Guy Vallaeys, Institut de recherches agronomiques tropicales et des cultures vivri res, Paris, who was unfortunately unable to proceed with a consultancy on this evaluation. It had been envisaged that the systems aspects should be investigated separately, but the findings of the first two consultants were in such close agreement that no such appraisal was necessary.

Dr Ojehomon traveled to institutions in Ghana, Liberia, Nigeria, and Sierra Leone, countries that had participated in the CARIS Pilot Project, and to Guinea, which had not. M. Lagi re obtained the views of a representative selection of agricultural research institutions in France before proceeding to visit institutions in Senegal and the Ivory Coast. Opinions on the usefulness and methods of CARIS and responses to a questionnaire were received by M. Th venin from many other institutions and organizations in developing and developed countries.

General Response to CARIS

In general terms, there was enthusiasm for the idea of CARIS, especially as a global system. All of the institutions and individuals visited by the consultants in West Africa agreed on the need for such a system to link separate efforts in agricultural research. The feeling in developed countries where directories of research activities are not so novel was more qualified; yet even there, criticism was leveled more at the presentation and the costs than at the system as an informational network. Countries outside the area of the pilot project expressed considerable interest and the wish to be

included in any expanded project. Symptomatic too was the attitude of several institutions in the WARDA countries who had failed to respond and thus were not included in the directories; they were eager to be included and thus to rectify the omission as soon as possible.

Input

The data collected were shown to be extremely varied in at least two dimensions: specificity of content and institutional coverage. Bearing in mind the experimental nature of the pilot project, both were to some extent explainable; but equally, both will need to be remedied in an operational system. The degree of detail that needs to be collected, both for printed directories or magnetic tape, is closely related to output requirements and will be considered later.

The question of institutional coverage, however, raises a fundamental point on the methods of data collection. The omission of many active establishments is disquieting. Although participation in the pilot project could not, of course, be enforced in any way, some mechanism will need to be introduced to ensure that all establishments with a responsibility for agricultural research are included.

Processing

Comparison of the processing differences, or systems differences, between FAO's French-language version of the CARIS directory and SSIE's English-language version was sometimes made difficult by a user's natural language preference. Indeed, when the evaluation was being discussed, it was thought that the difficulty might be so great that users in anglophone Africa would come out in favour of the SSIE version and users in francophone Africa be equally strongly disposed toward the FAO version. The consultants commendably overcame this problem; but comments in correspondence from other sources often indicated that only one version had been examined.

The consultants indicated many areas where processing changes were desirable, but there was nevertheless a decided preference for the FAO system as exemplified by the French version of the directory. The preference was particularly strong in the area of subject classification: the SSIE method was considered by the majority of users to be too theoretical, whereas the FAO method was thought to be more in tune with users' retrieval requirements. Refinement of the FAO / CARIS classification has already been undertaken in light of the consultants' reports. Steps have also been taken by the AGRIS Coordinating Centre to allow considerable compatibility between the subject categories and commodity codes used for AGRIS and the subjects and activities classifications of CARIS.

Output

There was general consensus that printed directories were the preferred form of output and would remain so for some considerable time. Most of the people interviewed by the consultants were interested in the provision of ancillary outputs, such as question-and-answer and SDI (selective dissemination of information) services, but certainly they considered services of this type only as additional rather than alternative ones.

It was generally recognized that the production of a global system of directories similar to those of the pilot project would be uneconomic. Schemes for breaking down global data into geographic, disciplinary, and commodity entities were considered in outline, but more importantly, there was a decided tendency toward simplifying the content of the directories by using a more simplified input. As mentioned under "Input," there was diversity of specificity concerning the research being carried out:

some establishments took the word "project" to mean an individual experiment, whereas others took it as "research program." This difference in interpretation occurred even between different establishments within the same country, but M. Lagière pointed out in his report that some of the misunderstanding arose from imprecise translation of the term "projet de recherche." Both extreme interpretations were generally rejected. To ensure a consistent input, more precise definition of terms would be required.

Users also evinced a preference for simplified project descriptions, in which the "title" and "objective" would be retained as data elements but "approach" and "results" would not be. It was felt that further data might be stored but not printed.

The information on establishments given in the directories was generally considered satisfactory, except perhaps for the inclusion of "financial support." Both consultants listed changes that were suggested by users.

Development

The Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research at its Eighth Meeting in July 1974 studied the evaluation reports of the IDRC's consultants and other views on user reaction and examined FAO proposals for the expansion of the CARIS project to cover all developing countries. The TAC concluded that:

- (1) There was considerable interest and enthusiasm among scientists, not only in the countries covered by the pilot project but also in countries that would wish to be included in any expanded project, for the provision of an information service on agricultural research of the CARIS type.
- (2) The information coverage of the project should be less ambitious than that of the pilot project directories concerning the level of detail recorded for on-going projects, with regard both to the practical difficulties of collecting and updating the mass of data required, and to the implied additional heavy costs those operations would incur.
- (3) Even if there were not a need for project data to be recorded as fully as in the pilot project, users need to be able to find out in general terms what research was being undertaken and where it was being carried out. The items considered to be suitable components of an expanded project include a directory of research stations and establishments, a directory of research scientists, and information on the main areas of active research at each station.
- (4) An approach on the lines of (1) - (3) above would be technically feasible. The data could be presented either sectorally or in a classified directory as prepared under the pilot project.

The TAC also saw considerable merit in establishing links between AGRIS and CARIS, and noted that AGRIS could be adapted to permit cross-linkages with particular reference to the inclusion of details of the institution where published work had been carried out. The TAC therefore urged FAO, in consultation with those concerned with AGRIS, to undertake the necessary revision and restructuring of its proposal for a worldwide CARIS project, taking into account the restricted nature of the research data coverage recommended in (2) and (3) above.

The TAC, recognizing that the considerable momentum generated by the pilot project should not be lost and that every advantage should be taken of the investment that had already been made in the pilot project, agreed that support should be recommended for an expansion of the CARIS project to cover operations until such time as the project could be absorbed into the regular program activities of FAO during the 1976-77 biennium.

