L2 scientific writing: the case of agricultural researchers in Brazil

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L2 scientific writing: the case of agricultural researchers in Brazil

by

Marisa Corzanego

A thesis submitted to the graduate faculty
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This is to certify that the master’s thesis of
Marisa Corzanego
has met the thesis requirements of Iowa State University

Signatures have been redacted for privacy
To my daughter Ana Teresa, to my husband Carlos, and to Odette and Rubens, my parents, for their love and support.
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ABSTRACT

I conducted the research between December 2002 and October 2003. Fourteen researchers working for EMBRAPA – SOJA and IAPAR, in Londrina, Brazil, answered a questionnaire. Researchers were asked to report on their own experiences (first two sections of the questionnaire) and to respond as speakers for the Brazilian scientific community within the field of agriculture (third section of the questionnaire). I obtained complementary information from informal interviews with other researchers and from EMBRAPA and IAPAR websites. My research questions were: (1) to what extent do organizational features and demands influence the writing and publishing of scientific articles in English by Brazilian agricultural researchers working in governmental organizations; (2) to what extent do language and cultural barriers limit the production of scientific articles in English by these agricultural researchers; (3) to what extent do researchers feel that international journal, editors, and reviewers discriminate against developing countries’ scientific production and scientists. My goals were (1) to obtain a preliminary understanding of the rhetorical context of scientific publications in governmental agricultural research organizations in Brazil and (2) to recommend actions and suggest further research topics. The main results of this study were: (1) organizational demands influence the amount of time researchers allow for publishing articles in English; (2) language barriers are due to little or no training in scientific writing both in Portuguese and in English and to a lack of knowledge of the rhetorical demands and expectations of the target language and target journals; (3) the degree to which researchers perceive discrimination by editors and reviewers of international journals varies according to discipline, country of graduate studies, and gender. My recommendations involve: (1) action and professional communication research at the organizational level; (2) professional communication research at the high school and university levels; (3) theoretical and applied research in L2 scientific writing in governmental agricultural organizations in Brazil; (4) a proposal for training in scientific writing in EMBRAPA and IAPAR.
CHAPTER 1
INTRODUCTION

The Study: An Overview

My interest in studying this topic is a consequence of my interaction with agricultural researchers for the last 30 years, and of having empathy for their difficulties when writing for publication. More specifically, my interest dates back several years ago, when I worked for EMBRAPA and realized how difficult it was for EMBRAPA researchers to write articles for publication. My understanding then was that several researchers did not have enough time to concentrate on writing, that they did not enjoy writing, and that they avoided it also because it was too difficult a task to perform. I also thought that writing was something instinctive rather than learned, and therefore, one would be either born with it or not. I guess this partly stems from the fact that our universities do not require freshmen to take composition courses and partly from the fact that Brazilian society is organized around the fluidity and adaptability that only oral communication allows.

Consequently, I accepted the fact that writing abilities were somehow an innate privilege of a few Brazilians. I also accepted these researchers' resistance to write as perfectly normal, particularly because I always thought of Brazilian society as primarily oriented towards oral communication rather than written communication. So, what was wrong with so many researchers not be willing to write and publish all of their research results? In fact, I understood these researchers' complaints concerning the organizational goals for publication. This situation was very similar to that I encountered at IAPAR several years later, and I would say that this was very common in Brazilian scientific society particularly up to 20 or 30 years ago. This is not to say, however, that all researchers behaved the same way concerning publications. As a matter of fact, the large number of professional journals that have been published in Brazil in those years and even before that are the living proof that a significant amount of scientific information has been published. Besides, the important technological development Brazil has experienced over the last 35 years or so, point to the fact that researchers' contribution to society have far exceeded the content of publications.
because research results have impacted society significantly, particularly when we consider the continuously tight budgets in Brazilian research organizations.

I never thought, at the time, that there were more elements involved in the researchers' resistance to write than lack of time and pleasure. And this is where I feel my contribution with this study can be most relevant. I now believe that scientists not only can but also should learn not only how to write, but also how to have pleasure in writing so that they can look at their successful publications as fruit of their beginning-to-end intellectual challenge. I believe that the rhetorical understanding of L2 learning among Brazilian scientists may help improve not only language learning for publication, but also organizational dynamics.

This is a study of the rhetorical context and the language problems associated with L2 scientific writing in English by Portuguese-speaking agricultural researchers working at two governmental research organizations in Brazil: EMBRAPA-SOJA (Brazilian Agricultural Research Corporation – National Soybean Research Center) and IAPAR (Parana State Agricultural Research Institute). The study was conducted between December 2002 and October 2003 and involved on-line research, informal appraisals, and questionnaires. My main goal is to allow agricultural researchers a voice in potential changes within their organizations and at universities, as far as training and communication curricula are concerned. Furthermore, recommendations for action and further research may be identified as these researchers express their concerns and problems related to their scientific writing in English.

The study calls for an exploration of how specific rhetorical contexts can be seen to affect scientists' motivations, concerns, problems, and possibilities for developing L2 scientific writing skills. Rhetorical context in this study involves two levels: the level of the organization itself, or the researchers' immediate workplace, and that of the international journals, the researchers' distant editors and reviewers.

At the organizational level, I analyze three main factors causing conflicts between writing in English and other research and communication activities: lack of training in scientific writing, schedule conflicts, and disperse accountability. Such factors are important for the researchers' decision making concerning what, where, and in which language to publish.
In international journals, Western European and North American editors and reviewers attitudes towards the science and scientists of the Third World have been considered barriers to the scientific visibility of the Third World. These attitudes have been widely considered discriminatory by Third World scientists, who feel they are systematically excluded from mainstream international scientific community. Within this context, such attitudes are also considered potential barriers for Brazilian researchers’ motivation to write and actually publish in English, in international journals. As I discuss in Chapter 2, First World journals often have editors and policies that inhibit and ignore the scientific production from developing countries.

As part of considering rhetorical context, this study also calls for an understanding of a third dimension of L2 scientific writing: that of language problems at the level of the individual researchers and their abilities to write in L2, which has been extensively reported in the text-based research literature. This study, however, is based on researchers’ perceptions of their problems and their report on the kinds of feedback they receive from journal editors and reviewers.

My guiding hypothesis in this work is that successes or problems in scientific writing in English among Brazilian, Portuguese-speaking agricultural researchers are not due solely to professional characteristics and one’s level of training in L2. Performance of L2 writing among Brazilian researchers is also influenced by the organizational culture and structure where the researcher works as well as by the larger scientific community, its journals, and by these journals’ policies at the international level. More specifically, I believe that the high levels of organizational demands, low levels of training in scientific writing, and discrimination towards Third World countries’ scientists, including Brazilians, contribute to the low numbers of scientific articles by Brazilian researchers being published in international journals in Western Europe and North America. This study centers on researchers’ perspectives concerning the three research questions below.
Research Questions

• To what extent do organizational features and demands influence the writing and publishing of scientific articles in English by Brazilian agricultural researchers working in these governmental organizations?

• To what extent do language barriers limit the production and submission of scientific articles among these researchers?

• To what extent do international journals' policies, editors and reviewers inhibit Brazilian scientific production and publication, from the perspective of these researchers?

Relevance of the Study

This research is relevant within the context of the Brazilian governmental agricultural researchers for two main reasons. First, these scientists are required to publish in English, in professional journals, particularly for promotion purposes and for visibility in the international scientific community. Second, some of the most important Brazilian professional journals today, such as PAB (Pesquisa Agropecuaria Brasileira – The Brazilian Journal of Agricultural Research), accept papers for publication in Portuguese, Spanish, and English. According to Oliveira and Pagano (2001), several others publish only in English, such as Ciência e Cultura (Science and Culture), the journal of SBPC – Brazilian Society for the Progress of Science, the largest Brazilian scientific association. Some of the other journals that accept articles only in English are: Journal of Brazilian Chemical Society, Journal of the Brazilian Computer Society, Brazilian Journal of Chemical Engineering, Brazilian Journal of Generics, Brazilian Journal of Plant Physiology, Brazilian Journal of Probability and Statistics and Brazilian Journal of Veterinary Research and Animal Science (440-441).

In any case, scientists need English to read textbooks, articles and manuals, to enter several graduate programs in Brazilian universities as well as abroad, to write and publish as requirements for graduate school, and to present and attend conferences. Nevertheless, as Oliveira and Pagano point out, English learning in Brazil is determined by the social class to which you belong: “The lack of English proficiency is sometimes a problem for some students, mainly for those who come from lower classes and were not able to afford to study
English in private courses" (439). The lack of English proficiency is also related to the lack of composition courses, also in Portuguese, beyond the high school level, which limits Brazilians' aptitude to write particularly scientific papers.

The social, educational, and political issues involving English teaching have been at the heart of the discussions for curricula changes in Brazilian schools. In this regard, Oliveira and Pagano criticize those who favor the teaching of ESP in public schools because they see it as piecemeal learning that does not allow for the development of cognitive learning that comprehensive language learning methods:

In a country where only those who can afford to pay for it are able to get some kind of English instruction, a policy focusing solely on the teaching of reading skills in public schools, is certainly a cruel way of curtailing students' potential for developing their foreign language skills to their potential (441).

Scientists, however, are usually interested in improving their strategic skills to communicate in their scientific communities. This would increase their chances for promotion, the number of readers for their articles, and eventually the number of citations of their articles. Research conducted by both Jernudd and Baldaulf Jr (1996) and Oliveira and Pagano (2001), as mentioned in Oliveira and Pagano, reveal three main reasons for Brazilian scientists to publish in English: 1) to reach a specialist international audience; 2) to reach "the broadest (widest) possible readership"; and 3) "to gain prestige" (440).

The main goal of this study is to obtain a first approximation to the problem of scientific writing among agricultural scientists in Brazil, from the perspective and experience of the scientists themselves. No previous study with this content and objective has been found in the literature, which reinforces the need for an appraisal of the situation. Understanding the main issues and bottlenecks involved in the writing process of scientific articles in English, by Brazilian Portuguese-speaking scientists, should help EMBRAPA and IAPAR facilitate the English writing and publication processes for researchers and, consequently, increase the number and rate of publication in English at the organizational level. This, in turn, would make both organizations more widely known internationally and would eventually enhance prestige for improving the chances for joint research projects and international funding.
At the same time, we must keep in mind that even if organizations decide to provide training or consultants to facilitate writing and publishing in English among their researchers, there will be other barriers. I will discuss, in Chapter 3, such barriers, if built on discrimination, may be difficult to remove although a third path for Third World science may well be developed, as discussed in Chapter 5.

**Background for the Study**

Agricultural doctorate students at the University of Missouri (1979-1983) and at Iowa State University (2000-2003) have contributed significantly to my understanding of the need for this study. Their complaints when writing their papers and dissertations have both puzzled me and made me think that something should be done. Furthermore, my work as a sociologist – as part of interdisciplinary research teams with Brazilian agricultural researchers and students for the last 20 years - has provided me insight into their problems associated with scientific writing in general and with English writing in particular.

From my experience working for both EMBRAPA (1975-1978) and IAPAR (1985-1990), I have observed how these organizations’ researchers have always been under pressure to write and publish. These personal experiences led me to, in this thesis, explore the problems in a more systematic way.

Before I started the thesis, I conducted informal appraisals with researchers and faculty in the agricultural sciences, to ascertain myself that the difficulties concerning scientific writing, as described above, still held true nowadays in Brazil. As I expected, all of those contacted complained that they had not had the chance to learn how to write scientific papers, and that they had learned it by doing. This process, however, was considered inadequate, and they were willing to undergo training once it were made available at their workplaces. These professionals also complained that they take too long to write also in Portuguese, and that writing in English was only possible by those who had done their PhDs in English-speaking countries.

The most common problems that researchers faced were lack of training in scientific writing, disperse accountability and schedule conflicts. On the one hand, those researchers constantly and daily had to respond to a variety of immediate demands from a wide range of
sectors of the Brazilian society. On the other, they needed to write and publish for promotion or scientific purposes.

Lack of training

In my observations at the time I worked for EMBRAPA and IAPAR, many researchers had problems organizing data and text, and others had difficulties expressing themselves properly to specific audiences. Lack of training in scientific writing in Portuguese and in English, both in college and at the workplace, accounted for much of the researchers' reasons for postponing the report and publication of results. In fact, except for a few courses offered at the graduate level, Brazilian universities do not offer composition or scientific writing courses as requirements for undergraduates. There are no English Composition courses in Brazilian universities that could be, even slightly, compared with these courses in the U.S.

Disperse accountability

The complex rhetorical context of these two governmental agricultural research organizations as introduced earlier has inherently involved conflict in terms of accountability. On the one hand, researchers are accountable to local, state, and federal governments and their scientific and political priorities. As such, researchers occasionally change their research projects when new political leaders are elected and new priorities are set. On the other hand, researchers are called constantly to participate in collaborative intra- or inter-organizational research and development projects. In fact, interdisciplinary collaborative projects are the backbone of both EMBRAPA and IAPAR. This dynamic, although rewarding and effective in most situations, eventually causes problems for scientific writing. The larger the research teams and the larger the number of organizations involved, the larger the number and kinds of kinds of publications that must be prepared, going from simple folders to technical reports and scientific articles. Consequently, the lesser the time researchers have for writing research papers for publication in scholarly journals, the more invisible they are for the international scientific community.

Researchers in these organizations also are accountable to two other communities whose interests might conflict: the community of farmers and the Brazilian society as a whole, as
taxpayers, and the scientific community, which is not limited by national boundaries. As we know, the scientific community has research needs and publication priorities which, because they are set at the global level and under the influence of other powerful sectors such as the industry, might have nothing in common with the Brazilians' research and publication interests.

Furthermore, Brazilian researchers are simultaneously acting within the farmers' and local communities' rhetorical contexts where immediate solutions to specific (and often unexpected) problems must be presented, such as those caused by weather conditions, and social and political changes that influence farmers' lives. Examples of these situations are: 1) when researchers must provide seeds, animals, and production follow-up for landless farmers who either take over or are given plots of land but have no resources to start the agricultural activities meant to assure their subsistence; 2) when researchers must assist farmers who are transferred to other regions (often with climate and natural resources that are different from those where they originally lived) due to the construction of dams that covered their original plots. The two situations are examples of the variety of case-by-case and diverse accountability situations with which researchers in governmental agricultural research in developing countries such as Brazil, have to deal. These examples are meant to provide help in understanding the context for researchers' answers to the questionnaire and of the schedule conflicts and lack of training discussed below.

**Schedule conflicts**

Schedule conflicts that affect these researchers' ability to write effective English are directly related to the fact that researchers are continuously engaged in a complex rhetorical context as discussed above. Besides, scientists at EMBRAPA and IAPAR have to respond to local farmers with different levels of literacy, to the urban laymen, to extension agents and cooperative officials on the field, to state and federal government secretaries and ministries, to the researchers' specific workplace research priorities and peer demands and to the national and international scientific communities.

Researchers not only are expected to participate in meetings and on-site demonstrations of technologies in different locations at the state (IAPAR) or national (EMBRAPA) levels,
but they also must prepare their presentations for such a variety of audiences. In some months, traveling alone can add up to 15 to 20 days.

