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Introduction to the original edition

The need for training targeted at African agricultural research scientists on the procedures and techniques for writing and publishing the results of their research has been identified by a variety of institutions, organisations and agricultural research and development networks throughout the region.

Early in 1990, the West Africa Rice Development Association (WARDA) and the West African Farming Systems Research Network (WAFRSN), coordinated by the Semi-Arid Food Grains Research and Development Project (SAFGRAD), met in Bouaké, Côte d'Ivoire to discuss this training need and to formulate a joint effort to organise a series of training courses in scientific writing for agricultural research scientists in West Africa. This discussion led to an expert consultation in Ouagadougou, Burkina Faso, supported by the Ford Foundation and the Technical Centre for Agricultural and Rural Cooperation (CTA) in 1991.

At this consultation, the target audience for these courses was identified, details of the training course curriculum and pattern of instruction were elaborated, and a 3-year training project was developed. An important component of this project was the development and publication of a training manual to accompany these courses.

Group training started in Togo in 1991, and has continued every year, with the International Centre for Research in Agroforestry (ICRAF) collaborating from 1994. Our aim in these courses is to achieve the following:

- strengthen scientific communication capabilities of agricultural research scientists in Africa;
- encourage and promote a culture of scientific publishing among agricultural researchers;
- create a community of agricultural researchers who regularly communicate with one another and thereby minimise scientific isolation;
- share experiences on problems encountered by researchers in publishing their research.

During the training sessions, we focus attention on analysing the structure of a scientific research paper, planning the writing process, observing style and ethics in scientific writing, correctly citing bibliographic references, and presenting agricultural research results orally.

We adopt a multifaceted approach, which includes a combination of lectures, a complete interactive mode between trainers and trainees and among the trainees themselves, experiential learning and feedback, hands-on practical exercises, working group activities, group discussion and critique, demonstrations, and the use of video recording.

This training reference manual has been developed and field tested as we have implemented this training project. In writing it, we have endeavoured to incorporate the procedures for citing references that are specified in the revised Council of Biology Editors' Manual *Scientific Style and Format*, published in 1994. We hope that it will serve as a guide to young agricultural research scientists who are starting their research and scientific publishing careers.

This manual can also be used by resource people preparing curricula and course notes for in-country training courses in scientific writing. In such cases, it is strongly recommended that the course curriculum be adapted to the particular needs of the target audience by selecting units and topics from this book and giving the necessary emphasis to those of particular interest to the group being trained.

Paul Stapleton

Avenues for the
communication
of science

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1.1 Introduction

Science and scientific research are essential components in the process of development. Continued agricultural research is critical to the progress of countries that are agriculturally based. Disseminating the results of such research so that they can have a clear impact is also essential. However, a problem in many countries is that information is not easy to obtain – research results are ineffective unless they are put to some use.

Most scientific communication today is still made in written form – even though websites such as YouTube feature hundreds of thousands of science-based films. Effective communication is based on the people involved in the system, of whom none is more important than the interpreter or editor, who is able to see what sort of information should go where, how, and to the best effect. Most scientists are not expert writers; they are professional scientists. But with a little effort, all scientists can go some way towards adapting their material to suit a specific audience. The most common example is the way that scientists can generate a visual presentation to a meeting from a research paper that they have written. This chapter is concerned with avenues of communication within the research field.

1.2 Objectives and expected learning outcomes

After completing this chapter, you will be able to:

- recognise the different avenues of communication within scientific research;
- choose the avenue most suitable for the audience you are addressing;
- be aware that you must adjust your writing style to suit the needs of your audience.

1.3 Avenues of communication within the research field

What avenues of communication do scientists have open to them in order to deliver information? For research communication, these include:

- research journals;
- research reviews;
- short communications;
- conference papers and posters;
- theses;
- books and book chapters;
- annual reports;
- working papers;
- newsletters;
- project proposals and reports;
- websites;
- blogs and discussion groups.

Each of these has specific uses in certain situations.

1.3.1 Research journals

The purpose of a research journal is to publish scientific papers that communicate new and original information to other scientists. Every journal has its own definition, but almost all of them centre on the phrase ‘original research’. That means research that has not been done or published before. The research paper takes a hypothesis and tests it by experimental methods in order to reach conclusions. Research journals are the most common organ of communication in science.

There are two types of reader of research papers. One is the expert in the field, who will want to read all of the paper to obtain all the information from it. But, more commonly, there are more casual readers, who will be interested in the results only as a background to their own work.

In their initial form, research journals may be widely disseminated, as paper publications and online; in their secondary form, where titles, or titles and abstracts, are published by the secondary publishing industry, they are exposed worldwide.

Assessment of the number of papers a scientist has published as a measure of their success and as a basis for promotion is very common. In the United States and some other countries it has gone even further – if a scientist does not produce papers from their research, they cannot obtain funding for their research, and they may lose their job.

The findings in most international research articles are believed to be fact because they are known to have been refereed or judged by experts in the field before they can be accepted for publication. Because of the high standards usually required of articles in overseas journals, it is often difficult to have a locally based paper accepted.

The whole basis of peer-reviewed publication is to make available work that is worth publishing. Scientists should not be rewarded for writing a paper; they should be rewarded for performing work of a sufficient standard that they can write a paper based on it that is acceptable to a critically minded audience. The system becomes meaningless as a measure of merit and promotion if any and all papers are accepted and published without critical assessment.