Report on Evaluation of Current Agricultural Research Information System (CARIS)

Dr O. Ojeaga Ojehomon
Embassy of Nigeria, Rome

Effective 1 March 1974 the International Development Research Centre (IDRC), Ottawa, Canada, appointed me as consultant to evaluate the CARIS pilot directory. The directory had been prepared in two versions — English and French — from the information collected from various agricultural research institutions of the member countries of WARDA (West African Rice Development Association) to assess the reactions of research investigators and research administrators to the pilot CARIS directories and to consider their suggestions for its future development.

I planned to visit several research institutions in five West African countries — Ghana, Guinea, Liberia, Nigeria, and Sierra Leone — during March of 1974. In each country, research institutions to be visited were selected primarily on the basis of their contributions to the pilot CARIS directories except for the visit to Guinea, which was planned as an introduction to CARIS since no project descriptions were received from there. In all, I visited 24 research centres and talked with about 150 researchers and administrators of research.

The discussions focused on the two versions of the CARIS directory (one in French using the FAO (Food and Agriculture Organization) system of information processing, and one in English using the SSIE (Smithsonian Science Information Exchange) system) and brought out the investigators' views on the organization, style, and utility of the directories. Opinions on the development of the CARIS project were given too, on how the CARIS information should be presented — in printed directories, comprehensively or selectively, or in a question-and-answer retrieval service from computing centres.

On my arrival at any institution, copies of the directories were distributed to the staff who had a day or two to look through them before we held our discussions. Some institutions needed more time to study the directories and mailed us their comments. The group discussions engendered a vigorous exchange of ideas, and gradually conclusions emerged.

At the beginning of each group discussion, I introduced the CARIS project by explaining its background and describing the project as a response to the ongoing need of researchers all over the world for information on other current agricultural research — on who is doing what, where, and how — so that they can readily contact their counterparts to exchange information. It was emphasized that CARIS was to be distinguished from bibliographies of published papers with which researchers were already acquainted.

As each section of the directory was introduced, the participants were asked to comment on it. A summary of their opinions follows.

In spite of our limited time, and the small number of institutions visited, a variety of researchers and research administrators participated whose disciplines covered a wide range of agricultural research activities. This provided a diversity of views that may, therefore, be considered representative of a larger research community.

Researchers welcomed CARIS enthusiastically as a project that would satisfy a long-standing need for information on agricultural research projects worldwide. It was repeatedly stressed that a communication gap exists internationally between research officers because counterparts are unaware of each other's work except through journals or occasional international conferences. Consequently, there has been a very limited exchange of ideas on current research, and much duplication, which it is hoped that CARIS will correct.

Assessment

Although the idea of a single-volume directory is very attractive, it would be unmanageably large, and several alternatives have been suggested. No consensus was reached on a preferred size, but the evident impossibility of producing an international CARIS directory in a single volume emphasized that the project write-ups will have to be more concise. Directories could list crops primarily, and under each give the disciplines throughout the world involved in research on them or, alternatively, the emphasis could be on disciplines, with mention of the crops being researched. Another variant would subdivide the crops or disciplines by geographical regions or climatic zones.

CARIS Service Options

The printed directory had the most appeal to investigators as a quick reference source allowing ready communication with other investigators. The pilot directory was understood to be only a part of the service that CARIS could provide. Several suggestions were made about the initial operative phase and future development of CARIS.

It is agreed that CARIS's first step should be the computerization of the data, which could then be updated regularly. Once the data are computerized, CARIS can offer a variety of services.

A careful distinction has been made between inputs for the printed directory and for the computer. All parties agreed that as much information as possible per project could be stored in the computer, within the limits of its storage capacity. Investigators could subsequently draw upon the stored material through a question-and-answer retrieval service.

The question-and-answer retrieval service, although considered important, was not entirely popular. Considering current postal delays, most investigators were sceptical about the usefulness of the service. However, it could be streamlined by having the computer data available at other regional or even national computerized documentation centres, particularly if communication were by phone rather than letter.

CARIS Format Options

The CARIS directory is a compendium of some of the ongoing research projects in the WARDA countries. The English version is divided into two parts: the Research Project Section, containing project descriptions; and the section on the research institutions. Four indexes — subject, executive agency, investigator, and investigator by speciality — accompany the Research Project Section.

The French version contains the same project and research institution descriptions as the English version, but the organization of the French directory and the style of indexing and presentation differ markedly. There are three parts in the French version:

the descriptions of the research institutions are presented first; Part 2 contains the project descriptions; and Part 3 contains the five indexes — subject, activities, alphabetical list of contents, investigator, and investigator by speciality.

Research Project Descriptions

Program, project, and experiment descriptions are three possible ways to describe research. Investigators were asked which of the three possibilities they preferred to see used in CARIS. With the exception of two investigators who preferred to have research descriptions focused on the experimental level, the investigators preferred the program or project descriptions. Of these, the majority asked for project descriptions. The descriptions of work submitted by many institutions were a mixture of all three levels, suggesting that the CARIS work level distinctions were not made clear in the questionnaire.

Data

The scope of descriptions of projects was discussed at length. Some investigators argued that in a printed directory, the title, objective, approach, and progress of a research project should be given; others said that it was sufficient to have only the title and objective with all other details stored in a computer for retrieval on request.

The following items were chosen to be included in the project descriptions: institution; title; investigator(s); objective; supporting agency; and dates.

Organization

The project section of both directories was organized alphabetically by country and by institution within each country, but the projects were not grouped systematically. It was agreed that the organization of the projects for an institute should be in some order, such as by crop, discipline, or investigator. CARIS was encouraged to choose a system with projects listed alphabetically under each heading.

Listing of Network Projects

The section on research project descriptions was organized alphabetically by country and by research institution within each country. In the French version, the parent institution was listed alphabetically and its substations listed immediately following it, as in the institution description section of both the English and French versions. In the research project section of the English version, however, this order was not used. Here both the parent institution and substations were treated as independent units and listed alphabetically.

In English, the projects in the substations were also treated as if they were separate from those of the parent institutions, although, in fact, many of the stations were only trial sites in zonal or network trials. Consequently, many of their projects were primarily experiments initiated at, and supervised from, headquarters, and probably replicated in several other sites (substations). Although these projects were described as networks, they were given accession numbers in both versions of the directory, as if they had equal status with the parent projects.

Thus, the relationship between the parent institution and its substations was distorted, the true relevance of the network projects was obscured, and the number of projects listed in the directory was inflated. To correct this, the network trials in substations should not be given separate accession numbers; instead, the locations of network trials should be listed under the appropriate parent project. An alternative could be to repeat under the substations the parent project number and title in smaller type or in some other way to identify the substation's status in the network trial.