Therefore, not only the variety of audiences but also the variety of publications the researchers were compelled to write added significantly to researchers’ frustrations and anxiety for not being able to write efficiently and effectively. A better understanding of this situation can be obtained from the information below, in the overviews of the missions and the sectors to which EMBRAPA and IAPAR are accountable.

EMBRAPA and IAPAR: Organizational Contexts, Missions and Publications

**EMBRAPA: Organizational context, mission and main publications**

EMBRAPA was created in 1973 and has, since then, generated more than 9,000 technologies for Brazilian agriculture in fields such as food production, sustainable agriculture, natural resources, agribusiness, and industrial crops. EMBRAPA coordinates the National Agricultural Research System to which most public and private agricultural research organizations all over the country are affiliated. It also sets the goals for all agricultural research in the country by following the priorities defined by the Ministry of Agriculture, Livestock and Food Supply.

EMBRAPA comprises 37 Research Centers and 14 other research units spread throughout the country and has approximately 9,000 employees. Fifty-three percent of EMBRAPA’s 2,250 researchers have PhD degrees and 45 percent have Masters’ degrees.

In December 2002, the Social Communications Department of EMBRAPA published the second edition of its Communication Policy (Política de Comunicação), which, among other aspects, dealt specifically with the need for integration of the communication, research and development, and technology transfer sectors of the organization at the national level:

The creation of knowledge, technologies and processes which are the “core business” of the enterprise, must be based on the understanding of the macro-environment, on responses to the demands of clients, and on improvements in the quality of life of our citizens in such a way that this network of competencies is articulated to achieve these goals. (50) (EMBRAPA – Política de Comunicação, 2a. edição, revista e ampliada, DF. 2002)
EMBRAPA has been engaged in developing norms and criteria for content and format of communication products (journals, newsletters, homepages, and others) to be applied by all employees nationwide. In this process, however, it also claims that such norms and criteria will allow for the incorporation of aspects related to local cultures, needs and demands.

The complexity of the social, political, and economic contexts within which EMBRAPA develops its activities is clear by the number of sectors it considers as its audiences, some of which are mentioned below:

- entrepreneurs, financial and agro-business agents
- coordinators and professionals of the National Agricultural Research System
- public and private agents for technology transfer
- coordinators and professionals at the executive, legislative and judiciary branches of national, state, and local governments
- representatives and professionals of the academic and scientific community, including college students
- representatives and professionals of national and international organizations that support agricultural research and regional development or are in some way involved with C&T
- non-governmental organizations and all organizations that belong to the tertiary sector
- professionals in the communications arena
- consumers

In order to respond to such a varied audience, EMBRAPA produces a wide variety of documents that follow the editing manual. (Manual de Editoração) Since one of my interests is to look at the support this organization provides for its researchers when they have to write scientific articles, I will describe briefly the two main EMBRAPA’s scientific publications for the scientific and academic audiences: PAB and CC&T.

**PAB** – *Pesquisa Agropecuaria Brasileira (Brazilian Agricultural Research Journal)* was first published 70 years ago and is, now, the most important and comprehensive agricultural research journal in Brazil. It has been published by EMBRAPA-Brasilia, the headquarters of the organization, since the mid-1970s. PAB’s articles may be submitted in
Portuguese, English, or Spanish and every abstract must have an English version. Articles published in this journal are indexed in: *Agricultural Engineering Abstracts, AGRIS, Agroforestry Abstracts, Animal Breeding Abstracts, Biological Abstracts, Chemical Abstracts, Crop Physiology Abstracts, Current Advances in Ecological and Environmental Sciences*, among many other indexes. PAB has an editorial board formed by one editor, four co-editors, one assistant to the director, three reviewers, and four editors in charge of electronic editing.

EMBRAPA-Brasilia also publishes the quarterly *CC&T – Cadernos de Ciencia e Tecnologia (Science and Technology Journal)*. CC&T is indexed in *CAB International (UK), AGRIS (FAO), AGRICOLA (USA), AGROBASE (Brazil – Ministry of Agriculture, Livestock and Food Supply), and EMBRAPA’s Data Basis for PAB*. CC&T was first published in 1984, “to think about, discuss, and communicate a critical interpretation of the sciences, of technology, and of agricultural development with emphasis in their social, cultural, and political aspects.” (CC&T, main page) CC&T has an editorial team of ten editors who meet twice a year to, among other responsibilities approve the editorial priorities and editing regulations modifications for the journal.

Researchers working at the National Soybean Research Center publish in both of the above journals and in a variety of others, as well as in other publications geared to lay audiences or audiences that use research results for diffusion of technology. At the level of the research center, researchers also count on the support of a Diffusion of Technology Department, which edits and publishes soybean materials for the national audiences and follows the norms and regulations determined at EMBRAPA-Brasilia.

**IAPAR: Organizational context, mission and main publications**

IAPAR was created in 1975 and has, since then, generated a large number of technologies for the Paraná state agriculture in fields such as food production, sustainable agriculture, natural resources, agribusiness, and industrial crops. These technologies are passed on to the state rural extension system, cooperatives, farmers’ associations, and most public and private agricultural organizations.
IAPAR also sets the goals for agricultural research in the state and follows the state Secretary of Agriculture and other related secretaries and local governments' needs and requests. IAPAR works closely with EMBRAPA and its research centers in developing technologies for specific products and processes that can be used nationwide.

IAPAR has 970 employees and 140 researchers in agriculture, livestock, environment, economics, and other areas. Most of the researchers have a Ph.D. degree. Researchers conduct experiments either at IAPAR headquarters or at its 20 other research stations, besides farmers' fields throughout the state.

Researchers working at IAPAR have published more than 2,500 documents in the last 30 years. Some of these were published in internal publications directed to the variety of statewide audiences (technical reports and bulletins, newsletters, folders etc), some in national and international journals, and others as books. As an organization, however, IAPAR does not publish any scientific journal similar in content and circulation to PAB or CC&T. Instead, it concentrates on publishing materials on a regular basis primarily for extension agents, non-governmental and other governmental agencies as well as other audiences at the state level. The bulk of these publications require non-scientific and non-academic languages.

As mentioned earlier, IAPAR as an organization is not engaged in producing documents strictly for scientific audiences. However, the researchers themselves (either in teams of individually) normally publish in journals such as PAB, CC&T, and other national and international journals. In order for IAPAR to produce research and development documents as well as institutional marketing and media products, a team of 2 journalists and 8 agronomists engage in a wide variety of communication tasks, including the editing of institutional documentation products.

**Practical Applications of the Study**

Learning about the actual context and problems related to English scientific writing and publishing among researchers in these two government agricultural research organizations in Brazil might contribute to solving current problems that researchers have when writing for international audiences.
This study might also identify procedures that may increase the rate of publication per researcher and consequently, improve researchers’ chances for promotion and international visibility, as well as organizations’ international prestige and financial support.

This study might inform university administrators about the need for changes in curriculum design to include scientific writing courses that benefit both faculty and students in the process of acquiring the skills required to write for a global scientific community.

From a theoretical perspective, this study may add to the existing knowledge in L2 scientific writing from the perspective that agricultural research writing in government organizations in developing countries occurs in the crossroads of internal organizational demands to respond to diverse audiences, researchers’ motivations and constraints to write, and the international context of scholarly journals published in English, in developed countries.

Due to the national importance of the two organizations where this research was conducted, results from this study may reveal a process of scientific writing (and publishing) in English that is similar to most governmental agricultural research organizations in Brazil. In such a case, results can be used to foster further research or orient changes in universities and research organizations throughout the country.

An overview of these researchers’ attitudes towards professional scientific writers and their organizations’ potential needs and roles for these professionals will help analyze the possibilities for hiring and training.

I hope this study may contribute to agricultural universities so that they may adapt their curricula to prepare students for scientific writing in a global scientific community while still in college.

Chapters Overview

In this Chapter, I identify my main assumptions and describe the background for and relevance of this study. As I describe the background for the work, I summarize the rhetorical context of each organization and its influence on researchers’ writing opportunities. I also briefly describe the audiences of organizations and the main kinds of publications, as well as the kinds of scientific writing support available for researchers.
In Chapter 2, I present the theoretical perspectives that seem most appropriate for my understanding of the problems associated with L2 scientific writing and publishing among Brazilian agricultural researchers at EMBRAPA and IAPAR. The literature review will cover the following topics: (1) the influence of workplace demands on scientific production, (2) the language problems associated with L2 scientific writing in English, and (3) the role of international journals located in the First World in determining the visibility of the scientists and the sciences produced in Third World countries.

The description of the methodology used can be found in Chapter 3, as follows: (1) an overview of the methodology, (2) my main assumptions and research questions, (3) the research stages, and (4) the methods for result analyses.

In Chapter 4, I discuss and present the main results of this study and finally, in Chapter 5 I present the most relevant conclusions and recommendations for action or further research.
CHAPTER 2
LITERATURE REVIEW

Overall Context of L2 Scientific Writing Studies

Literature on researchers' perceptions of L2 scientific writing and on text-based studies of L2 scientific writing in the specific context of governmental agricultural research in developing countries is non-existent. Nonetheless, these kinds of studies might become more numerous in the near future, as non-English speaking agricultural scientists in developing countries communicate more intensively with their counterparts worldwide by means of the worldwide web. Furthermore, evaluation for promotion in these countries and research organizations has relied increasingly on publications in international specialized journals, which are largely in English. The main reasons studies in L2 scientific writing in developing countries will likely concentrate in agriculture are: 1) agriculture is normally the main economic and research activity in these countries, and 2) developing countries' agriculture has accumulated knowledge that can be shared with developed countries.

My literature review draws on studies concerning scientific L2 writing in general rather than on the writing that is actually done within the specific context of governmental agricultural research organizations in developing countries. My view is that the analysis of L2 scientific writing should take into account the contexts within which production and publication take place, and if we consider the perceptions of researchers concerning the process of writing and publishing in L2. The literature review in this study involves three sections: 1) the role of researchers' immediate workplace demands in determining writing and publishing possibilities in scientific journals; 2) the language problems associated with L2 scientific writing and publishing; and 3) the social and political aspects of revision and publication of scientific articles written by developing countries' scientists. Even given this body of research, this study relies primarily on the researchers' experiences and points of view rather than on analyses of documents or processes that could otherwise provide quantitative data.

The sociological background for this study is the understanding that writing is situated and thus determined by social, political, and ideological contexts (see Atkinsons 2003 for a
detailed literature review on postmodern theory). This study has two socially-oriented purposes: 1) to understand the actual situation of L2 scientific writing (and publishing) at two government research organizations in Brazil within the context of the international scientific discourse community, and 2) to identify ways for strengthening the role of the social actors in charge of agricultural scientific communication in Brazil, so that agricultural scientists have more international visibility than they do now.

Collier and Toomey (1997) provide the political framework for this study. They say that

the challenges scientific and technical communicators face nowadays are due to the presence of increasingly diverse audiences, the proliferation, ownership, and marketing of information, the ethical problems presented by development in science and technology, and the need to balance individual and unique roles in our evolving "technical society." They [students and practitioners] will serve as gatekeepers within professions by determining who has access to information. They will serve as mediators among the interests and concerns of professionals and laypersons. And they will serve as translators of specialist language to and from the language of other specialists and laypersons (ix).

The literature review below concentrates on studies relevant to understanding the actual situation of L2 scientific writing at IAPAR and EMBRAPA and the potential for changes in the way Brazilian scientists interact with the international scientific discourse community.

Section 1: Scientists' Workplace Demands and Possibilities for Writing and Publishing in International Journals

Workplace demands seem to be one of the most important determinants of scientists' productivity in communicating research results all over the world, although literature on this aspect was not found. This section of the study contributes to this gap in knowledge concerning workplace demands and their influence in scientific production, specifically in governmental agricultural research organizations in developing countries. However, because this aspect is only one among others that affect researchers' productivity in the workplace and that are herein taken into account, conclusive research should be conducted with larger
samples of both researchers and agricultural research organizations, in Brazil and other developing countries, so that the gap can be filled. Nonetheless, the two other issues influencing researchers' production of scientific articles in both organizations, namely schedule conflicts within the research process itself and lack of training have long been of concern in research organizations.

Candelaria (1958, 2002) reports that scientists in the U.S. in the 1950s spent on average 70 percent of their time "collecting, recording, and passing on information." She suggests that some of the functions at the time carried out by researchers can be done more properly by technical writers, including "brochures, proposals, and instruction manuals for customers, technical papers or articles for trade publications, abstracts of reports and articles for scientific personnel within the organization." (4) Her article touches the same problems scientists working for IAPAR and EMBRAPA reported at the time of the informal interviews and while I was working at IAPAR or EMBRAPA (see Chapter 1). Although writing almost fifty years ago, Candelaria's suggestions to enable scientists to concentrate on their research seem to be appropriate for research organizations nowadays. She specifies the tasks technical writers can perform as members of scientific teams as follows:

• gather information
• determine the kinds of materials to be produced for each audience
• conduct interviews with researchers to prepare drafts of publications
• edit scientists' written communications
• check drafts with researchers for content and with managers for types of presentation
• supervise production and printing, among other responsibilities in the publication process (5)

Candelaria also presents ways technical writers can contribute to research organizations, as follows:

He [the technical writer] can furnish clearer reporting, especially useful to people who finance the research. He can, by clear reporting relieve much of the confusion and congestion of scientific publication in journals, helping worthwhile accomplishments by a scientist to be more easily disseminated and recognized.
The technical writer relieves the overburdened scientist of part of his job, freeing him for creative research, thus helping provide more research per man dollar. The writer can improve the quality of an organization’s writing by standardizing format and approach, by consideration of art functions which contribute to a report, by maintaining a high quality of writing, and by keeping an eye open for publication possibilities (5).

The tasks Candelaria describes for a technical writer would certainly help Brazilian and other developing countries’ governmental research organizations in the publishing process and productivity. Nonetheless, these professionals are to my knowledge, so far non-existent in Brazil and likely in most developing countries as well. Therefore, agricultural researchers largely seem to be condemned to learn the scientific language and more specifically, the English scientific language if they want to increase their chances for publication, promotion, and international visibility.

Training, however, conflicts with most Brazilian agricultural researchers’ time due to constraints caused by diverse accountability for communicating results, in government agencies. In fact, both at IAPAR and EMBRAPA, require that researchers write research projects and reports for their organizations and funding agencies, technical bulletins, newsletters, and other documents for extension agents, other researchers, university faculty, and government and non-government organizations working at the farmers’ level, besides the research articles for national and international journals. The Introduction Chapter of this work presented the variety of audiences to which researchers are accountable at IAPAR and EMBRAPA as they respond to the political, economic, and social arenas in Brazil. Therefore, Candelaria’s work seems particularly relevant in that it points to concrete possibilities for professional communicators to release researchers’ burdens. Time constraints among most scientists in Third World research organizations as well as lack of training in writing usually contribute to these scientists’ international invisibility.
Section 2: Language Problems Related to L2 Scientific Writing and Publishing in English

Whenever language problems are discussed in non-English speaking developing countries, three main aspects are considered: 1) training in L2; 2) cultural and linguistic differences between L1 and L2; and 3) scientists’ social characteristics and motivation to publish in English in international journals. The discussion below addresses these problems and situates them within the context of developing countries.