Publishing research results internationally will stimulate debate and encourage further work on the subject. It will produce information exchange, advance knowledge, and open up new opportunities for research. To achieve this, a paper should be directed at a specific journal read by a suitable audience of interested researchers.

1.3.2 Research reviews

The review is a special type of scientific article that, in many ways, is like an extended version of the discussion section of a research paper. An essential feature of a review is that the reader is led to the frontiers of science in the area covered.

The review summarises all aspects of a particular field; it also develops logical arguments until they end in new hypotheses, and speculations on how they may be tested. It leads to new areas of research, which must be testable and must be supported by facts – but the review is not a catalogue of facts. Rather, it interprets existing facts and theories within a particular field, often with the intention of explaining that field to other workers in closely allied fields of investigation.

1.3.3 Short communications

These are preliminary results of a project, perhaps one season's results, or results that are not of major significance but are nevertheless interesting. The exact nature of these communications will vary with the target publication.

1.3.4 Conference papers and posters

Conferences offer scientists an opportunity to present results of research that is still at a preliminary stage, but that contains interesting developments. Because time is limited during a conference session, papers that are presented orally at conferences are necessarily short. They are usually confined to a brief presentation of the methods and, more importantly, the results, which may be preliminary, and several clearly stated points brought out in the discussion. Speculation can be introduced; interpretation is by far the most important area to have impact. The version presented for publication can be more thorough. Conference organisers accept or reject papers based on an abstract that the author submits.

Reviewers develop a list of papers and allocate them to different sections of the conference. Usually there are many more papers submitted than can be read, so organisers offers authors of less significant, but still interesting, papers the chance to present a piece of work as a poster. Authors have wall space, usually about 1 × 1.5 metres, on which to present their findings, and are given an opportunity to discuss their work with passing scientists.

1.3.5 Theses

The thesis is written evidence of sustained research, testing a particular hypothesis in a novel area, done over a considerable period, usually 5 or 6 years. The overriding characteristic of a thesis is its length. It generally contains an extensive review of the literature, as well as the results of a number of experiments, all aimed at testing a unifying hypothesis. Some of the material may already have been published in a series of research papers during the course of the research.

1.3.6 Books and book chapters

The book chapter is a synthesis of knowledge and information about a particular subject. It rarely has a fundamental hypothesis. It is more likely to form one part of an overall contents list that, taken together, exhaustively describes a clearly defined aspect of one field of science.

1.3.7 Annual reports

Annual reports contain straightforward descriptions of work that has been done during a year or 12-month period. The intention is not so much to prove a hypothesis, rather to describe activities, justify budget expenditure in terms of research undertaken, and demonstrate impact to attract more funding. The traditional approach to annual reports was to describe all activities of all the programmes of an institution. This approach is useful to give an overall idea of the institution's work, and to form a historical record. However, such reports can be long and very detailed. There is a tendency more recently for annual reports to concentrate on one aspect of the institution's work, or to select the areas of work that have had most impact.

1.3.8 Working papers

A working paper or technical report may be a preliminary report of a piece of research that is interesting, but suitable or intended for peer-reviewed publication. In many cases, a working paper can be developed later, with the addition of more material, into a scientific paper. Often authors may release working papers to share ideas about a topic or to elicit feedback before submitting to a peer-reviewed conference or academic journal.

1.3.9 Newsletters

The purpose of a newsletter is to communicate quickly facts that are of interest to its readers. Thus the content of any contribution is basically factual, with little emphasis on justification or methodology. Usually having a more general readership, newsletters should never be regarded a substitute for the true publication of research results.

1.3.10 Project proposals and reports

A project proposal represents the justification for a programme of work, with the aim of producing measurable outputs that will demonstrably reach a clearly defined objective. Like a research paper, it starts out with a hypothesis that has led to a proposed course of action and a programme of research designed to test the concept.

1.3.11 Websites

Most research institutions now have a website, where they present their most up-to-date or significant results, describe the institution and its programmes of research, and list its staff. Often there is a list of publications, with some sites offering the possibility of downloading copies of institutional publications, working papers, etc.

Websites have a potentially huge audience with different levels of expertise, and so offer scientists an opportunity to publicise the results and impact of their research to groups of people different from the usual scientists.

1.3.12 Blogs and discussion groups

A blog (a contraction of the term 'web log') is a type of website, usually maintained by an individual, with regular entries of commentary, descriptions of events, or other material such as graphics or video. Blogs are personal, representing the views of the writer, and so offer scientists a chance to put forward their own ideas, free of the constraints of the institution they are working within.

Discussion groups are electronic meeting places, where groups of people with a common interest can share their views in a continuing discussion.

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1.4 Audiences

Many groups of people are concerned with agricultural research in one way or another, but have very different needs, and receive information in different way. The most common audience groups include:

- researchers within a specific field of research;
- researchers with a peripheral interest in a field of research;
- research managers;
- extension agents;
- university teachers;
- students;
- policy-makers;
- donors;
- governmental research coordinating committees;
- technicians;
- commercial interests;
- farmers.

1.5 The intent of a research communication

Different research communications have different intents. They take the same basic information and modify it so that different audiences, with various levels of scientific understanding, can understand it (see Table 1.1).

The technical content of any publication is crucial to the understanding of its intended audience. If the person reading the material cannot understand it, then the whole point of the work is lost. This will obviously have tremendous implications for the impact of the work and its benefit to the writer.

1.6 Exercise – Assessing publication types

List the different types of publication you have to write.

- Who are you writing for?
- What level of scientific content should each type of publication have?
- Draw up your responses into a table for later use.