Institutions

The names of several institutions were unrecognizable in both versions of the directory. This may have been the fault of research institutions that incorrectly completed the appropriate section of CARIS Form A; it might also have resulted from excessive abbreviation during computer processing of the source documents, or from the separation of substations from parent institutions. The latter would appear likely as most of the names were listed correctly in the section on institution descriptions.

Title

It was suggested that the most important element of the project description is the title, both for indexing and retrieval purposes, and in attracting the interest of the investigator. Therefore, the title should be clear and comprehensive.

Identification of Investigators

The listing of investigators in the English (SSIE) version of the directory, where more than one were involved in a project, was widely criticized. In French, all investigators cited in the source document were named in the project description section; in English, only a principal investigator was mentioned. This caused resentment among the investigators, who felt slighted and questioned CARIS's choice of principal investigator in a cooperative project by researchers of equal status. They requested that all investigators cited on the source document should be identified, as in the French version.

Objective

The objective, it was stressed, should be concise. Actually the details given in most objectives could be rephrased as the titles, so that there would be no need to list the objectives.

Approach

A few investigators would have liked to have seen as much information as possible on the methodology used in each project. Some of them argued that they would like to know how a counterpart was doing his work before communicating with him, because the title and objective alone might not indicate whether an appropriate method were being used. On the other hand, many investigators argued that the section on approach should be deleted, because the limited information given would still require correspondence with the investigator for details on methodology. Other investigators suggested that the information dealing with approach in the pilot directory was not always useful. Where it was, they thought it should be retained and where not, omitted. The problem was how to decide when to include or exclude "approach" data.

Results

Although some investigators argued in favour of including information on results in the project description, most favoured its exclusion. Those who argued for its retention pointed out that it would help them to form a complete idea of a counterpart's work before communicating with him. It was therefore proposed that some brief but precise information on results should be included. Others argued that it was difficult, if not impossible, to present results precisely in a few lines.

One person pointed out that in some cases, the results are so informative that comparisons are possible without further correspondence, but the majority of investigators rejected this argument since they see CARIS essentially as a reference guide to further communication — like the yellow pages of a telephone directory. They argued that since CARIS focuses on ongoing research whose progress and results should be changing continually, any inclusion of those details in the directory would quickly be out-of-date, and that details of progress or results consequently have no place in a CARIS directory.

Identification of Supporting Agency

Where projects were listed following an institution's name, there was no doubt that the project was funded by that institution. However, where an external agency had provided the funds for some specific research, it was agreed that the supporting agency should be mentioned.

Project Dates

Several investigators asked for the commencement date and probable date of completion of a project to be included in the English version, as has been done in French.

Number of Projects in the Directory

Since network projects were given accession numbers in each trial location or station, the apparent number of substantive projects in the directory was overly large. However, several institutions and university faculties of agriculture were not entered in the pilot directory, and some institutions reported only a few of their projects. A total of 465 unreported project descriptions were collected from eight institutions after the pilot directory was prepared.

Definition of Agricultural Research

The types of projects that qualify for inclusion in CARIS need to be specified to various scientific research institutions and university faculties of agriculture. Uncertainties about this point led to the omission of several projects from the pilot directory.

Form B Questionnaire

Since time was lost waiting for the institution heads to sign all the questionnaires that were ready to return to CARIS, it was agreed that a single covering letter from each institution would be sufficient in future.

Translations

Generally, investigators were dissatisfied with the quality of the translations in the directories, and suggested better editing.

Indexes

None of the indexes on subject and activities was satisfactory to investigators, although those in the French version were more acceptable. However, there was unanimous support for a simple, alphabetical index, with the main terms based on crops, disciplines, and projects.

Two particular complaints were made about the indexes. It was observed that the main concepts chosen for classification were sometimes abstruse or far-fetched, and that the subject areas or activities were not arranged in any apparent logical order.

Subject Index (English Version)

The inclusion of this index was widely rejected, with comments ranging from "too difficult to use; totally unrelated to usual agricultural practice," to "no index at all is better than this one." Other criticisms follow:

(1) It was suggested that the type of classification used in the subject index was based on complete scientific knowledge, probably already in use by the Smithsonian Science Information Exchange, and bears little relevance to actual subjects or areas of agricultural research.

(2) There was excessive indexing including unnecessary classification terms (such as minor taxa of Insecta) requiring many cross-references, and leading sometimes to a dead end after a long frustrating search.

(3) The concepts used for the classification were not specific enough. Consequently, many unrelated projects were grouped under a common term, and related ones scattered about the index.

Some specialist groups, such as those in forestry, recommended the indexes used in bibliographies with which they were familiar. Among those suggested was the "Forestry Abstracts of World Literature," using the Oxford decimal method. The specialists argued that, if the same Oxford code numbers were used for CARIS, cross-referencing between bibliographic citations and CARIS would be simpler.

Subject Index (French Version)

Two indexes, "A, par sujets de Recherche," and "B, par Activités," were generally more acceptable than the subject index of the English version. The reasons were:

(1) The classifications were more closely related to actual agricultural research practice.

(2) They followed some easily recognizable patterns; references were simple and easy to follow, even though the limited cross-referencing made it possible for one to trace an item from only a few angles.

The consensus was that none of the subject indexes was adequate. Most investigators would like a simple subject index listing projects under disciplines, and disciplines under crops, all alphabetically.

Executive Agency Index

The unanimous conclusion was that this index was only of statistical interest and should be deleted.

Investigator Index

A few people questioned the value of the investigator index, arguing that, unless an investigator was already known, this index could not help an inquirer. But the majority of investigators found this index very useful by enabling them to keep track of the work and whereabouts of others, and so it was decided to retain it.

Investigator by Speciality Index

This was the most controversial index. At first investigators welcomed it, but after closer study, they criticized it. In principle, this could be a very useful index, but it was weakened by imprecise definitions and insufficient breakdowns of specialities. In other cases, certain specialities were subdivided excessively, and the boundaries between the subdisciplines were not clear, and even inaccurate.

Institution Descriptions

These were generally approved and the only objection expressed by some institutions concerned the inclusion of financial support. They argued that this was unnecessary, especially as it could be confidential, and that the information could change from year to year.