Training

Training in writing in general is often considered superfluous in developing societies, and the same is normally true for training in scientific writing as well. Because these societies usually strive to carry on research on an extremely limited financial basis and insufficient facilities, equipment, and personnel, funding training in writing and publishing are often seen as unaffordable and as not being priorities. Furthermore, significant numbers of farmers and members of other audiences in these societies are illiterate and require oral and a learn-by-doing knowledge transmission within small groups or by means of radio or other popular media, or still in meetings. Written communication, therefore, is often considered inappropriate for many developing countries’ rural audiences.

Still another reason, probably related to the illiteracy mentioned above, is that these societies usually have long histories orally transmitting agricultural knowledge. Written materials, therefore, would not cause the needed and expected impact on the evaluation or transfer of technology. The situations above differ significantly from those in most Western European and North American countries where written communication has been historically predominant. It seems, therefore, that in societies where oral communication prevails among laymen and women, it also prevails among scientists. In order to verify this assertion, however, studies must be conducted.

Nevertheless, orality does not decrease Brazilian researchers’ need to publish in specialized national and international specialized journals, and mostly in English. Publishing in these journals gives scientists international visibility and greater chances of promotion. The need for visibility is recognized worldwide. According to St. John (1987), “Spanish-
speaking researchers need to publish in English to maintain visibility”. Having time and training for writing for these journals, however, seems to be a major constraint not only for Brazilian researchers, but also for Third World countries’ researchers as a whole.

Khanna (2001), reporting on developing countries’ health researchers’ challenges in communicating results, shows how the lack of training in scientific writing prohibits scientists’ visibility through publication. Khana also says that the low contribution of publications by developing countries’ researchers is not due to a lack of “science culture” among these professionals or even to the “alleged bias on the part of Western journals against scientists from developing countries.” (53) Instead, it is “largely due to a lack of training on the part of researchers in how to write scientific papers.” (53)

Khanna based his analysis on the evaluation of the efficiency of diffusion of research results, carried out in 1988, of the still ongoing UN/WHO/World Bank Human Reproduction Program. This research has been conducted in research centers located in both developed and developing countries and research results have to be published timely and properly for international and local audiences. He says:

while many centers in developing countries were conducting sound scientific research, scientists in these centers were facing considerable problems in getting their research articles published in peer-reviewed international journals. In fact, in many cases, valuable research knowledge was being lost, resulting in a waste of precious limited resources. It was recognized that during the course of their education in research methods, most scientists never received any training in how to prepare research articles for publication, let alone training in how to communicate with policymakers and the public (51).

Consequently, the program developed workshops on how to write research articles in science communication were developed for scientists, journalists and policy makers. Since the first writing workshop in 1991 in Santiago, Chile, more than three hundred researchers were trained. In 1994, the survey that assessed the impact of the scientific writing courses showed that more than 70 percent of respondents agreed that they improved their writing skills and self-confidence in writing scientific papers. Eighteen of the eighty-two course participants and fifteen out of the forty-nine respondents worked in the Brazilian research
center, (Khanna 52) which indicates the relatively higher participation of Brazilian scientists as compared with scientists from other developing countries. This high representation Brazilians is largely due to the policies of the Brazilian government and the high investments to foster training of scientists both in Brazil and overseas, since the early-1970s.

Therefore, it seems reasonable to say that there is a need to discuss the development of scientific writing training among students and scientists in Brazil. From my experience with higher education in Brazil, scientific writing is not a priority or even a possibility among the courses offered. The dearth of writing courses in Brazil leads to a situation of scientific writing illiteracy among college students, college graduates, and scientists alike. Universities in other non-English speaking countries, however, have developed compulsory English writing courses in order to prepare their students for participating in the international scientific community. Ammon (2001) has compiled 22 articles on English as the language of science including several teaching experiences in different countries. At the University of Botswana, for instance, English for Academic Purposes (EAP) has been compulsory for all first year students and science students have to take a Communication and Study Skills course. (Chimbganda 2000, 310)

Defining the concept of scientific writing literacy programs can, I believe, be analogous to those in literacy in general, because both have social causes, develop within specific social contexts, and lead to social consequences, all within an ideological environment. Freire (1970) was the first social scientist to develop a pedagogical theory of the ideological and political determinants of literacy and of the role of literacy in consciousness awareness and social action. Freire developed his theory based on his experience with the Brazilian adult education programs carried out particularly during the 1960s and 1970s.

Recently, Atkinson’s (2003) summarized the meaning of “Literacy as an ideological arena” for the context of L2 research writing, as follows:

Literacy as an ideological arena” refers to a growing understanding over the past two decades that reading and writing are not the decontextualized, information-centered, impersonal activities they were once thought to be, but rather that they actively construct, and are centrally implicated within, power relations, society, culture, and, indeed, individually itself. It may even be a mistake, according to
some theorists (e.g., Gee, 1996; cf., Foucault, 1972), to regard reading and writing as the main focus of literacy: These social activities may be so bound up in other forms of doing, being, and knowing that they are not in any ecologically valid way separable from them. The ideological nature of literacy emerges in L2 writing research and practice when we realize that, for example: (1) what we are teaching and researching is often “powerful literacy” (Gee, 1996), with a strong basis in quite particular (and quite restricted) social practices (e.g., Belcher, 1997; Belcher, 2001 and Pennycook, 1996); and (2) who we are teaching are often the already-powerful, and socio-economically privileged (Vandrick, 1995; cf., Bourdieu, 1977) (3).

Besides the organizational, social and ideological determinants mentioned above, language problems associated with L2 scientific writing remain a challenge not to be easily overcome by most scientists in developing countries.

* Cultural and linguistic differences between L1 and L2

No study of L2 writing would be complete without mentioning the contributions of contrastive rhetoric. Kaplan (1966) says that languages are cultural manifestations and that therefore, each language has its own rhetorical strategies which are necessarily brought to L2. Nowadays, contrastive rhetoric has contributed to learning about the “preferred patterns of writing”, particularly in ESP, as a pedagogical tool (Connor 2003, 218).

Connor (2003) reports on several, contrastive rhetoric text-based studies that show specific cultural differences between L1 and L2 writers’ and readers’ strategies and expectations that hinder communication. The main differences she reports when discussing research articles and grant proposals, are: placement of the main point in texts, and “lack of transitions and other metatext to guide the reader” (229). Contrastive rhetoric, therefore, sets the grounds for and is intertwined with most L2 writing issues reported below. Furthermore, it provides a background for this study because of the need for situated research, as Connor explains:

Consistent with post-modern indications, contrastive rhetoric needs to promote further research-situated reflexivity, to be more sensitive to local characteristics
and particularity of writing activity, and to become more conscious of the influences of power and ideology in any setting" (236).

L2 writing problems therefore, require solutions concerning the teaching of scientific writing among L2 scientists that combine process and post-process pedagogy. I agree with Atkinsons in that process writing pedagogy should not be replaced in the L2 writing classroom because pre-writing, drafting, feedback, and revising are useful classroom activities and that in fact, process pedagogy should be broadened to incorporate connections to the broader society, including power relations. The language problems associated with L2 scientific writing in English is discussed below within a framework that incorporates process and post-process elements, and draws on contrastive rhetoric even though this study is not based on textual analyses. In other words, language problems are discussed both as actual text-based problems and as culturally and socially-influenced L2 writing.

As mentioned previously, this study relies on the researchers’ experiences and points of view. I provide a brief discussion of the main issues involving L2 writing in general because literature specifically on L2 scientific writing among scientists in developing countries’ agricultural research organizations was not found. Nonetheless, the studies presented below may help the development of a framework for the analysis of agricultural scientists’ L2 writing problems in the specific context of developing countries.

It seems that L2 scientific writing is intrinsically different from L2 writing in general, as opposed to Khanna’s ideas. For him, overall improvement in L2 communicative skills leads to improvement in L2 scientific writing skills. He argues that barriers to publish in international journals in English have become less of a problem because more developing countries’ scientists have become proficient in English (53). Being proficient in communicative English as a second language, however, does not necessarily mean that the scientist has also become a proficient scientific writer in English. Writing scientific articles in English requires immersion in the genre of English scientific writing, in the discourse community of academic writing, and in the social, political, and ideological contexts within which writing takes place. Writing scientific articles in English, therefore, is not analogous to translating one’s article in one’s mother tongue into English.
From my own experience working with agricultural scientists both at EMBRAPA and IAPAR, as well as from my academic contact with non-native English speakers at U.S. universities, it seems reasonable for me to argue that the ability to communicate orally in L2 is not transferable to writing. In other words, even though most scientists I know are able to both read and communicate orally quite efficiently in English, only an extremely small number of them are able to write effectively. These scientists do seem to need mid- to long-term training in L2 scientific writing before they can independently write and submit their articles for publication. Furthermore, they might quite frequently also need training in scientific discourse both in their native languages and in L2, so that spontaneous discourse and L1 rhetorical context are largely put aside and new communication strategies are learned.

There have been many attempts to determine what non-native speakers of English should learn in order to write successful products. Most of these attempts in the last three decades have been based on process approaches to writing and on cognitive models.

Chimbganda (2000), for instance, discusses several studies that identified strategies L2 learners adopted in order to compensate for communication problems, particularly reduction or compensatory strategies (mainly paraphrasing, borrowing and translating), negotiation of meaning, message adjustment (including risk avoidance). In this particular study, Chimbganda studied communication strategies used by first year science students at the University of Botswana, non-native speakers of English, as they answered academic questions. The author analyzed four strategies: risk taking, risk avoidance, L2-based strategies, and semantic simplification. (305). He found that students preferred to use L2-based strategies to communicate (including generalization and paraphrasing), which were not appropriate for the accuracy required by scientific discourse. He also found that students engaged in message reduction, which damaged message contents. Another finding was that students who took risks and engaged in deliberate negotiation of meaning performed better, indicating that students should learn how to use their strategic resources to communicate knowledge (327). He points out that awareness of the intended audience and its rules should help students adapt their written discourse and therefore, avoid the use of strategies that are normally used in non-scientific and non-written contexts.
Chimbonda’s study provides insight into the actual strategies that may be used by non-English speaking science students in other universities and other countries, so that pedagogical strategies and tools can be developed. However, this study would be most applicable to other situations had it provided an overview of the scientific community the students would normally enter as well as analyses of the students’ cultural and sociopolitical backgrounds and intentions in participating in specific scientific discourse communities. In this case, both the textual and the social variables that influence writing could be better understood and therefore, the study could be repeated with greater accuracy. Still, Chimbonda’s contribution to text-based research is significant.

Sionis (1995) follows a perspective similar to Chimbonda’s, in that he also understands the role of discourse communities in determining the rules and appropriateness of specific L2 writings. Sionis conducted a comparative study of the communication strategies used by representatives of two generations of French “Grandes Ecoles” faculty when writing and submitting their articles to anglophone specialized journals. He found that both groups had their articles denied for the same reasons: “discontinuity in the argumentative process”, “lack of consistency”, and “failure to convincingly introduce, link or conclude various key-elements in several parts of the demonstration” (101). In his understanding, these comments pointed to the fact that L2 authors were not able to use those persuasive rhetorical strategies that were normally used by the already members of the scientific discourse community. Consequently, the authors engaged in neutral or ambiguous statements which devalued the content and goal of articles. “Lack of familiarity with the discourse conventions of science writing in English” was one of the main causes for the authors’ rejected articles (102).

For Sionis, authors should be aware of “communication strategies” required by their intended audiences if they want to be successful. Sionis’ statement actually reflects the widely known fact that “communication strategies occur all the time” (Douglas, personal statement). Sionis’ borrows from Tarone’s (1983:64) understanding of the uses of “communication strategies” as follows:

communication strategies are used to compensate for some lack in the linguistic system, and focus on exploring alternate ways of using what one does know for
the transmission of a message, without necessarily considering situational appropriateness” although “lack of situational appropriateness is often the main reason for the rejection of their articles by reviewers when the texts submitted are globally correct in terms of lexis and syntax. (99)

Sionis’ emphases on the relevance of “situational appropriateness” for increasing one’s chances of having articles accepted is particularly important for L2 scientists who submit articles to specialized journals. As he says,

“Situational appropriateness” here means adherence to the written genre of specialist scientific articles in general but also to the particular style of a given journal, not to mention the specific requirements of a profession or of a scientific domain (100).

A similar perspective is adopted by Gosden (1995). Gosden’s article, entitled Success in Research Article Writing and Revision: a Social-Constructionist Perspective, is particularly relevant for this research. Gosden was motivated by a previous study he conducted in 1992, when he found that 74 percent of 136 science journal editors admitted that “there was a danger for NNS researchers that the value and quality of their research may be disguised by the quality of its reporting” (45). Gosden found that four main aspects influenced the 116 editors who judged the L2 research articles in his 1995 study:

- the logical and clear linking of sentences for the reader
- the development of the topic from sentence to sentence in a coherent way
- the use of grammatically correct sentences, and
- the ability to manipulate skillfully the language used in making claims.

Gosden also found that 54 percent of language corrections made by editors and reviewers were in what he called “simple syntax problems”, “poor sentence structure and the (incorrect) use of definite/indefinite articles.”

Gosden conducted the 1995 study with seven doctoral students at a science and technology Tokyo University who received feedback while writing, revising, and submitting their first research articles in English to journals. None of the participants had previous training in scientific writing in Japanese or English. From this study he came to recognize that although appropriate grammar and syntax in research article writing are important, L2
writers must understand deeply the “rhetorical machining of RA discourse”. RA L2 research should therefore, pay attention to the social construction of texts as writers adapt to the reviewers’ rhetorical ‘machinery’, particularly by means of adding words such as “therefore, thus, consequently, as a result, in order to” (52).

Although the results above are as important for developing pedagogical strategies and tools as Khanna’s results were, Gosden’s main contribution lies in the social-constructionist perspective he adopts to analyze the rhetorical context for which articles are created and rewritten or fixed, in the process of anticipating or responding to readers’ criticism and expected claims. He argues that writers must be aware that “scientific reporting is deductive in style (in English, at any rate)” and that, following Swales (1990), readers of research articles have expectations about the purpose of the author (50). This particular aspect of writing research articles as persuasive arguments seem to be particularly instrumental for developing L2 scientific writing courses that include discussions about the deductive and inductive writing styles predominant in different areas of knowledge among different languages and cultures. The ability of researchers to write and publish effectively, however, seems to depend on other variables as well, such as motivation and the scientists’ social characteristics, as will be seen below.

**Scientists’ social characteristics and motivation to publish in English in international journals**

From my experience mostly with Brazilians but with other non-native English speakers as well, it seems reasonable to suggest that scientists are not evenly motivated to publish in English nor in international journals. I have observed that younger scientists at the beginning of their careers are usually more motivated, particularly those who aim at the pure science or academic arenas, as opposed to those aiming at the community extension area. Another variable I have found to influence the level of motivation to write and publish in English is specialization, mainly because some areas of expertise require several years of research before any results can be obtained and published. From my own experience, other variables could also be mentioned. However, since I have no objective data supporting my
assumptions I will limit myself to the ones above and will report on works done by colleagues that took similar analytical paths, such as Sionis (1995).