Conclusions

The principal suggestions made by the researchers were:

- (1) A printed directory would be more useful than a question-and-answer computerized retrieval service.
- (2) Project descriptions should only include data on the research title, investigator(s), objective, approach, progress, supporting agency, and dates.
- (3) Concise information should be included in the project descriptions; fuller information should be fed into the computer memory bank.
- (4) Substations should be listed alphabetically under their own parent institutions, and not listed separately in a full alphabetical listing.
- (5) Network projects should be given accession numbers under the parent institution, and not new numbers.
- (6) The projects listed under an institution should be arranged systematically, either by crop or discipline, in addition to a full alphabetical listing.
- (7) Institutions should be named correctly and in full.
- (8) All, and not only the principal, investigators should be listed under a project.
- (9) The supporting agency should be cited only with specially funded projects.
- (10) Indexes must be revised — a single alphabetical index is needed, and certain existing ones could be deleted.

Acknowledgments

Without the kindness and valuable assistance given me by many people during this tour, I could have achieved only a small fraction of my objectives. As it is impossible to identify everybody individually for thanks, I take this opportunity to express my gratitude to all those who helped me in any manner.

I should, however, like to express special thanks to the Ambassador of Nigeria in Rome, and through him, the Nigerian Ambassadors in Ghana, Liberia, and Sierra Leone, and the Chargé d'affaires in Guinea. Similarly, I thank the Ambassadors to Italy (and Permanent Representatives to FAO) of Ghana, Guinea, Liberia, and Sierra Leone, and through them, the various research investigators and administrators who all treated me so very kindly and courteously.

Appendix I

List of Institutions Consulted

Ghana

Council for Scientific and Industrial Research; Accra; managerial staff and coordinator for CARIS

Animal Research Institute; Accra; researchers

Food Research Institute; Accra; researcher

Crop Research Institute; Kumasi; administrators and researcher

Soil Research Institute; Kumasi; director and researchers

Forest products Research Institute; Kumasi; director

Guinea

Ministry of Agriculture; Conakry; minister and bureau chief

Ministry of Research; Conakry; bureau chief

Liberia

Firestone Plantations Company, Botanical Research Department; Harbel; researchers

University of Liberia, Department of Agriculture; Monrovia; dean of faculty and forestry expert

West African Rice Development Association (WARDA); Monrovia; managerial staff and researchers

Nigeria

Agricultural Research Council of Nigeria; Ibadan; secretary and chief scientific officer

Cocoa Research Institute of Nigeria; Ibadan; director and researchers

Federal Department of Agricultural Research; Ibadan; director and research staff

Federal Department of Forestry Research; Ibadan; director and deputy director

Federal Department of Forest Research, Savana Forestry Research Station; Samaru, Zaria; researchers

Institute of Agricultural Research, Ahmadu Bello University; Zaria; director and deputy director

Institute of Agricultural Research and Training, University of Ife; Ibadan; assistant director and researchers

International Institute of Tropical Agriculture; Ibadan; Outreach director and researchers

Nigerian Institute for oil-palm research; Benin City; director, deputy director, and researchers

Rubber Research Institute of Nigeria; Iyanamo, Benin; director and researchers

University of Ibadan, Department of Agricultural Biology; Ibadan; professor

CARIS Pilot Project: Evaluation Mission to France, Senegal, and the Ivory Coast

R. Lagièrre

Institut de recherche du coton et des textiles exotiques, Paris

The objectives of CARIS are to collect and disseminate basic information in the areas of agriculture, maritime and continental fisheries, and food technology, respecting: (1) research operations in progress; (2) research institutions and stations; and (3) researchers. In a nutshell, this information relates: *Who* is doing *What*, *Where*, *Why*, *How* and with *What Results*.

However, the services provided by CARIS are neither the distribution of abstracts (secondary documentation), nor the publication of brief articles for handy reference. We see it solely as information given by researchers to other researchers about their current activities, in a spirit of cooperation and with a view to establishing relations between fellow workers in the same field.

CARIS is based essentially on actual research operations. General information on institutions, stations, and support facilities serves to outline the context in which such activities take place; interesting though it is, this information — like data on climate and soils — was limited to occasional spontaneous comments. It was the research activities themselves that attracted most attention, both from the researchers consulted and the sponsoring administrative bodies.

We shall accordingly begin by examining the information distributed by the CARIS pilot project, with regard to both their gathering and content, and we shall then outline remarks and suggestions concerning the processing and distribution of information by CARIS worldwide; we shall conclude with a summary of the main points of our survey.

The opinions presented here were expressed personally by 203 people — research administrators, records officers, and mostly researchers — belonging to 32 institutions and stations working in or supporting agricultural research in West African countries.

Information Provided by the CARIS Pilot Project

In considering the information that is provided in the directories, it will be convenient to distinguish between information on the subject components and activities of research projects and information on stations and other establishments where the research is being carried out. These two aspects are considered separately.

Information on Research Activities

The main criticism directed against the pilot project concerned the heterogeneity of the information distributed with respect both to the level of the studies reported and to the style of the reporting. This has less to do with CARIS, whose explanatory notice

was sufficiently clear, than with the researchers, who divided their work and developed their reports more or less according to their personal inclinations.

Partial blame is also ascribed to the expression used in the questionnaire “Projet de recherche” (research project). French-speaking researchers did not understand it. They rejected it and unanimously suggested “*opération de recherche*” (research activity) to replace it. This term has the twofold advantage in French of indicating a study in progress (whereas “projet” suggests something in the future) and of identifying its proper level in the program/activities/practices concept of research. Generally, a research activity is the smallest unit enjoying distinct funding; it is usually multidisciplinary, and a researcher cannot reasonably take an effective part in more than four or five activities at any one time. The Ivory Coast uses the term “opération de recherche” with the same definition. For Senegal, the corresponding level is called “unité de recherche” (research unit). Both governments have the same notion in mind, and feel that their research should be reported in CARIS at the “activity” or “unit” level.

With regard to reporting style, 162 users (including a good many “suppliers”) out of 203 (81%) feel a need for codification and the elimination of unnecessary detail. Titles should be clear and concise, and should at once indicate the main objective of the activity. Supplementary information should be kept brief, in note rather than sentence form, and 50 researchers out of 162 go so far as to say it would be preferable to use descriptor words rather than sentences to indicate objectives and methods.