Sionis concentrates his study on "two fundamentally different attitudes towards foreign language learning": language to solve immediate and isolated problems and language to improve overall written and oral communication. He found that scientists' age and professional status at the workplace influence their motivation to improve scientific writing skills and lead to one of the two kinds of motivation (mentioning Gardner and Lambert 1959): "instrumental motivation" and "integrative motivation." (103) The older group of faculty in Sionis' study was classified as having "instrumental motivation": they were interested in solving the punctual and specific problem and as avoiding risks. On the other hand, the younger group was said to have "integrative motivation": they were more interested in improving the L2 to the extent that they could eventually participate in the acquired-language community. The younger group was also more willing to take risks, which indicate a greater possibility for L2 learning. Unfortunately, however, correcting the papers after they had been denied by anglophone specialized journals involved "abandoning the researchers' optimal meaning" in both groups (112).

One of the most important implications of Sionis' findings for my research is that research organizations should select those scientists with the greatest learning potential for training in scientific writing in English, according to their ages, professional status, and consequently, motivation for learning and publishing in English. Another important implication is that training in scientific writing must include a "situation awareness" component at different levels, including each journal's situation.

Although there has been a significant amount of literature about the need to include social and economic variables to the study of L2 writing for the last three decades, I will limit my discussion on this topic to a few examples. This is not because I think social and economic variables such as race, gender and class are secondary in importance to understanding L2 writing. In fact, I believe these are among the most important variables and research topics to be studied nowadays and in the future, as globalization simultaneously increases social differentiation and forces western-pattern values worldwide. This study, however, is a preliminary work that I hope will help delineate further research topics that
include social and economic variables in systematic ways, much in the lines of Kubota's studies (2002).

Kubota presents three elements that should be considered in research on L2 writing, and which I believe should be considered in scientific writing studies as well. In his article *New Approaches to Gender, Class, and Race in Second Language Writing*, Kubota says that although some attention has been paid to gender in L2 writing, unfortunately, class and race relations have been practically ignored. Kubota reports on the few introductory books (such as Larsen-Freeman and Long 1991) and research on second language writing that consider (although not adequately) one or more of the issues just mentioned. Departing from examples of research in L1, Kubota argues that L2 pedagogy would greatly benefit from incorporating gender, class, and race into future research. She suggests that "new approaches to gender, class, and race are dialectic in that they should both explore differences between social categories in a non-essentialist way and expose discourse and power relations that are embodied in these differences (31)."

Kubota's article is very important for this work in that it emphasizes the role of social relations in determining both the kinds of writing processes people engage in and their potential for success. It restates that the factors that influence writing and lead to writing (and publishing, I would say) problems or successes are located beyond the text itself. Therefore, these factors must be well understood and, if necessary, changed. Gosden (1995) adopts a similar perspective, as shown below.

Gosden argues that we can understand success in research article writing and revision by analyzing and understanding the processes of “peer review, negotiation, revision, and eventual acceptance for publication of research articles (RAs) in international English-language scientific journals” (38). These processes, he argues, allow us to “gain insights, not only into the composing processes and strategies of a particular group of L2 writers, but also into the regulating mechanisms of a particular discourse community” (38). Gosden calls for writers' social and cultural awareness of the scientific community that will be judging the articles for publication. He also agrees with Bazerman (1988) and Myers (1985, 1988) in that writing, peer reviewing, and revising are essentially social actions (39). For Gosden, scientific writing involves a complex interaction of several social actors (editors, reviewers,
scientists from other institutions, co-workers, and research supervisors) that goes beyond
textual analysis. He says, “[success] in scientific RA writing can be evaluated by analyzing
textual revisions in relation to a network of Ideational, Interpersonal, and Textual functions
as determined by the rhetorical purposes and structure of the scientific RA (41).”

Gosden argues that the “implicitly shared goals and discourse conventions may well be
difficult for ‘outsider’ novices to fathom”. and adds:

Since technical critique and social control are inseparably intertwined (Knorr-
Cetina 1981) in the research writing process, a central place for the written
product in the EAP classroom must be translated into developing social awareness
of the manipulative potential of academic discourse (53).

From a somewhat different perspective, Blakeslee (1997) conducted a detailed study of
the mentoring relationship between an English native speaker mentor (a university professor)
and the non-English native speaker (a graduate student in physics), while the student was
writing her first journal article. Although the focus of the research was on learning to write
journal articles in situ, as part of the process of becoming part of a scientific community,
some of the issues raised are particularly important for L2 scientific writing of journal
articles for publication in international journals. Blakeslee argues that “although scientific
mentoring relationships are clearly a means for transmitting rhetorical knowledge in science,
the situated learning that occurs through these relationships may be limited or constrained by
several factors” that “inhibit the learning and confidence” of graduate students.

For Blakeslee, newcomers bring with them knowledge and strategies that are familiar to
their cultures and with which they feel comfortable because they learned from previous
schooling and real life experiences. Writing in L2, however, and particularly for journals
located elsewhere and far from the writers’ familiar location presents conceptual and
strategic difficulties and requires efforts not required from native speakers or those who,
although not native speakers, obtained their graduate degrees in schools in countries where
the writing and publishing will take place. These factors lead to lack of autonomy and
authority among non-native speakers. Therefore, mentors, reviewers and editors might help
scientists if they learn from Blakeslee’s accounts on how to lead to writers’ autonomy and
authority. Blakeslee’s most important contribution for my work, however, is that authority is
not always necessarily good or beneficial, or that "the reproduction and reification of scientific practices is not always desirable." (161) Non-English speaking scientists can, therefore, and perhaps should, look into the power relations involved in the rhetoric of scientific article writing and mentoring so that they can gain culture-specific authority even when writing for international audiences. Gaining culture-specific authority would allow L2 writers to improve their communication strategies and better adapt them to their audiences.

The authors cited in section 3 below, suggest the need for a scientific-writing pedagogy that incorporates sociological and political aspects of revision and publication of L2 scientific articles by the international scientific discourse community and its gatekeepers.

Section 3: The Social and Political Aspects of Revision and Publication of Scientific Articles Written by Developing Countries' Scientists

This last aspect is discussed particularly in terms of the role of international journals’ policies and practices in fostering (or hindering) Brazilian (or other developing countries) scientists’ international visibility. In order to do so, I emphasize the sociological, political and ideological aspects of L2 scientific writing by Third World scientists who intend to participate in the international scientific discourse community.

Casanave (2003) advocates a "socio-politically-oriented" L2 writing research and recognizes diversity in academic writing worldwide, approaches that she developed from her in-depth experience with Japanese university students. By fostering the concept of relationship between cultural relativity and academic lwriting she makes it a tool for change in the way academic writing has been taught. In other words, she suggests that teaching L2 academic writing should not be done according to culture-bound English academic writing exigencies, but according to each culture’s specificities.

In the same article, Casanave also suggests that future studies should continue to look at, although not be limited to texts, processes, and writers, since “they are equally important”. She also argues that, “In L2 writing scholarship, written artifacts are generally taken to be writing produced by L2 learners, novice writers, and they have tended to be studied apart from sociopolitical concerns.” (87) She suggests that the political instance of academic writing can also be assessed by research on the ways writers must persuade gatekeepers of
knowledge in order to secure research funds (88) and publication in scholarly journals (89). This article by Casanave presents an extensive literature review on this 'sociopolitical' trend in L2 writing research. However, for the objectives of this work, at this point it is important only to acknowledge this trend.

An important contribution to the current debate over social and political aspects of writing has been made by Hyland (2002). She advocates the genre-based pedagogy to teaching L2 writing, in an effort to understand "how language works in human interaction." (17) Hyland criticizes the process approach because it fails to explicitly inform L2 writers about the exigencies of their intended audiences so that they can understand the context where mainstream writers from that culture write. She also criticizes the process approach because it assumes L2 writers know genre outcomes for any society. She continues, saying that these assumptions do not hold true for L2 writers and, therefore, newcomers "lack knowledge of the typical patterns and possibilities of variation within the texts that possess cultural capital (Cope & Kalantzis, 1993; Hasan, 1996)." (19)

Hyland draws heavily on Bakhtin (1986) as far as considering writing dialogic, "both because it presupposes and responds to an active audience and because it involves a plurality of voices through links to other texts." He also draws on Swales (1990, 1998) for the definition of discourse communities and adds that these communities are, according to genre theorists, the determiners of who will write and what will be written, as manifested power relations in modern society. Consequently, genre adepts will teach writing genres according to the discourse communities where they belong or wish to belong. In responding to criticisms that teaching genre is the same as teaching accommodation to the dominating groups and rules, Hyland says that, "in fact, learning about genres does not preclude critical analysis but provides a necessary basis for critical engagement with cultural and textual practices. As Bakhtin (1986) has suggested, writers must be able to control the genres they use before they can exploit them (24)."

Hyland provides a framework and a detailed set of activities that would be undertaken in genre-based writing instructions, which could be particularly interesting for teaching L2 scientific writing also in the context of agriculture.
Writing scientific articles in a second language, therefore, involves a complex interaction of socio-cultural, stylistic and scientific elements of one's background that might be considered either coherent or conflicting with specific scientific communities’ rules and goals at certain points in time. In this study, data will provide some indication of the extent to which research participants feel they can properly communicate in the target language and with target journals as they write for publication.

The literature review below shall provide indications of the role played by international journals’ policies and practices, as carried out by editors and reviewers, in term of either fostering or hindering the visibility of developing countries’ scientists and science. My main goal is to expand on the framework that scientific production is socially produced and that it is influenced by institutional, social, political, and ideological conventions and demands. The second goal is to show how such influences have been detrimental to the development of a desired greater visibility of developing countries’ scientists and science.

This study sees the possibilities for success among L2 scientific writers as dependent on three inseparable variables: 1) workplace conditions, which may or may not favor publication of scientific articles, particularly in English and in international journals, 2) L2 language problems, where language is understood within a broad context of cultural and social manifestations of knowledge, and 3) the actual need for scientists in developing countries to acquire international visibility as dependent on the political role of gatekeepers of scientific knowledge in fostering or hindering this desired visibility. The small numbers of articles published by developing countries’ scientists, in international scholarly journals, point to the fact that these scientists are disadvantaged compared with scientists from the developed world. The works discussed below show some approaches to this issue.

In emphasizing the need to situate the context of scientific production and communication as a means to understand the degree of visibility of scientists from developing countries, Collier and Toomey’s (1997) definition of the scientific method seems particularly relevant: “Scientific “method” includes not only observation, hypothesis, experiment, data, and conclusion but relationships among peers, argument, negotiation, serendipity, coercion, statistical sleight of hand, and fund-raising (70).”
The ‘relationship among peers’ aspects of the definition above seems to touch the very core of some problems related to L2 scientist-writers from developing countries, who have to publish in international journals for international visibility and promotion. Most scientists from developing countries went to college in their home countries and therefore, do not have the colleagues, professors, or others, who may be in the position of peer reviewers, referees or journal editors. Besides, these scientists are not normally aware of the rules of argumentation and negotiation within those cultures and discourse communities where their works will be judged. Therefore, differences in rhetorical contexts can lead to L2 article writing that is inappropriate and consequently, rejected when submitted for publication.

Most of the literature on the social construction of L2 scientific articles has approached the problem from the perspectives of the socio-cultural and linguistic backgrounds of the writer, the journal editors and reviewers (also called referees), and the readers, as discussed earlier in this chapter. Most literature on L2 scientific writing also has relied on the analyses of already published texts, where analysis of the process leading to publication and of all the actors involved in shaping the style and content of the article should be well understood. The recent contribution by Burrough-Boenisch (September 2003, in press), in “Shapers of published NNS research articles”, also indicates that a normally overlooked category of actors, the ‘authors’ editors’, also called 'language professionals' or 'professional correctors', "operating where NNS writing, text revision, and translation overlap" plays a very important role in shaping scientific articles, outside the discourse community. The author quotes Mary Ellen Kerans, an 'authors' editor', as she explained her definition of this professional’s "realistic goal" as follows: “to ensure that the material submitted is given a respectful reading by the peer reviewers, editors, regulatory authorities, or whoever will pass judgment on the suitability of the content for wider dissemination ([Shashok, 2001]) (page15 of 21).”

Recognizing the importance of authors’ editors as a pedagogical instance for authors to learn how to improve genre appropriateness, content, and text problems among others, has overriding implications for scientific writing pedagogy as acts of liberation and empowerment. The author, nonetheless, goes through a step-by-step analysis of the "constraints to correction" from the perspective of the 'authors' editors' and their relationships with the authors themselves, which include valuable discussion topics such as time.
constraints, "cognitive constraints, mother-tongue attrition, the ethical dilemma, assertiveness: authors' and correctors", among others. Burrough-Boenisch's contribution to understanding the relevance of the authors' editor is only equaled to the theoretical contribution for the field of applied linguistics and scientific communication, in that "few NNS traits may survive in the published article." Therefore, "This is a good reason for being wary of characterizing written discourse on the basis of an analysis of published NNS texts." (14 of 21). To this situation can be added the need to look beyond the writers' cultural and social rhetorical spaces, and toward all the actors that participate in the writing process from the very beginning.

Burrough-Boenisch also made other major contributions to the study of L2 scientists who write scientific papers, including the development of what she calls "the spiral toward publication", to inform writers about all the actors that will be shaping their papers from the moment they start the reviewing and editing process to the time of publication. Burrough-Boenisch raises L2 writers' awareness in that some of the suggestions for changes may be irrelevant, others contradictory, and others even be negotiated. The main aspect of this awareness is that L2 scientists can be trained to critically analyze feedback in the process of submitting articles for publication, leading to writers' empowerment and liberation.

However, besides the studies of factors leading to greater or smaller international visibility of L2 scientists from developing countries, from the perspective of writers and other actors in the writing process, the ideological sphere requires specific analysis. Unfortunately, even though several studies have mentioned the ideological issues at the level of the journal, specific studies on the topic were not found. The discussion below points to the need for further studies concerning the level of acceptance of articles written by L2 scientists while in their countries. The data below might raise the awareness of scientific communicators working as journal editors and referees, concerning some of the problems L2 scientists face as they seek international recognition and visibility.

Wayt Gibbs's (1995) article Lost Science in the Third World, under the topic Trends in Scientific Communication, presents data obtained from interviews with more than one hundred scientists and journal editors. The data below shows the magnitude of the problem and somehow assesses the potential for greater visibility of L2 scientists as writers:
• SCI (Science Citation Index) "lists articles from roughly 3,300 scientific journals selected from more than 70,000 that are published worldwide" (92)

• Subscription rates to SCI are a constraint to many developing countries (Wayt Gibbs gives the example of a Mexican medical journal which had to pay $10,000 and which, once could not afford the payment, was immediately cut off from the database) (92-3).

• 30.8% of the papers published in 1994 by the journals included in SCI came from the U.S.; 8.2% from Japan; 7.9% from the U.K.; and 7.2 from Germany, adding up to approximately 54%; 1.6% came from India (this country known as one of the most prolific country in terms of scientific production) and 0.6% of the papers came from Brazil (92)

• although developing countries encompass 24.1 percent of the world's scientists and 5.3 percent of world's research spending, (93) "leading journals in most fields publish far fewer than the 5.3 percent of articles expected as the fruit of that fraction of the world's research investment spent in less developed countries." Besides, "the 2 percent participation in international scientific discourse allowed by Western indexing services is simply too little to account for the scientific output of 80 percent of the world," (as mentioned in the editorial of the British Medical Journal in June 1995) (96)

• Brazilian papers "are cited approximately 60 percent less than American papers in the same journal" (98)

As far as language is concerned, many editors held strongly negative views about non-native English scientists as quoted by Wayt Gibbs:

If you see people making multiple mistakes in spelling, syntax and semantics," says Floyd E. Bloom, the editor of Science, "you have to wonder whether when they did their science they weren't also making similar errors of inattention," to which Wayt Gibbs adds: "It is interesting, however, that acceptance rates for papers from India, where English is widely spoken, still tends to be far below those for French and German articles. (96)
Bloom's statement clearly fits in the ideological arena as many other potential statements of other editors of scientific journals may fit, as they criticize the science being done in the Third World as a whole. This discussion, however, although related to the topic of this study, would require an extensive theoretical discussion that is above the goals of this study. Also, the fact that some journal editors have made efforts to "train" developing countries' scientists and editors to learn and obey the rules of English (primarily U.S. English), the dominant scientific lingua franca worldwide, does not mean that the dominant ideology is providing the tools for authors' empowerment. These, therefore, and other ideological issues involved in this almost religious salvation of Third World science and scientists can be topics for other studies. What really matters at this point is the awareness that beyond the linguistic, personal, and social aspects of L2 scientific writing lies a wide range of ideological issues that remain little studied.

Worthwhile mentioning, however, although also from an ideological perspective, is the WHO initiative to create an alternative citation index for the health sciences which was followed by alternative indexes for the agricultural sciences (with the FAO) and all fields of science and technology (with UNESCO). These initiatives have in common the goal to cite articles published in journals published in developing countries, at considerably lower subscription rates ($750 in 1995). These indexes are also made available in a large number of libraries in the Third World. (Wayt Gibbs 96)

Besides all these efforts, however, Wayt Gibbs reports that more than half the Third World scientists he interviewed were convinced of prejudice against these countries' science and scientists by editors and referees of mainstream countries. Some of the scientists Wayt Gibbs interviewed made the point that authors' address and specifically the country from which the scientist was writing influenced the chances of acceptance by mainstream journals (97-8).

Of greater importance for scientific communicators working as editors of scientific journals, however, is the social responsibility of their tasks. Wayt Gibbs reports on some scientists' angry comments about the irresponsibility of mainstream journals when breakthroughs in science are not taken into account. Wayt Gibbs cites Jacques Gaillard's
(ORSTOM) study of the publications of 207 scientists in Latin America, Asia and Africa, who says that

[scientists in developing countries] are caught in an especially vicious circle, because even when their findings are published in highly influential, prestigious scientific journals, they are, all told, far less often cited than writings by their colleagues from [industrial nations] (98).

Therefore, as we refer back to the issue of invisibility of Third World countries' scientists, many of the facts above reassure that although initiatives have been taken to change this situation, by the United Nations through WHO, UNESCO and FAO, a lot remains to be done. As Horton (Lancet) says, the actual situation inhibits the development of indigenous science journals in Third World countries and at the same time, it "may deprive the industrial world of critical knowledge." (Wayt Gibbs 93) From an international perspective concerning the development of the sciences, Horton suggests that scientists in the Third World should be more efficient in communicating their results to each other (Wayt Gibbs 94), a view that has become increasingly important in Latin America.

The main purpose of the last part of Chapter 2 is to shed some light on the context of L2 scientific writing by researchers living in developing countries, Brazil included. This chapter as a whole has sought to learn, from the existing literature, how the issues of workplace context, language problems, and the processes of social production and publication of scientific articles are interrelated and determine the chances for visibility of scientists living in developing countries. To end this part of the chapter, I quote Casanave:

We are indeed looking ahead to an era (that may or may not become labeled “post-process”) in which attention to linguistic and cognitive processes and even interest in the products of writing have become embedded in local, institutional, and disciplinary contexts, and where people, their goals and institutional policies, and their relationships matter as much as do grammar and syntax, drafting and revising. It is especially important for L2 writing scholars to continue expanding their interests into these areas in that our field is fundamentally a political one. Linguistic minorities learn to write in mainstream contexts and linguistic majorities (e.g., Japanese in Japan) learn to become literate in a language, English
that dominates world Internet communication, commerce, scholarly publication, and cross-cultural political negotiation. We cannot therefore escape the sociopolitical implications of our work (96).

In Chapter 4, the data collected is analyzed in light of the methodology used and the contents of previous studies on the topic. By doing so, I provide theoretical and pragmatic inputs for the development of appropriate actions and needed research, including those related to the development of appropriate training in scientific writing in L2 in the field of agriculture. The results of this study should be complementary to previous L2 scientific writing training experiences in other countries that share similar cultures, particularly those in Latin America.
CHAPTER 3
METODOLOGY

An Overview

This research was conducted in order to understand the main problems associated with scientific English writing in two governmental agricultural research organizations in Brazil. The research is about researchers' perceptions at three different levels: 1) the actual workplace conditions that may or may not favor publication of scientific articles particularly in English and in international journals; 2) the language problems L2 writers have, where language is defined within a broad context of cultural, social, and political manifestations of knowledge; and 3) the role of gatekeepers of scientific knowledge in fostering or hindering the international visibility of scientists from developing countries. I have incorporated some information about the relationship between gender, specialization, and country of doctorate, and researchers' perceptions concerning the international visibility of developing countries' scientists. My study has followed the recommendation of Blakeslee et al. (1997), who state:

one important role of [technical and scientific communicators] is to improve our understanding of the settings and individuals we study through accounts that describe the rhetorical practices of our participants in ways that are meaningful and useful to them and to ourselves (126).

Although engaging in these three levels of analysis made this study more complex and the analysis, of necessity, a bit more general, the three levels were valuable in extending the scope of my study. This study is the first of its kind in these Brazilian governmental research organizations and, as such, a comprehensive method is the most appropriate to identify specific research topics to be studied further.

I collected data from a variety of sources: informal appraisals with agricultural researchers, visits to websites (a bookstore, three universities, EMBRAPA, and IAPAR), and questionnaires. The websites were the following: Livraria Cultura (one of the main bookstores in Brazil), UnB – Universidade de Brasilia, USP – Universidade de Sao Paulo, and UEL – Universidade Estadual de Londrina, EMBRAPA Headquarters (Brasilia, Distrito Federal), EMBRAPA – SOJA (Londrina, state of Parana), and IAPAR Headquarters (Londrina). The
information I gathered during the informal appraisals and the visits to websites were reported in Chapter 1.

In Chapter 4, the results of the questionnaires (Appendix) are presented and discussed. The questionnaires were emailed to Brazilian researchers working at EMBRAPA – SOJA (Brazilian Agricultural Research corporation – National Soybean Research Center) and IAPAR (Agricultural Institute of Parana), both located in Londrina, Parana state. Parana is the southern state that borders Argentina and Paraguay, and two other Brazilian states: Sao Paulo and Santa Catarina. Londrina, located in northern Parana, has a population of approximately 500,000.

Below I articulate: (1) my assumptions and research questions; (2) the research stages; (3) the methods for result analyses. The research stages to be presented below are: (a) conducting a preliminary appraisal of scientists’ problems in writing scientific articles and gathering website information; (b) obtaining research approvals; (c) defining the sample; (d) preparing the questionnaire and defining methods for response analysis.

**Hypotheses and Research Questions**

- **Hypothesis 1**: The complex rhetorical context of researchers’ schedule conflicts and disperse accountability divert them from developing their scientific writing skills.

  **Research question**: To what extent do organization features and demands influence the writing and publishing of scientific articles in English by Brazilian agricultural researchers working in the governmental organizations mentioned above?

- **Hypothesis 2**: Researchers’ problems in writing scientific articles in English are due to lack of training in L2 scientific writing as well as to rhetorical and cultural differences.

  **Research question**: To what extent do language and cultural barriers limit the production of scientific articles in English by the participants?
• **Hypothesis 3**: Researchers would publish more frequently, in international journals, if their L2 problems were evaluated from a post-process perspective, by journal editors and reviewers.

**Research question**: To what extent do the participants feel that international journals, editors, and reviewers discriminate against developing countries’ and Brazilian scientific production and scientists?

**Research Stages**

**Preliminary appraisal of scientists' problems in writing scientific articles and gathering website information**

This stage was conducted between December 2002 and January 2003. My purposes were: 1) to obtain information about the kinds of scientific writing courses offered by three Brazilian universities; 2) to find books of scientific communication in one of the major bookstores in Brazil; and 3) to obtain information about researchers’ main problems when writing scientific articles and about the kinds of training offered on the topic.

To obtain information about scientific writing courses, I analyzed the sites of three of the most prestigious Brazilian universities (Universidade de Sao Paulo – USP, Universidade de Brasilia – UnB, and Universidade Estadual de Londrina – UEL), for their courses in professional communication and scientific writing in three major programs: agriculture, communications, and journalism. I looked for courses with the titles: scientific composition, scientific writing, technical writing in the sciences, technical writing, and technical communication. As expected, I did not find any course with those titles.

To ascertain books available, I visited the site of one of the main Brazilian bookstores – Livraria Cultura, to learn about the kinds of scientific communication textbooks available. I looked for titles that had the same or similar words as the course titles mentioned above, and few were found, most being in English. Books in Portuguese had comprehensive titles such as ‘research methodology’, which often included chapters about the organization of scientific articles but lacked rhetorical discussions. This made them ‘dry’ and similar to a manual of instructions rather than a discussion of strategies to be considered. Furthermore, all of the books in Portuguese were in the 1st or 2nd editions, dating back 10 to 15 years. This was an
interesting indication of the continuing lack of interest on the topic of scientific communication by national publishers and universities.

To determine the main problems of researchers, I conducted the informal appraisals with six agricultural researchers that worked for EMBRAPA or IAPAR, whose responses were very similar to those I had learned from experience while working in those organizations several years ago. My work consisted of conducting sociological research with small farmers in the state of Parana. As part of interdisciplinary teams with responsibilities in the sociology component for several years, I experienced collaborative writing of research reports and articles as well as oral presentations. In these experiences, I came across the high levels of difficulty involved in writing for different audiences in Researchers complained about lack of training while students and as researchers, as well as about schedule conflicts and disperse accountability at their current workplace. They thought these situations kept them from developing the scientific writing skills they needed.

I also obtained website information about EMBRAPA-SOJA and IAPAR. This information was reported in Chapter 1 as background for the research itself, and contained explanations and data about the organizations, their missions and audiences, main publications and considerations on their communications policies. This information was important as a first approximation to the subject of study, before I planned the following steps of the research. Because the researchers who answered the questionnaire are more engaged in publishing scientific articles than the average of the population, largely because of workplace requirements, they might not represent Brazilian scientists in other areas of expertise. This is a possible limitation of my study.

**Obtaining research approvals**

This stage was conducted between February and October, 2003 and involved obtaining approvals from the Brazilian organizations and from the Institutional Review Board (IRB) at Iowa State University. I sent the Boards of Directors of IAPAR and EMBRAPA information letters, templates of letters of approval, the Informed Consent Document, and the preliminary version of the questionnaire. At Iowa State University, I took the web-based training on the protection of human subjects in research and had the research project approved by the IRB.
Defining the sample

I asked the Directors of EMBRAPA and IAPAR to identify the researchers that would be more cooperative and willing to answer the questionnaire and that fit two criteria: (1) have Ph.D. degrees and have published in international journals, and (2) five of the ten participants in each organization should be women. Requiring that half the sample should be women was based on comments by those researchers who participated in the informal appraisal that women would certainly be more cooperative and would take the time to write more extensively than men. I accepted this assumption by the researchers as a judgment based on their experience and expertise and not on uninformed gender bias.

Although the criteria to choose the sample might seem to lack scientific standards for being representative, they suit my purpose of conducting this research based on the need I had long ago identified as well as the will of these organizations to learn about this topic. Directors of both organizations have requested that I present my results to all researchers at each organization as a means to open the topic for discussion and action.

Sample size (n = 14) may also be subject to criticism in this study. It may be argued that 14 participants are not representative of most researchers in each organization. However, this study is not a survey, but an in-depth analysis of the commonalities among these 14 cases, as well as the occasional differences among them, which will be reported in the next chapter. The sample size seems to be appropriate for two main reasons: 1) education degrees and working conditions among these researchers in both organizations are similar; and 2) agricultural researchers in government organizations share similar organizational cultures, funding problems, and society demands, and can therefore, act as speakers for the Brazilian scientific community. Furthermore, researchers working at other government organizations in other states are hired and promoted according to the same criteria.

Not taking age as a criterion into account for sampling researchers may lead to criticism of this study as well. Age might indeed influence my research results since younger researchers will probably report having fewer writing problems in English than their older counterparts. Younger generations in Brazil have had more opportunities to learn English because: 1) there are more English schools nowadays than ever before; 2) the internet and cable TVs have made English very popular among young people; and 3) more researchers
travel and live overseas nowadays than ever before. Therefore, future studies may consider this variable so that specific actions can be taken to improve writing abilities of different age groups of researchers.

**Preparing the questionnaire**

My research questions were prepared to help me understand the dynamics of writing and, intrinsically related to writing, the publishing of scientific papers in English in two governmental agricultural research organizations located in Londrina: EMBRAPA – SOJA and IAPAR.

A qualitative study suited my purpose of obtaining the researchers' perspectives on the writing and publishing process of scientific articles in English. Therefore, I may count on subjectivism on the part of the respondents and mine. Eliminating subjectivism is an impossible task, particularly in this kind of studies. Furthermore, since my goal in this research is to initiate a conversation with both researchers and organizations that participate in this study as to actions that can be taken after my results are discussed widely, a qualitative analysis allows for a more consistent engagement of the participants. As we know, validity can be assessed in both quantitative and qualitative studies. Herrington “defines validity as accountability to the situation being studied that can be judged by readers of the research and or by the people who are actually in the situation” (Blakeslee 128).

Post-modern research has shown that qualitative studies can ensure validity, although not according to the same criteria as quantitative studies. According to Blakeslee, validity in qualitative studies should contain “a more fluid notion that disperses authority, instead of situating it solely with the researcher” (127).