Remarks

Every kind of assessment was made of the content of the activity descriptions, ranging from a preference for much detail to the elimination of objectives, methodology, provisional results, and final results.

The possibility offered by CARIS of establishing direct relations by letter between researchers was clearly realized but variously assessed: “that is the chief value of CARIS,” “it means I’ll have to write ... and reply,” “will the other fellow answer?,” “what about forwarding?,” and “wouldn’t it be better to apply to CARIS central for additional information?”

Despite this divergence of opinion, we did attempt to identify some general trends on the basis of the answers given to a detailed questionnaire.

(1) Is the statement of provisional results necessary?

No: 163 (81%)

Yes: 30 (15%): How should they be formulated?

- | | |
|--|-----------|
| (a) summary with figures: | 15 (7.5%) |
| (b) 2-3 lines of explanation, without figures: | 15 (7.5%) |

(2) Is the statement of final results or partial results (at conclusion of each activity) necessary?

Yes: 117 (58%): How should they be formulated?

- | | |
|------------------------------------|------------|
| (a) summary with figures only: | } 77 (38%) |
| (b) same, plus report reference: | |
| (c) 2-4 lines of explanation only: | |
| (d) same, plus report reference: | 40 (20%) |

No: 76 (38%) What should replace them?

- | | |
|---|----------|
| (a) the reference to the report or publication: | 76 (38%) |
|---|----------|

Only 15% of the researchers would like to have provisional results; they were found almost exclusively among those working on perennial plants, shrubs, and trees; half of them would be satisfied with brief qualitative indications.

A majority (58%) of those consulted would like to see final results in the directory; such results should be presented in a brief abstract.

However, we should not underestimate the importance in relative terms of the 38% who feel that it is extremely difficult to assess the validity of a finding expressed in a few lines, when one does not know under what conditions it was obtained, and they request only the reference to the report or publication, preferring to consult the authors directly by writing to them.

It should be noted that the report reference is requested by 153 researchers, or 76% of those consulted; it is impossible not to take this into account.

Users do not appear to place very much emphasis on "objectives" as they are presented; most often such objectives are merely an amplification of the title, and improvement of the latter could avoid this repetition. Users would prefer an account of the research practices included in the activity.

Nor is there a clear majority in favour of a detailed statement of the methodology or approach used. The use of descriptors is most often recommended in the case of standard techniques. In the case of a novel technique, a very brief note would be sufficient to call attention to the fact and encourage others to apply to the researcher involved for further details.

The major problem is said to be that of access to the researchers' annual reports. The authorities responsible for scientific research in the Ivory Coast and Senegal would be agreeable to the distribution of these reports; they are studying the possibility of submitting to CARIS the annual synopses describing the stage that has been reached in each research activity. Governments participating in CARIS should either provide copies of their reports for distribution or send a copy of each one to CARIS central on a regular basis; CARIS would handle requests for information. Such a collection, with the main portions stored on microfiches, would constitute an extremely useful pool of "inside" information.

In addition to the observations and suggestions noted in the preceding paragraphs, the following procedures are recommended:

- (1) indicate the discipline to which the activity is related;
- (2) provide a reference to the program under which the activity is carried out;
- (3) date the profile;
- (4) indicate any liaison with other institutions in connection with a particular activity; and
- (5) include in the directory any work done in universities and elsewhere that has a direct bearing on agriculture (theses, and so on).

These points could be stored in the memory bank, or included in the directory.

In view of the foregoing, and in order to satisfy the largest possible number without giving the directory a character that it does not have and that many would deny it — that of a secondary periodical made up of abstracts — we propose that each operation should be reported in the directory as follows:

- (1) title;
- (2) list of activities;
- (3) review of methodology;
- (4) significant partial or final results (in summary); and
- (5) the reference to the report or publication where results have been published.

We will give two examples to illustrate our proposal (using imaginary data):

IV-300-0043¹ Retention and Percolation of Nutritive Elements in the Soil in Relation to the Level of Fertilization

(1400) A. Durand (01 / 72—12 / 76) Profile Prepared 5 / 2 / 74

Activities: (1) Inventory of nutritive elements in banana groves at Azaguié
 (2) Inventory of nutritive elements in pasture lands at Adiopodoumé
 (3) Inventory of nutritive elements in corn lands at Adiopodoumé and Korhogo

Standard research techniques.

Activity 1 completed; nitrogen percolation, phosphorus fixation.
Annual report, ORSTOM, agronomy department, 1973

IV-300-0052¹ Biocenotic Study of Insect Pests of the Cotton Plant

(1411) B. Durand (06 / 71—12 / 76) Profile Prepared 10 / 7 / 73

Activities: (1) Ecology of *Dysdercus voelkeri*
 (2) Ecology of *Heliothis armigera*
 (3) Predators of Aphids and Jassids

Standard techniques. Novel nutritive medium for *H. armigera*

Activity 1 completed; new knowledge on migrations of *D. voelkeri*.
Published in *Coton & Fibres Tropicales* 1973, 256-270.

Information on Research Institutions and Stations

The pilot project proposed describing each station on the basis of the following 10 characteristics:

- (1) full address, cable address, telephone number (if any);
- (2) geographical location: longitude, latitude, and altitude;
- (3) environment (climate, soil);
- (4) research staff (researchers, technicians);
- (5) area and layout of experimental fields;
- (6) special facilities;
- (7) teaching, training, and extension activities;
- (8) library, documentation, periodicals;
- (9) areas of activity; and
- (10) financing.

¹It does not seem necessary to report the name of the organization conducting the activity, since this is already indicated in the catalogue number (IV-300).

What were the opinions of the users consulted?

- | | |
|--|-----------|
| (1) fully satisfactory: | 126 (63%) |
| (2) satisfactory, but should be more complete: | 74 (37%) |

The main suggestions follow:

- (1) *add* date on which the institution or station was established, and give total area;
- (2) *add* date profile was prepared;
- (3) *add* type of agriculture carried on in the region (rain-fed, irrigated), crop schedule (seeding, harvesting), main product of the region;
- (4) *indicate* existence and layout of farm equipment fleet (animal traction and power traction);
- (5) *eliminate* the heading "4-research staff," and include this information under heading "9-disciplines and areas of activity," giving the number of researchers assigned to each discipline; this would provide a clearer picture of the station's activities;
- (6) *change* "areas of activity" to "disciplines and areas of activity," with information being provided by the station in accordance with a specimen list distributed by CARIS, and covering technology used and plants studied;
- (7) *complete* the item "area and layout" by adding details of afforestation cover and forestry, and land conservation and reclamation.

We find most of these suggestions excellent, and the information gathering form will be slightly modified.

Note the necessity for more accurate geographical data on research stations.

Information Gathering

Two types of forms were used to gather information, one for research activities in progress, and the other for details of the research stations themselves. A variety of opinions were expressed as to their wording, the manner of completing them, and who should do so.

Researchers were generally satisfied with the information requested on the forms. Opinions of users were divided on the explanatory notes accompanying the forms, but the general feeling was definitely positive.

Bearing in mind the observations and suggestions discussed in the introduction, we wish to present two improved specimen forms; they are appended to this section.

The Research Activity Form

We have already reported what most researchers wished to know. It rapidly became obvious that a good many of the forms had not been completed by the head of the activity; there were many reasons for this. The question thus arose as to who — in the researchers' opinion — should provide the information. Four possibilities were presented, and the results were as follows:

The research activity form should be completed by:

- | | |
|--|----------|
| (1) the head of the activity alone: | 25 (12%) |
| (2) the researchers' supervisor alone: | 4 (2%) |
| (3) the head assisted by his supervisor: | 92 (45%) |
| (4) the head assisted by a traveling CARIS expert: | 68 (34%) |

After examining the pilot project directory, a large majority of the researchers concluded that it was essential to require a high level of consistency in the presentation of information. They suggested two possible ways of achieving this, expressing a slight preference for the first: relying on the regulatory assistance of their supervisors, or seeking the advice of a traveling CARIS expert, at least during the first year. Perhaps the position of expert could be filled by one of them; the person concerned would take a brief course of training at CARIS central, and would then act as an adviser in the country where he was working, or in all the countries in a particular region.

The title of the research can be classified, and for greater detail, a number of descriptors, or key words, are selected from the information provided, and are indexed for cross-referencing. The CARIS coordination centre undertook to identify the key words for the pilot project. The responses of researchers to these proposals follow:

In your opinion, who should identify the information descriptors?

- | | |
|--|----------|
| (1) the chief of the activity alone: | 9 (4%) |
| (2) the head assisted by his supervisor: | 18 (9%) |
| (3) the head assisted by a traveling CARIS expert: | 61 (30%) |
| (4) CARIS central: | 98 (49%) |

The head, whether or not assisted by his supervisor, would prefer that CARIS central undertake this task, in cases where he does not possess the dictionary of descriptions, such as the AGRIS Thesaurus being prepared. The idea of the traveling CARIS expert is regarded by many as the best solution, if he has the dictionary, but a number of users, having decided at the outset that this was unworkable, opted in favour of CARIS central. It is obviously difficult to ask researchers to choose descriptors without the dictionary that gives their exact meanings. The best they can do is to suggest words, giving definitions, but this is a job that most of them would be reluctant to take on. However, if they do have the dictionary, we believe they are best qualified to choose the descriptors appropriate to their work.

Specimen Forms

Samples of the research activity profile and of the research station profile are on pages 24 and 25.

Information Processing

Comparison of FAO and SSIE Directories

With respect to cataloguing, classification and indexing, users were requested to compare two systems for processing the information:

- (1) the FAO Directory, printed in French; and
- (2) the directory prepared by the Smithsonian Science Information Exchange (SSIE) presented in English.

Almost all users consider the FAO system of coding, in which each project is given a three-part identification comprising country, institution, and project, more satisfactory than the SSIE system in which the code reflects country and project only. Researchers wish to be able to classify references found in the index by looking up the station, since the geographical location of the latter gives an indication of the climatic zone.

One special case was raised: how is reference to be made to a station if an activity includes trials spread throughout a country and being conducted by researchers who are not attached to that station?

Research Activity Profile

(1) CARIS number:

(2) Research station: (3) Prepared (date):

(4) **Title of Activity** (5) Begins:Ends:

(6) Discipline to which activity is related: (7) Program under which activity is carried out:

(8) Researchers: Disciplines / specializations:

(9) List of research practices involved in subject activity:

(10) Standard methodology indicated by descriptors:

(11) Novel methodology (brief notes):

(12) For research activity on shrubs and trees — summary of provisional results (2-3 lines):

(13) Partial results (activities) or final results qualitative (2-4 lines):

If published give reference:

(14) Material already published on activity in progress:

(15) Liaison with other institutions in connection with this activity:

Research Station Profile

(1) CARIS number:

(2) Sponsoring administrative body: (3) Prepared (date):

(4) **Research Station** Established (date):
Registered land area (hectares):
Long: Lat: Alt:

(5) Research organizations involved: Established (date):

(6) Local agriculture: rain-fed ☐ irrigated ☐ Main product:
Normal seeding time:
Harvest time:

(7) Disciplines and areas of activity, with number of researchers in each discipline:

(8) Products being studied:

(9) Experimental fields: total area (hectares), including:

Under cultivation		Pasture	Forest and silviculture	Ponds & fish breeding	Land conservation & reclamation
nonirrigated	irrigated				
ha	ha	ha	ha	ha	ha

(10) Special facilities: (11) Farm equipment:

improved: yes ☐ no ☐

animal traction ☐

power traction ☐

(12) Teaching, training, and extension activities:

(13) Library, documentation, periodicals:

(14) Funding (total amount):

The question of a system for classifying information did not give rise to a great deal of discussion. The FAO system corresponds to the technical classifications with which agricultural researchers are familiar (research subject and research activity); they quickly became accustomed to it.

The SSIE system, which is essentially documentary and much more general in character, was deemed to be incomplete and unsuitable. This assessment should be considered with the understanding that the directory using the SSIE system was in English while most researchers interviewed were francophone. Their job of evaluating the English directory was made even more difficult by its lack of brief summaries of major sections.