With the above in mind, I prepared the questionnaires (Appendixes A, B, and C) as a means to raise concerns and problems researchers have and at the same time, to prepare the grounds for further research and action. Once I had the overall background for my research, I pre-tested the questionnaire for clarity and relevance of content with two Brazilian doctorate students in agricultural sciences at ISU. After modifying the questionnaire, I emailed them as attachments to Brazil. The 14 researchers answered within 10 days, also by email attachments.
Methods for Analysis of Results

Analysis of results was done when questionnaires were received, as email attachments, by following the steps below:

analysis of one question at a time and development of frequency tables

- analysis of each question by grouping the data primarily according to gender, specialization, and country where doctorate was obtained
- identification of the main issues in each of the three sections of the questionnaire
- development of recommendations for action and further research to be should be discussed within EMBRAPA and IAPAR

Each section below presents relationships between variables considered explanatory to the purposes of this study, which were, therefore, my working hypotheses.

Section 1: Researchers’ workplace demands and possibilities for writing and publishing in scientific journals

The main objective of this section was to understand the ways the dynamics and demands of the organizations affect the amount of researchers’ time for writing and publishing scientific articles, particularly in English. Research participants were asked to answer nine questions, two of which in the format of tables to be filled in with time percentages for their activities (APPENDIX).

The working hypotheses for this section were: (a) organizations’ diverse accountability effects on researchers’ schedules do not allow them the time needed for research; (b) researchers do not have a satisfactory allocation of time for the different research tasks (literature review, data collection and analysis, research projects and reports, research articles in Portuguese and English); (c) researchers expect their organizations to provide the means for increasing the publication of research articles, particularly in English.

The research question that guided this part of my research was to what extent researchers at IAPAR and EMBRAPA feel that their schedules are appropriate for their expectations and responsibilities as scientists.
Section 2: Language issues associated with L2 scientific writing and revising in English

The main objectives of this section were to obtain information on the availability of, and need for training in scientific writing. Researchers were also asked to report on problems associated with the process of writing scientific articles in English as well as on the language, motivation, and cultural issues associated with it. Participants were asked to list previous training in scientific writing in Portuguese and English and to answer 16 questions (APPENDIX).

The working hypotheses in this section were: (a) researchers' lack of training in scientific writing influences their ability to publish in English; (b) cultural and linguistic differences between Portuguese and English make English scientific writing difficult for Brazilian researchers; (c) research participants have similar motivations to publish in English and in international journals.

The research question that guided this part of my research was to what extent lack of training, L2 cultural and linguistic difficulties, as well as researchers' motivations, limit the production and publication of scientific articles in English.

Section 3: researchers' perception of the role of international journals' policies and actual practices in fostering (or hindering) the international visibility of developing countries' scientists and science

The main objective of this part was to obtain the perceptions of research participants, as speakers for the Brazilian scientific community in agriculture, concerning the attitudes of international journals' editors and reviewers towards Brazilian and Third World science and scientists. Researchers were asked to respond (True or False) to 11 statements (APPENDIX C). Researchers were told that they could comment on the statements presented if they considered necessary to qualify the information they wanted to present.

The main working hypotheses in this section were: (a) that the more researchers experience training in scientific writing and have been in contact with English schools and academy, the less they feel discriminated or believe in discrimination when submitting articles for publication in international specialized journals; (b) the extent to which
researchers feel discrimination depends on their gender, specialization, and country where
doctorate degree was obtained.

The research question that guided this section of the research was what influences research participants' perceptions toward discrimination against Brazilian scientific production and scientists, by international journals, editors, and reviewers.

In the next chapter, I will present and discuss the data obtained through the questionnaires, according to the criteria explained above.
CHAPTER 4
RESULTS AND DISCUSSION

This chapter, which contains results and discussion, is organized around three sections:

- the role of researchers’ workplace demands in determining their possibilities for writing and publishing in scientific journals;
- language issues associated with L2 scientific writing and revising scientific articles in English;
- researchers’ perceptions of the role of international journals and their editors and reviewers in fostering or hindering the international visibility of developing countries’ scientists and science.

The overall goal of this chapter is to understand the actual situation of L2 scientific writing at IAPAR and EMBRAPA, from the perspective of researchers. A specific goal of Section 3 is to obtain preliminary information about the relationship between researchers’ gender, specialization and country of doctorate, and their perceptions about discrimination by international journals published in developed countries. This information will allow me, in the last chapter of this study, to suggest changes for a more efficient interaction between Brazilian scientists and the international scientific discourse community.

Section 1: Researchers’ workplace demands and possibilities for writing and publishing in scientific journals

The main objective of this section is to understand the role of researchers’ immediate workplace demands in allowing time and conditions for writing and publishing in scientific journals, particularly in English. I consider this step necessary to understand the organization’s context within which researchers must negotiate their time to do research and write and publish RAs while attending to other workplace demands. In order to do so, I obtained data about the average percentages of time researchers spent in research, extension, administrative, and other activities. Data were also obtained on the average time researchers spent on each of the six steps in research: literature review, data collection and analysis, and writing research projects, reports, and articles in Portuguese and in English.
The main working hypotheses for this section, which will be discussed below, were:

- organizations' diverse accountability effects on researchers' schedules do not allow them the time needed for research;
- researchers do not have a satisfactory allocation of time for the different research tasks (literature review, data collection and analysis, research projects and reports, research articles in Portuguese and English);
- researchers expect their organizations to provide means for increasing the publication of research articles, particularly in English.

The research question that guided this part of my research was to what extent researchers at IAPAR and EMBRAPA feel that their schedules are appropriate for their expectations and responsibilities as scientists?

**Working Hypothesis 1: Organizations' diverse accountability effects on researchers' schedules do not allow them the time needed for research**

Data on researchers' schedules were relevant to understanding the workplace context within which researchers acted on a daily basis and which determined, to a large extent, the amount of time they had to write and publish RAs. Furthermore, these data allowed the identification of constraints that might be solved in order to provide researchers with the resources and time they need to write.

My data confirmed my hypothesis that overall, researchers were not satisfied with their time allocation due to their organizations' diverse accountabilities. Most of the researchers in my study were frustrated with the large amount of time spent in administrative and other tasks as compared to research activities, which they thought should be their priority as researchers. As it was established in Chapter 1, because both IAPAR and EMBRAPA are governmental agencies, both staff and researchers were accountable to a large number of civil, governmental, and political organizations that required involvement in a variety of committees and tasks to solve immediate and long-term problems.

Results in this study showed that most researchers considered the time they allocated for administrative and 'other' activities were beyond the time they considered ideal. For the purposes of this study, administrative tasks were defined as any non-research activity that
involved primarily budgeting, project coordination, and internal policy study-groups (such as the salary policy committee and other committees formed for specific purposes and usually by demand of government sectors or the employees). 'Other tasks' were defined as any activity that were research related or not, and involved external participation. Among these activities were: undergraduate and graduate student advising, revising journal articles, teaching, organizing workshops, congresses, and conferences, responding to farmers' needs on individual bases - usually in phone calls, by email or farmers' visit to researchers' office, communicating with the press, and participating in discipline-specific committees.

Researchers' dissatisfaction with the time they spent in administrative and other activities other than their research projects could be observed in the results as follows. Eight of the researchers used 20 to 70 percent of their times in administrative tasks and only five, spent 10 percent or less. However, 13 researchers reported that their ideal times would vary from no time to 20 percent at the most, of whom 10 suggested from no time to 10 percent as ideal. Only two researchers thought that they would like to spend between 10 and 20 percent of their time with 'other' activities, whereas all others would like to spend no time to 5 percent. (Figure 1)
As expected, a different pattern occurred in the research category. Only two researchers (#8 and #10), who used 70 and 100 percent of their times for research, considered their current distribution of time as ideal. All the others reported that they would like to increase their timeshare in research, some of whom, significantly. Nine researchers dedicated between 20 and 60 percent of their time to research, and four dedicated 70 to 100 percent. Also as expected, 11 of 13 considered between 50 and 80 percent for research as ideal and the 2 left considered 100 percent. (Figure 2)

![Figure 2. Current and ideal times devoted to research activities](image)

On the other hand, researchers varied significantly in terms of their satisfaction with the time spent in extension activities. The data for this category showed that time spent with extension activities varied significantly among researchers (from no time to 70 percent). The data also showed that time spent in extension activities was related to specialization, and within each specialization, time was related to the kind of project. Researchers informed that those projects that were oriented toward solving specific problems at the farms, usually on a regional basis, tended to require more time for extension (meetings on the field with groups of
farmers, cooperative members, or extension agents). The five researchers having 10 percent or less of their time in extension would like to increase their share, whereas four of five who had more than 15 percent in these activities, would like to decrease their activities. Most researchers (11) considered between 10 and 20 percent of their times as ideal for extension activities.

Researchers reported they felt that their time was used inappropriately. Most researchers reported being willing to increase the time in research activities to between 50 and 80 percent, use between 10 and 20 percent of their times for extension activities, and decrease the time in administrative and ‘other’ activities to no more than 10 percent. These results, when combined with those presented in Chapter 1 concerning IAPAR and EMBRAPA’s diverse accountability, indicated that researchers would welcome significant adaptations in their schedules in order to accommodate longer hours in research. Such adaptations, however, would require changes in the ways and mechanisms through which the organizations responded to all the social sectors that rely on the technology therein developed.

Now that I have presented researchers’ current and ideal time-shares for research activities as compared to other, non-research activities and organizational demands, I will present data about schedule conflicts occurring among research activities themselves.

**Working Hypothesis 2: Researchers do not have a satisfactory allocation of time for the different research tasks (literature review, data collection and analysis, research projects and reports, research articles in Portuguese and English)**

The background for this hypothesis was Candelaria’s concern with the inefficiency of researchers’ time allocation among research-related activities (1958, 2002), as discussed in Chapter 1. Candelaria thought that researchers spent too much time in such activities at the expense of their creative research work, and suggested that technical communicators were capable of relieving their workloads. Below are the data about researchers’ time allocation, which validate Candelaria’s argument that researchers spend too much time in activities that could be conducted by professional communicators, particularly in writing project reports and, to a smaller extent, research projects. Considering that most researchers in my study would like to use a larger portion of their time to conduct research than they did by the time
this research was conducted, as shown above, the data below identify bottlenecks among
different research tasks that can make research more efficient.

Most researchers reported that the ideal percentages (%) of time to do literature review,
write research projects, and collect and analyze data were slightly different from their current
timeshares. Eleven of the respondents spent, on average, between five and 10 percent of their
time doing literature review; eight of them would like to increase this share to 10 and 15
percent. Except for two researchers, all others spent 10 to 20 percent of their research time
writing research projects and changes normally involved small increases or decreases, of five
to 10 percent. Time spent in data collection and analysis varied substantially among
researchers, however, and seemed to be related to specialization although no conclusive data
were obtained. Current and ideal percentages in data collection and analysis normally fell
between 20 to 45 percent. Since data collection and analysis is not one of the activities to
which professional communicators can contribute, it was mentioned for the sole purpose of
completing the illustration of researchers’ overall time schedule.

In the research report writing item however, only two researchers reported being willing
to increase their timeshare. Except for one researcher who considered his time appropriate, all
others said they would like to decrease the time by 30 (one), 15 (four), and 5-10 (six) percent;
eight researchers would like to spend between five and 10 percent of their time only, two 15
percent, and another two 20 percent of the time writing reports. This points to a possibility for
technical writers to facilitate the communication of results by organizing data and probably
writing first drafts of reports, since several researchers reported that time spent writing
research reports is ‘wasted time’. (Figure 3)

One researcher said: “too many activities deviate the researcher from his or her goal; we
waste a lot of time writing research projects and reports, when emphasis should be place on
publication of results.”(#9)"
A different situation occurred when researchers were asked about their actual and ideal timeshares for writing research articles in Portuguese and in English. Only one researcher (who was one of the few to already spent 25 percent of the time writing RAs in Portuguese) would like to spend 20 percent, and two others who spent 15 and 10 percent and would like to keep those percentages. The others reported on the ideal situations as being higher: six would like to increase between 5 and 10 percent, and four would like to increase significantly, between 15 and 25 percent. The most important findings in this aspect were: nowadays, 10 of the 14 researchers spent 10 percent or less of their time writing research articles in Portuguese, whereas eleven would like to spend between 10 and 35 percent and 8 would like it between 10 and 20. Researchers, therefore, were willing to spend more time writing research articles in Portuguese than they are nowadays, at least doubling the current amount of time. (Figure 4)

Researchers reported the same willingness for increasing their timeshares for RAs in English as for Portuguese. Only two researchers found that the time percentages were appropriate. As for the other researchers, seven would like to increase their times between five and 10 percent and four would like to increase between 15 and 23 percent. Most
researchers (10) considered between 10 and 20 percent as ideal, compared to most currently using no time at all or up to 10 percent. (Figure 5)

The data above showed that most researchers would like to use between 50 and 80 percent of their time for research, as compared to the current 20 to 60 percent. When research activities were broken up into tasks; it became clear that researchers would like to spend more time doing literature review and writing research articles in both Portuguese and English. They would nonetheless, want to spend less time writing research reports. The data also suggested that much should be done to allow scientists more time to write research articles and therefore, communicate their research results more efficiently.

**Working Hypothesis 3: Researchers would expect their organizations to provide the means for increasing the publication of research articles, particularly in English.**

Preliminary interviews with IAPAR and EMBRAPA scientists before conducting this research brought to my attention the fact that the nature of their work demanded frequent, and
often several days of traveling to conduct experiments both at the farm and the experimental station levels in different parts of the state and the country. This fact, added to the fact that researchers were involved in a variety of non-research activities as well, gave the picture of how complex the researchers' schedule was and how little time was normally available to write RAs. As a consequence, my hypothesis was based on these constraints and seeks to have researchers' feedback on ways they believed their organizations would be able to help them write more RAs, particularly in English.

Research participants agreed that their organizations could help them increase the time they had for publication of articles, both in Portuguese and in English. They presented the following alternatives, by order of most to least frequent:

- hire a professional in scientific writing with knowledge in agriculture who could help with writing, revising and editing of articles
- offer courses in scientific writing or fund them
- make publications in English one of the evaluation criteria for promotion
• pay for translations and publications in international journals
• allow more time for researchers to work on the publication of research articles and less time for administration and other issues.

Approximately half of the 14 researchers reported that text organization, revision and editing were their first, second, or third main difficulties, as will be reported in Section 2. Therefore, professional communicators could train researchers to improve scientific writing. In this case, as some researchers suggested, the organizations would probably develop a continuous training organizational culture that would likely be more economical and efficient in the long run than hiring professionals occasionally for specific courses. Also, the availability of a professional communicator at the workplace would suit the need for peer reviewers. As one researcher mentioned, her peers were not always available or did not always have the knowledge to review her articles properly.

Researchers argued that making publications in English evaluation criteria for promotion would be a way of giving recognition for the additional work that writing in L2 involves. Although funding research agencies do value publication in the most important international journals, which were usually in English, higher than in national journals, neither EMBRAPA nor IAPAR had adopted this criterium yet.

Only two researchers reported hiring translators. Most researchers expected their organizations to somehow help them publish in English. Some scientists suggested that hiring a professional who would be familiar with agriculture and scientific writing in Portuguese and English would increase the number of publications at the levels of organizations and researchers, and therefore lower the costs of courses and translations. This ideal situation was considered a convenient way for the research organizations to improve their international visibilities and therefore, increase their chances for international funding.