The following figures show how opinions were divided:

	<i>Classification</i>	<i>Research Index</i>
Advocates of		
(1) the FAO system:	191 (95%)	178 (89%)
(2) the SSIE system:	9 (4%)	8 (4%)

Many felt that the FAO alphabetical subject index was deficient in exact descriptors, and a number of suggestions were made for improvements:

- (1) using the SSIE system as a basis, adding numerous exact key words that would not be used, but would refer to more general descriptors;
- (2) combining the subject index with the alphabetical subject index, keeping only the activity index separate.

The second of these suggestions appears to be promising, and deserves further study; it would also have the advantage of avoiding a closed subject classification that could not be expanded.

A number of preferences were formulated:

- (1) The indexes should be placed at the beginning of the directory, the alphabetical subject index coming first, followed by the other two, each with its classification.
- (2) The names of disciplines and commercial products should be included in the index.
- (3) Vernacular plant and animal names should refer to the corresponding Latin terms.

Information Dissemination

Printed Directories and Inquiry Service

The information collected was disseminated by means of a general directory of research activities, in book form. Naturally there are other possible methods of communicating information to the researcher: selective distribution of information, an inquiry service, direct consultation using information stored on tape in a number of cities equipped with retrieval equipment, a data bank, and so on.

The 203 researchers questioned were quite clear about their preferences on this point:

(1) dissemination by directory only:	58 (29%)
(2) directory plus inquiry service:	132 (61%)
(3) inquiry service only:	9 (4%)
(4) selective dissemination of information:	0 ¹

¹After the first 60 people replied "no," we stopped asking this question.

The answer is clear: 90% require a printed directory in order to keep properly informed. Both their areas of activity and their information needs are too broad to warrant selective dissemination. A directory in book form is a practical tool that can be consulted regularly, and that can in many cases supply information for which the need cannot be foreseen. Without this printed medium the information stored on tape will lose much of its usefulness, since it will not be adequately employed. Furthermore, the availability of a directory encourages a researcher to consult it and improve his knowledge, something that a tape cannot do whether it is 10 000 or only 1000 km away.

The directory in book form is thus essential to the successful operation of CARIS. If the written style is kept concise, the directory's size should not become excessive, at least in the first 10 years. On the basis of the size of the directory for the pilot project, which covered 13 countries, and bearing in mind that about one-third of the research activities were not included in it, it is possible to roughly estimate the size of a directory covering 65 countries.

	<i>13 countries</i>	<i>65 countries</i>
Stations and institutions	50 pages	250 pages
Research activities	300 pages	1500-2000 pages
Indexes	180 pages	900 pages

There is nothing alarming about this. Very few researchers will have to consult the 1500 pages of the directory of research activities, as shown by the following replies:

- (1) In which form would you like the directory presented?
 - (a) as an all-inclusive work (such as the pilot-project directory): 19 (9%)
 - (b) divided into sectors: 179 (89%)
- (2) If it were divided into sectors, on which basis?
 - (a) by disciplines: 99 (49%)
 - (b) by types of product: 47 (23%)
 - (c) geographically (by continent or subcontinent): 33 (16%)

Apart from the usual broad divisions, we were asked to group subjects under the following headings, as far as possible:

Scientific disciplines

Environment
 Farm machinery
 Agricultural economics, sociology (demography)
 Animal sciences
 Animal physiology, nutrition, and feeding
 Animal pathology
 Plant protection (entomology, pathology, plant protection products, protection techniques)
 Physical and biological oceanography (fish biology)

Types of product

Animal production (husbandry, pathology)
 Forest production and fisheries

Geographical sectors

Europe (not including the Mediterranean Basin)
Mediterranean Basin
Sub-Saharan Africa and Madagascar
Middle East and Asia
Oceania
North America (Canada, USA)
Central and South America

Classification under such headings would enable a researcher to find in one place the largest possible number of activities of direct interest to him. He will be able to use the inquiry service to obtain additional information on sectors other than his own, or to learn the most recent results that have not yet been published.

Multidisciplinary research stations and research management centres will undoubtedly have information on all geographical sectors. Researchers in their immediate vicinity will be able to make use of this, and will probably make only occasional use of the inquiry service. The latter will nevertheless be of use to isolated researchers.

The researchers' interest in a directory in book form was further demonstrated in their replies to the following hypothetical question:

If the human and financial resources of the FAO were insufficient for a full CARIS service to be set up immediately, should we:

- | | | |
|--|-----|-------------|
| (1) confine ourselves to the printed directories
(manual documentation)? | 35 | } 173 (86%) |
| (2) confine ourselves to the directories but process
the data and computerize them for later use? | 138 | |
| (3) immediately establish an inquiry service? | 20 | (10%) |

The inquiry service is seen as a complement to the printed directories and 30% of the researchers questioned saw no need for it if they had access to information on all geographical sectors. CARIS is seen as a printed directory to be consulted at will, rather than a tape storage to be searched. Thus, the printed directory is a basic document, and provision will have to be made to revise and update it. Opinions on the optimum frequency of revisions were varied:

<i>Republication</i>		<i>Updating</i>	
(1) (a) every year:	4	without updating	27
(b) every 2 years:	17		
(c) every 3 years:	6		
(2) (a) every 3 years:	9	plus updates	(a) every year: 152
(b) every 4 years:	14		(b) biennially: 20
(c) every 5 years:	149		(c) by means of
(d) every 6 years:	1		the inquiry
(e) every 10 years:	2		service: 3
(3) no republication, but updates every 6 or 12 months by means of the replacement of entire pages:			1

The preferred arrangement is republication of the directory every 5 years, with annual updates covering new activities as well as the final results of completed ones; these would be printed on loose leaf for inclusion in the directory.

A 3-year interval without updates but with recourse to the inquiry service for new information on a given subject would also be acceptable.

An Agricultural Data Bank

Data banks are already in existence in mechanical engineering, physics, chemistry, physical oceanography, and so on; others are being prepared (biological oceanography); still others can readily be imagined: farm machinery, economics, technology, and statistics. Researchers find it somewhat difficult to see what the nature and purpose of an agricultural data bank would be, outside of a few specialized branches of agriculture.

They would be strongly in favour of it if they thought it feasible, but they found it difficult to believe that it was, due to the extremely restricted validity of results obtained in the field of agricultural research, which are strongly affected by local factors and by the methods used, and which change as research activities proceed; generally speaking, agriculture is not an exact science.

Replies to the question: "What do you think of an agricultural data bank, and what use would you make of it?" were as follows:

- | | |
|---|-----------|
| (1) Unfeasible, unrealistic, and pointless except in specialized sectors: | 148 (74%) |
| (2) Feasible and useful (technology, machinery, systems, plant protection chemistry): | 27 (13%) |
| (3) No opinion | 28 (13%) |

Very few see the feasibility of an agricultural data bank, except in certain sectors. But even if it were feasible, it is not one of their primary concerns. They feel that existing documentation services, plus those of AGRIS level II, and the possibility of writing to researchers in other countries, enable them to satisfy most of their requirements insofar as data are concerned.

Conclusion

At the end of this survey of researchers, we can state that CARIS is being well received, even that it is now eagerly awaited.

At the end of each 2- or 3-hour session, our interviewees were asked for a candid answer as to the usefulness of CARIS: did it conform to their wishes? They replied as follows:

- | | | |
|---------------------------------------|-----|-------------|
| (1) very useful (in fact, essential); | 38 | } 172 (85%) |
| (2) useful: | 134 | |
| (3) of some use: | 25 | |
| (4) of no use: | 1 | } 31 (15%) |
| (5) no opinion: | 5 | |

Of the potential users consulted, 85% feel that CARIS will be useful or very useful if the requested frequency of publication is maintained, if service is speedy, and if the information provided is up to their expectations.

CARIS will be an excellent information medium that will not compete with documentation services, and will offer researchers access to the world of agricultural research.

How are their needs to be satisfied?

- (1) By providing clear and concise information on research activities.
- (2) By providing complete information on research stations.

(3) By a regular gathering of information, and dissemination of same with a minimum of delay. They are perfectly willing to complete the forms every year, provided that good use is made of their input.

(4) By processing the information using a slightly improved FAO system.

(5) By disseminating printed directories. The subject matter could be divided into four main parts:

- (a) a directory of research institutions and stations (about 250 pages, 1 volume);
- (b) indexes by research subjects and by disciplinary activities (about 600 pages, 1 volume);
- (c) the author indexes (alphabetical and by discipline) and the indexes of stations (about 250 pages, 1 volume);
- (d) the directories of research activities (about 1500-2000 pages, *n* volumes) including, for example, individually or in groups: plant improvement (genetics, breeding, vegetative improvement); plant protection (pathology, entomology, plant disease control products, protection processes); climate, water, soil (soil science, soil biology, soil physics, and soil chemistry); plant physiology; cropping and harvesting techniques (farm machinery); rural economics; sociology; technology animal sciences (animal physiology, nutrition, feeding, and pathology) physical and biological oceanography; or inland fisheries.

Volumes (a), (b), and (c) could be published every 5 years, with no updating. Those in category (d) would be updated annually and reissued every 5 years.

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We would also express our thanks, and our apologies for any disruption of their activities, to the Senegal Scientific and Technological Research Branch (Mr Sene), the Ivory Coast Ministry of Scientific Research (Mr de Dinechin), the Director of the Senegal Institute of Agricultural Technology, the Technical Director of OCLALAV (Mr Afoyon), the directors of the various research institutes, and the director of ITIPAT in the Ivory Coast. We are most grateful to our colleagues, the researchers who agreed to take part in this survey; we hope that future results will reflect their wishes.

Finally — last but not least — we shall definitely not fail to mention all that we and CARIS owe to the coordinating team placed at the FAO's disposal, under the leadership of Mr Armand Thevenin, an agricultural and forestry engineer. The quality of the directories and the speed with which the first three phases were completed were a pleasant surprise for the researchers, who in turn could not do less than respond as well as they did to the questions asked during this fourth and final phase.

Appendix I

List of Institutions Consulted

France

Centre technique forestier tropical (CTFT); Nogent-sur-Marne; researchers and records officer

Institut d'élevage et de médecine vétérinaire des pays tropicaux (IEMVT); Maisons Alfort; laboratory supervisors, records officer

Institut français des recherches fruitières outre-mer (IFAC); Paris; managerial staff, records officer

Institut français du café et du cacao et autres plantes stimulantes (IFCC); Paris; research supervisors, records officer

Institut de recherches agronomiques tropicales et des cultures vivrières (IRAT); Paris; research supervisors, researchers, records officer

Institut de recherches du coton et des textiles exotiques (IRCT); Paris; research supervisors, researchers

Institut de recherches pour les huiles et oléagineux (IRHO); Paris; managerial staff, research supervisors, records officer

Centre d'études et d'expérimentation du machinisme agricole tropical (CEEMAT); Antony; managerial staff, researchers

Senegal

Délégation générale à recherche scientifique et technique (DGRST); Dakar; director and data-processing specialist

Institut de technologie alimentaire (ITA); Dakar; managerial staff, research supervisors

Organisation commune de lutte antiacridienne et de lutte antiaviaire (OCLALAV); Dakar; technical director, experts

CTFT, IFAC, and IRHO offices; Dakar; administration and extension representatives

Laboratoire national d'élevage et de recherches vétérinaires (IEMVT); Dakar; managerial staff, researchers

Centre national de recherches agronomiques (IRAT); Bambey; researchers

Station de recherches des fibres textiles (IRCT); Kaolack; researchers

Office de la recherche scientifique et technique outre-mer (ORSTOM); Dakar; managerial staff, research supervisors, researchers

Ivory Coast

Institut pour la technologie et l'industrialisation des produits agricoles tropicaux (ITIPAT); Abidjan; director, research supervisor, researchers, records officer

Station sylvicole (CTFT); Bouaké; researchers

Station piscicole (CTFT); Bouaké; researchers

CTFT centre for the Ivory Coast; Abidjan; researchers

Centre de recherches zootechniques de minankro (IEMVT); Bouaké; researchers

Station de recherches fruitières (IFAC); Anguédédou; researchers

Station expérimentale (IFCC); Bingerville; director, researchers

Station de recherches d'agronomie tropicale et des cultures vivrières (IRAT); Bouaké; researchers

Station de recherches du caoutchouc en afrique; Bimbresso; researchers

Station de recherches des plantes textiles (IRCT); Bouaké; managerial staff, researchers

Station de recherches des plantes oléagineuses et huiles (IRHO); La Mé; researchers

ORSTOM centre; Adiopodoumé; director, researchers

ORSTOM centre; Abidjan; researchers

Centre de recherches océanographiques (ORSTOM); Abidjan; researchers