The next section of this chapter provides information about the availability and need for training in scientific writing, from the experience of these researchers. This information helped to understand factors that influenced the writing and publishing of scientific articles in English at IAPAR and EMBRAPA, from a perspective of the language itself. This information, when combined with the information on organizations' demands and researchers' time availability for writing and publishing RAs, provided a wide picture of the
writing process among these researchers. By reporting on researchers’ perceptions of the ways international journals hinder or help their international visibility, the last section of this chapter will complete the full analytical cycle for understanding some of the aspects of RA writing and publishing in the contexts of IAPAR and EMBRAPA.

Section 2: Language Issues associated with L2 Scientific Writing and Revising in English

The main objectives of this section of my study were to obtain information on the availability of and on the perceived need for training in scientific writing. Researchers were asked to report on problems associated with the process of writing scientific articles in English as well as on the language, motivation, and cultural issues associated with it. Participants were asked to list previous training in scientific writing in Portuguese and English.

The working hypotheses in this part were:

- researchers’ lack of training in scientific writing influence their ability to publish in English;
- cultural and linguistic differences between Portuguese and English make English scientific writing difficult for Brazilian researchers;
- research participants have similar motivations to publish in English and in international journals.

The research question guiding this part of my research was to what extent lack of training, L2 cultural and linguistic difficulties, as well as researchers’ motivations limit the production and publication of scientific articles in English.

The analysis of results was conducted primarily by looking at each assumption and related questions. Each question was analyzed individually by gathering all the data collected from each participant. Analysis of any researcher individually was only done when his or her characteristics indicate situations that were considerably different from that of their colleagues.

All of the fourteen researchers responded to this part of the questionnaire.
Working hypothesis 1: Researchers’ lack of training in scientific writing influence their ability to publish in English

As discussed in the literature review, it was important to understand the data below within the context of Brazil as a developing country with limited resources for training. It was also important to remember that Brazil has a tradition of orally transmitting agricultural knowledge primarily to those who are the legitimate audience for government-supported research: the farmers and the Brazilian society. Furthermore, the data must be understood within the context of scientific development in this century, which only considers science the research results that are published in English, and primarily in developed countries’ most important and indexed journals. Therefore, the writing and publishing in English by researchers in agricultural organizations in Brazil and in other developing countries, involves competition in resource allocation, funding, time, and accountability. Using the data below within this context, I will analyze some aspects related to training, cultural and linguistic differences between Portuguese and English, and scientists’ motivations to publish in English.

Khana (2001) has suggested that developing countries do have a “science culture” and that their relatively low numbers of publications as compared to developed countries’ was mostly due to lack of training in scientific writing. (53). This is particularly true in Brazil, since Brazil’s first government agricultural research organization – the Agricultural Institute of Campinas, for instance, dates from the late 1800s and several others were created in the first half of the 19th century. Khana concluded that developing countries’ scientists needed training in order to become more visible internationally. Khana’s argument seems to be partially true for this research’s participants because, although researchers considered training a necessary tool for publication, many were aware that other factors such as journals’ policies also limited their access to international visibility. This aspect will be discussed in the third section of this chapter. Below are the data and discussion concerning training.

Ten of the 14 participants have had some kind of training in scientific writing in Portuguese. Training time varied from 16 hours to 160 hours, where seven (half the overall participants) had between 40 and 60 hours of training. Some courses were offered by EMBRAPA and IAPAR in the 80s and 90s (no mention of courses after 1997), and others by Brazilian universities (particularly UFGS and ESALQ-USP), as part of the graduate courses.
In some situations, scientific writing was taught in ‘Special Topics’ courses and in others, in “Technical and Scientific Composition” or ‘Composition and Oral Presentation Techniques” courses, and even in a “Technical and Scientific Composition, Ethics and International Indexes”, offered by ABEC. Detailed information about the content of these writing courses was not collected because this was not the goal of this research. Training in scientific writing in Portuguese, however, has not led to larger numbers of publications among participants in this research.

However, as I mentioned in Chapter 2, my experience in Brazilian universities, as well as the preliminary interviews with IAPAR and EMBRAPA researchers, before this research was conducted, and still this research participants’ view concerning training, all seem to point to the ‘scientific writing illiteracy’ among most scientists and students in Brazil. Because this research did not aim at obtaining detailed information on training, further studies on the availability of scientific writing courses in Portuguese, in Brazil, should be conducted. These studies could be compared to L2 academic courses offered in other countries such as Botswana (Chimbganda 2000), and their content evaluated according to Atkinson’s (2003) definition of literacy as an ideological arena.

Only three of the participants have had some training in English scientific writing while doing their doctorate courses: two in the U.S. and one in the U.K. One of the researchers who did the doctorate in the U.S. took an 80 hour scientific writing and oral presentation course as required at Purdue University (1979-1980) and also audited a second course on the same topic while doing his post-doctorate at North Carolina State University (1994-1996). The other researcher took an academic writing course at the University of Nebraska, and the third researcher took an ESL course at Cranfield University at Silsoe, U.K. Following the same trend as training in Portuguese, training in English writing did not seem to lead to larger percentages of publications in English. Training in English for the two latter researchers did not result in higher percentages of publications in that language, as compared to the other researchers.

The first researcher mentioned above had all of his publications in English in the last two years. This fact was explained by the fact that he has been working at EMBRAPA for 30 years, has done both his doctorate (late 70s and early 80s) and post-doctorate (mid-90s) in the
U.S., and has always had a native speaker U.S. professor to co-author all of his publications in English. This researcher's case can be discussed in light of Sionis’ findings on the impact of attitudes toward language learning. He found that the age and professional status of scientists, at the workplace, influence their motivations to improve scientific writing skills. In this research, this scientist was at the beginning of his career when he came to the U.S., and he took courses in scientific writing because he had a perspective of publishing in English. He had what Sionis (1995) calls “integrative motivation” to become part of the international scientific community. Furthermore, once he became a member of this community, he maintained close relationships with his U.S. colleagues to make sure he used the appropriate “communication strategies” (Sionis 1995, Tarone (1983) and “situational appropriateness” (Sionis, 1995) to continue publishing in English.

As expected, all researchers agreed that training in scientific writing was very important, and many agreed that it should be done both in Portuguese and in English. Some of the comments about training were:

- Highly necessary and should be required in agriculture and even in high school (#9) (a similar statement was made by # 4)
- A work with high scientific value will be devalued when it is poorly written and may end up rejected [for publication]... The worse situation occurs among researchers who think that they know enough of a language and believe they do not need this kind of training because of the scientific knowledge they possess. (#3)
- Scientific writing is the primary tool for the communication of research results and activities. (#2)

Some respondents said that they had learned scientific writing in English by reading other articles in their specialization, by reviewing other researchers’ papers as blind or peer reviewers, or still by reading about scientific writing techniques; others mentioned Brazilian graduate faculty’s efforts to teach scientific writing while requiring course papers and reports. There was agreement concerning the definite need for training in scientific writing among both researchers and students, and it seemed that the point of view that the sooner students learned it the better, was widely held.
Working hypothesis 2: Cultural and linguistic differences between Portuguese and English make English scientific writing difficult for Brazilian researchers.

Culture always is intrinsically related to the linguistic patterns of each society. Kubota (2002) said that although gender has had some attention in L2 writing research, little has been done in terms of class and race relations. Kubota’s point was of greatest importance in L2 scientific writing particularly when L2 is English and L1 is any of the languages spoken by developing countries’ scientists; therefore, it deserves further and numerous comparative studies. In this study gender seemed to determine, to a large extent, researchers’ perceptions of discrimination and their chances to acquire international visibility.

Nevertheless, before the data are presented, it is important to situate Brazilian researchers’ answers in the context of a contradictory society that sees itself and the developed world as belonging to two different social classes. This feeling is manifested in continuous and alternating cycles of enchantment and disenchantment of Brazilian scientists toward developed countries’ scientists. These oscillations occur among scientists, as they alternate between nationalist feelings against the science and scientists of the developed world (disenchantment) and the feelings associated with the ‘best’ of science and scientists in the developed countries (enchantment). Researchers’ attitudes toward L2 writing often seemed to oscillate between these two moods as well, one of the reasons why English learning is more complicated of a task than one can suspect at first sight. As Kubota suggests, L2 writing should be analyzed also from a social class perspective, going beyond textual issues.

In a similar way, one of the goals of this study was to understand some of the ways culture influences researchers’ attitudes toward writing in English, which was related to ideology in the sense that it reflects larger social class issues. It was interesting to find out that the overall self-image of Brazilians, and our attitudes were very similar to the image research participants held of the writing process. In other words, Brazilian culture was normally seen by Brazilians as prolix and therefore, not objective or ‘scientific’, and this self-image was manifest by the research participants as true for scientific writing.

The most important differences researchers agreed upon when comparing English and Portuguese scientific writing were objectivity (4 researchers) and style (another 4), which are intrinsically related. Researchers said that English was more "objective" than Portuguese,
meaning that English writing was simpler, and more straightforward and direct than Portuguese. Some referred to the Portuguese writing style as complicated because it uses longer sentences and takes longer 'to get to the point'. In fact, there was a general perception among Brazilians that it was easier to write in English once one knew the basic grammar and terminology required to express oneself, than in Portuguese. This collective idea led many researchers to believe (as Khana did to a certain extent) that once one becomes familiar with conversational English and learns the scientific terminology, he or she will be able to improve his or her scientific writing significantly.

Gosden (1995) realized that scientific writing is complex and is judged according to specific rhetorical strategies that differ among cultures, which make L2 scientific writing particularly difficult to learn. He also suggested that such differences were used by editors to reject the publication of most L2 scientific articles rather than scientific content.

Brazilian scientists understood the issue above and felt a disadvantage concerning cultural rhetorical differences as they wrote in English, as compared to native speakers. L2 scientific writers should be concerned with all of the rhetorical concerns Gosden (1995) mentions concerning editors, as well as with other audiences that will be reached. As one of the participants said,

It is more difficult to write in English because we are more concerned with the variety of readers that will have access to the publication, some of whom are English native speakers and many others have English as a second language. (#14)

The researcher’s comment above was an important contribution to L2 pedagogy, in the sense that it requires the teaching of multicultural awareness and audience analysis that goes beyond international journals’ editors and reviewers, the ‘gatekeepers of knowledge’, and the scientists’ specific discourse community in the developed country. In other words, it requires an approach to teaching L2 scientific writing that incorporates a concept of discourse community as a multicultural and multinational forum where cultural differences are also manifested at the level of the scientific discourse and professional interaction.

The main overall problems research participants mentioned having, when they write scientific articles in English, were as follows:

- grammatical: mainly word order
• lexical: particularly technical terms. One of the seven researchers who mentioned this aspect said that “although there are excellent glossaries” in English, in his specialization, good quality glossaries have not been translated into Portuguese, which makes writing in English difficult (#120).

• communicative: mainly concerns with the appropriate transmission of ideas.

When researchers were asked to rate their main difficulties when writing articles to be published in English, by considering a set of alternatives, they responded as below:

• all researchers agreed that one of their three main difficulties is to properly communicate their ideas, eight of whom consider this to be the main problem;
• twelve of the researchers also placed the definition of the appropriate level of information details among the three main difficulties;
• between six and eight researchers reported the difficulties involved in organizing the text (paragraph and sentence order), revising for content, coherence, and relevance of information, and editing for grammar, syntax, and publication rules, as first, second, or third major difficulties.

The findings above indicate that researchers had problems situating themselves in the L2 rhetorical context of the readers because writing in L2 involves a wide range of stylistic and linguistic differences from L1. Gosden (1995) also reached similar conclusions, in that three of the four main aspects he found to influence editors when judging L2 RAs were rhetoric related: logical and clear linking of sentences, appropriate development of topic from sentence to sentence, and ability to make claims.

The fact that the English reading audience is complex and difficult to reach because it is diverse as compared to the Brazilian reading audience, impacted Brazilian researchers significantly. All researchers in my sample reported difficulties in properly communicating their ideas. The implications for L2 scientific writing pedagogy are, therefore, as previously mentioned, highly important and might be the biggest challenge for instructors because it involves instructors’ training in multiculturalism and rhetorical analysis with considerations of multicultural audiences and locations.

Gosden argues that success in research article writing and revision can only be understood by the analyses and understanding not only the composing and revision processes
of specific L2 groups but also the regulating mechanisms of a particular discourse community. Therefore, one might expect the Brazilian group of researchers who responded the questionnaire do adopt significantly different writing strategies when writing for Brazilian journals and international journals because the social actors involved in the whole process were different. Expectations that the cultural and linguistic differences between Portuguese and English would lead researchers to adopt different process strategies to write their articles in English were mistaken. In fact, all researchers took, basically, the same steps in writing in articles in English and Portuguese, for publication in Brazilian or international journals. Gosden's arguments, however, might prove truthful for revision as compared to the initial writing and peer reviewing processes investigated in this research as the richness of his arguments incite in-depth studies.

The most interesting findings were:

- about half the researchers placed the discussion with colleagues as first or second steps in the writing process, and the other half consistently place it as third;
- only four researchers did the journal search to find out which ones would be interested in the researchers' topic before they prepared the article outline, and only one said he would talked to colleagues before preparing the outline;
- only four researchers wrote the articles firstly in Portuguese and then translated them, all of whom did their doctorates in Brazil; only two of these researchers hired translators. One of them also commented that translations were expensive and her organization did not help with these expenses;
- nine of the researchers, seven of which worked for EMBRAPA, reported sending their articles to the publication committees at their workplaces; these committees conducted content revision and editing, and in the case of EMBRAPA, also the English editing;
- only two researchers reported not requesting peer comments.

The findings above show that most Brazilian researchers prepared outlines, sought colleagues' collaboration, searched for the most appropriate journals for their research publication, usually wrote their first drafts in English, rarely required professional translation,
and normally received feedback from publication committees within their organizations, before articles were sent to the recommended journals. As mentioned above, in-depth studies based on Gosden’s arguments (as well as Blakeslee’s 1997), concerning the role each social actor plays in changing the original manuscript of L2 scientific writers should be undertaken at the workplace and journal levels and might prove elucidating to IAPAR and EMBRAPA.

The main implication of the findings above for professional communicators, was that these professionals can be engaged in helping researchers to communicate properly, from the very beginning of the writing process, e.g. at the outline level. It is important to remember at this point, that approximately half the sample reported that text organization, Revision, and editing were their first, second, or third main difficulty. Professional communicators could also help researchers to adapt to the rhetorical situation of target journals.

Ten researchers reported that most corrections were made in the Results and Discussion section of their papers, and four of them also reported that significant changes were made in the Introduction. Only one researcher reported that changes in the Materials and Methods section were substantial.

The fact that most criticisms fell in the Results and Discussion section maybe an additional indication of the real rhetorical problems Brazilian researchers had when writing in English. Reporting results in English is a persuasive act that entails persuasive arguments and language. Brazilians, because of the lack of objectivity embedded in Portuguese language and culture, lack the ability for this kind of direct and succinct discourse. Therefore, results seem vague and disperse, and researchers are often required to make significant genre changes.

The country where doctorate was obtained, number of hours in scientific writing in Portuguese and English, and percentage of publications in English over the last two years seemed to influence L1 feedback on L2 writings, as shown below. Several participants, however, did not answer several of the alternatives presented below. This might indicate that the items were not problems for the researchers, or that they were not sufficiently clear for the participants. Anyway, the answers will be considered potentially representative of the existence of the problems. Researchers were asked to inform about the most common kinds of feedback English-speaking reviewers and editors made.
According to Gosden, understanding the revision process within the context of the readers' criticism and expected claims help writers improve their chances of being successful. Although probably the most appropriate way to really understand and prove Gosden's theory and assumptions would be to analyze the research articles in the process of being revised and re-written, the following findings serve the purpose of developing a general picture of the main corrections Brazilian researchers have received from international editors and reviewers. These corrections were added as frequencies, as follows:

- grammar: seven out of 12 respondents considered grammar the first or second most frequent kind of correction
- re-arrangement of sentences within paragraphs: seven out of 13 considered it first
- deletion of sentences: seven of 11 considered it third
- addition of technical details: seven of 11 considered it from third to sixth most frequent

Therefore, from both a structural and a rhetorical perspective, the data above was similar to the data presented previously, concerning researchers' perception of their main problems when writing in English. The implications of these findings, therefore, are that the main training targets would be to improve researchers' communication of ideas through improvements in grammar, text organization and revision, and to develop skills to write succinctly.

According to Gosden, it is also important to understand the "rhetoric machining of RA discourse" whereby authors are told to add linking elements or improve clarity, consistency, and claims of texts (52). Seven researchers responded to this section of the questionnaire. Researchers reported the most frequent suggestions for including expressions as follows:

- in addition, furthermore, as shown in, the first is: four respondents considered this the most frequent suggestion
- however, on the other hand, although: four of the six respondents gave it first or second place
• it can be suggested that, it seems reasonable to conclude that, X may be interpreted as, it is likely that, possibly, certainly: three researchers considered this first or second
• therefore, consequently, thus, in order to, because, since: four of the seven respondents considered it first or second

The data above, plus my own experience, indicated that a significant number of Brazilian writers had problems using the linking words and expressions above, which are so intensively required in English writing. Researchers also rated the most important aspects related to text clarity and organization:

• "discontinuity in the argumentation process" was acknowledged by all seven respondents, four of which consider it the most frequent comment
• failure to consistently introduce, link, or conclude elements” was acknowledged by five researchers only, where only one considered it first and three considered it second in frequency
• “lack of consistency” was acknowledged by six respondents, three of which considered it the most common comment

In trying to understand the reasons for researchers to be receiving the kinds of feedback from reviewers as mentioned above, I analyzed the respondents as related to country of doctorate and number of publications. Four of the six respondents who answered all or most of the alternatives obtained their doctorate in the U.S. (three) and in the U.K. (one) and all six respondents are very productive writers, some also in English. Therefore, it seems reasonable to conclude that researchers who wrote more, particularly in English by means of living and doing graduate studies in English-speaking countries and who have a denser experience in writing scientific articles were more able to decide on or even recall the kinds of corrections or suggestions they receive. However, a more conclusive study should learn about the frequency of the comments above, in research articles written in English by Brazilian scientists, should be conducted. Scientific writing style is, after all, a rhetorical tool used by a particular discourse community, e.g., the international scientific community to which Brazilian scientists want to belong. They must, therefore, be analyzed on the bases of
sociological and political issues that influence L2 scientific writing and publishing, particularly in developed countries' most important journals.

In the next section I will present the researchers' perceptions on the sociological and political issues involved in successful L1 writing and publishing in L2.

**Section 3: Researchers' perception of the role of international journals' policies and actual practices in fostering (or hindering) the international visibility of developing countries' scientists and science**

The main objectives of this section were: (1) to obtain the perceptions of research participants, as speakers for the Brazilian scientific community in agriculture, concerning the attitudes of international journals' editors and reviewers towards Brazilian and Third World science and scientists; (2) to understand the extent of researchers' needs for promotion, international visibility, and funding in determining their efforts to publish internationally; (3) to help evaluate the need for IAPAR and EMBRAPA to invest in training or hiring of professionals to increase the chances for researchers' publications in international journals.

This section was included in the research particularly because of the data presented by Wayt Gibbs' (1995) about the impact of international journals' editors and reviewers on the visibility of Third World countries' scientists (see Chapter 2, section 3). This section was also prepared having in mind Casanave's (2003) and Hyland's (2002) studies about the influence of socio-politics and human interaction on L2 writers, who lack the basic rhetorical patterns and "cultural capital" (Hyland) valued by the gatekeepers of knowledge. This situation has already been explored above in terms of the linguistic, cultural and stylistic aspects of second language writing and revision in the previous sections of this chapter. Now, attention will be paid to the more political and ideological aspects of L2 research article publishing, which researchers might perceive as discrimination against Third World scientists and science.

The main working hypotheses in this section were:

- that the more researchers have experienced training in scientific writing and have been in contact with English schools and academy, the less they would feel discriminated or believe in discrimination when submitting articles for publication in international specialized journals;
• the extent to which researchers feel discrimination depend on their specialization, gender, country where doctorate degree was obtained, total number of publications, and number of hours training in scientific writing in Portuguese.

The research question that guided this section was what influences research participants’ feelings toward discrimination against Brazilian scientific production and scientists, by international journals’ editors and reviewers.

The analysis and presentation of the results was conducted for each statement individually. Observations about any researcher individually were done only when his or her characteristics indicated situations that were considerably different from their colleagues’.

**Working Hypothesis 1: Editors and reviewers of international specialized journals judge research articles written by Brazilian scientists with criteria that differ from those used to judge articles written by developed countries’ scientists.**

I hypothesized that the statement above was not only true for most researchers in Brazil, but also that chances for publication would be influenced by specialization, gender, country where the doctorate degree was obtained, total number of publications, and extent of training in scientific writing. As I expected, women perceived the criteria as different, as did most researchers who got their doctorates in Brazil and researchers with more extensive training in scientific writing. Contrary to my expectations, however, researchers with high numbers of publications agreed with the statement.

Seven of thirteen respondents agreed with Statement 1 above, which indicates that this issue is not only important but also still unresolved for Brazilian the scientific community. The fact that all of the three entomologists agreed with the statement above, as did two of the three plant pathologists indicates that the level of discrimination might be discipline specific. More women felt the discrimination than men did: six of the eight women as compared with one of the five men.

Of the six researchers who obtained their doctorate in Brazil, four agreed with the differences in criteria, whereas of the seven who studied overseas, only three did. This seemed to indicate that having access to academic work in English-speaking countries might
decrease one's feeling of discrimination. However, not only access to academic work in English-speaking countries but also the country itself, seemed to influence researchers' perception of discrimination. Only one of the four researchers who got their doctorate in the U.S. and two of the three who got it in the U.K. agreed that criteria were different.

All researchers who had never had any training answered positively as did those with between 16 and 60 hours of training, indicating that training did affect the way one felt discrimination: the more training one had, the less he or she felt discriminated because on the likely-to-occur increased self-confidence.

Unexpectedly, all of the seven participants who answered positively to the statement were prolific publishers: between 91 and 221 publications so far, with one exception. This researcher has published 193 documents, and his answering negatively to the statement was likely related to the fact that he always had a native-English speaker U.S. university professor as co-author for his English publications. Co-authorship, in this case, certainly contributed to level out the rhetorical differences inherent in L2 writing and the application of criteria that would otherwise affect developing countries' scientists.

Some of the participants' comments were as follows:

- If a researcher becomes fluent in English, time conflicts and problems with understanding are solved. (#15)
- In almost all journals it is important to know someone in the editorial board and submit the article for this person to forward to the editor. This will speed the revision process and increase the chances of approval. (#1)
- I have seen this happen several times. (#13)
- I think this is true although not for all international journals. (5)
- There is prejudice; they demand much more from us in terms of grammar. (#7)
- I consider this to have a low probability. However, talking about this with my colleagues, they think it is true. Editors and reviewers discriminate against foreigners. (#12)

The comments above indicated that Brazilian scientists do believe that publication criteria for developing countries' scientists were different from those of developed countries'. They also pointed to the fact that researchers were not talking just about themselves but about
a widespread perception among Brazilian scientists not only the quality of the article but also the relationship they had with scientists in developed countries will impact the chances for publication in international journals.

**Working Hypothesis 2: Brazilian scientists feel in disadvantage as far as their chances to have their research articles published in international specialized journals.**

My hypothesis was that scientists felt in disadvantage when trying to publish in international journals mainly because of discrimination against developing countries' scientists and science. The researchers overwhelmingly agreed with Statement 2: 11 out of 13. The only two researchers who disagree are in soil fertility and both got their PhDs in the U.S., supporting the findings in the previous statement that both discipline and country where the PhD was obtained might inform researchers’ perceptions and attitudes towards international specialized journals.

In a few situations researchers think that the non-acceptance is more related to the scope of the topic than to discrimination: topics and results that are mostly applied to solving local problems are not as easily accepted than those that contributed to science in a wider range. In other situations, researchers relate the rejection for publication to the quality of the English used.

Comments on this statement:

- [we are in disadvantage] because we are not First World scientists. (#5)
- The main disadvantage is the lack of fluency in English although this may be overcome with a good English translator/reviewer. (#12)
- Mostly when the research concerns regional problems; in these situations, we must broaden the focus of the research. (#1)
- In agriculture, many subjects have applied interest. (#2)

Researchers' comments to hypothesis 2 were particularly elucidating to the issue of discrimination concerning developing countries' scientists' publications in international journals. On the one hand, scientists seemed to agree that international journals discriminate against developing countries' scientists and also that not knowing those who would be revising and judging their articles could be a disadvantage. On the other hand, they felt in
disadvantage because of L2 language problems and because the research topic and scope they had to work on were not necessarily interesting or applicable to other regions, therefore limiting the possibility for publication in international journals. The discussions below will provide other elements that may qualify the relationship between international specialized journals published in developed countries still further.

**Working hypothesis 3:** Brazilian scientists believe that, beyond the scientific criteria, international journals also adopt political criteria before they accept articles for publication.

Following my goal to compile researchers' perceptions of their relationship with international journals and their editors and reviewers, I asked researchers specifically about their attitude toward political criteria. Only four of the respondents agreed with my third hypothesis, or about one-third of the sample.

All of those who agreed with the statement above were women who received their doctorate degrees from Brazilian universities and were productive publishers (between 91 and 114). Specialization and number of hours in scientific writing training did not seem to influence researchers' perceptions in this case. Both the less productive overall researchers (25-29 publications) and the most productive ones (155-221) responded negatively.

Researchers' comments on this statement:

- I have never heard this kind of comment. (#12)
- This does not happen in international journals alone, but also in national ones. (#1)
- Scientific publishing should be independent from politics. (#9)
- I am not sure [the criteria] are political, but it is true that they judge differently. (#5)
- The issue is prejudice not politics (#13)

According to the comments above, it seemed that researchers did not believe there were political criteria to judge their articles and, if there were, they were not any different from national journals. Researchers did, however, feel discriminated. Interestingly, researchers separated discrimination from politics and had the idea that science could be apolitical.
Researchers' reactions to the three statements above provided a better understanding of their perceptions concerning the gatekeepers of knowledge and the journals for which they work. I found that besides the discriminating elements, there were structural constraints that should be solved before developing countries’ scientists had greater international visibility. Some of the constraints to be eliminated were related to language barriers, the development of relationships with actual and potential editors and reviewers in developed countries, choice of research topics and their adaptation to the rhetorical needs of international journals and audiences, development of more egalitarian gender relationships in the sciences, and change in attitudes of researchers who did their doctorates in Brazil.

**Working Hypothesis 4:** Editors and reviewers of international specialized journals consider Third World science as being of lower quality than that of developed countries.

Eight of the 13 researchers answered positively to the question concerning this hypothesis. Disciplines seemed to play an important role in determining researchers’ perceptions concerning international journals’ policies toward Brazilian scientists. All entomologists, and two of the three plant pathologists, plus the researcher in crop sciences, agreed with the journals’ discriminating practices.

Other variables leading to the positive answers were gender, country of doctorate, number of publications, and time spent in training. Women largely agreed (7 out of 8), as did the large majority of the researchers who got their doctorate from Brazilian universities (5 of the 6). Only half the researchers who got their doctorates from the U.S. or U.K. agreed. About 50% of those who had more than 100 publications agreed that editors and reviewers of international journals considered Third World science as being of lower quality than that of developed countries.

In any case, the fact that 8 of the 13 researchers responded positively to the statement, plus the facts that women were very representative and that discipline seemed to be important in determining researchers’ perceptions showed that discrimination, based on gender and country of doctorate, could be affecting researchers significantly.

Time spent in training also seemed to be important in determining researchers’ attitudes. Seven of the 10 researchers who had no training at all plus those who had up to 56 hours
agreed with the statement as compared to only one of the three who had 60-160 hours of training. This indicated that training might increase researchers' self-confidence and chances to be accepted. To what extent training would dissolve gender and country of doctorate as discriminating variables remains to be seen.

Comments of this statement:

➢ In developed countries there is also poor quality research with poor methodology and many times, they are published in wide impact journals such as ‘Nature’. ‘Nature’, for instance, published an article about the Monarc butterflies and the GMO corn whose methodology was widely criticized; eventually it was required that the research was repeated with appropriate research methods. (#1)

➢ Sometimes I think this really happens. However, I do not blame them [the editors and reviewers] for this because in some situations, workplace conditions make it difficult to conduct appropriate and accurate research [in developing countries]. (#9)

➢ [it is] true for some situations. I have seen few Brazilian researchers being invited to write articles on relevant topics. I'm optimistic and I think that the good papers get accepted and that we must discuss this and argue on grounds of equality. (#7)

➢ I think this is true although I don’t think it happens in every international journal. (#5)

Researchers’ points of view concerning the fourth hypothesis show that there were elements that would justify the differential treatment of Brazilian scientists by international journals’ editors and reviewers, such as the poor research conditions in developing countries. However, they also showed that by and large, discrimination exists, although not as a general rule for all journals.

Working Hypothesis 5: Workplace and home addresses of Brazilian scientists influence their chances for publishing in international journals.

Because I thought that discrimination was related to country of doctorate, I asked researchers if they felt workplace and home address influenced their chances for publication.
Seven of 13 respondents agreed with Statement 5. Specialization, gender, country where the doctorate was obtained, number of publications, and extent of training in scientific writing all seemed to influence researchers’ perceptions on this topic. All of the entomologists, two of the three researchers in soil fertility, plus the crop scientist and the economist believed the statement above is true, whereas none of the plant breeders and plant pathologists did. The plant breeders’ opinions might be explained by the fact that it was not until a few years ago that Brazil created its own plant breeding journal; publishing, till then, had to be in international journal. Consequently, existence of discipline-specific journals in one’s country might be an important variable determining researchers’ experiences with the international publishing process.

In this case, again, women agreed with the statement at a much larger extent than men did: five out of the eight women participants and only two of the five men. As far as the country is concerned, half the students who had their doctorate from Brazilian universities agreed, as did all of those who had it from the U.K., as compared to only one of the four who were in the U.S.

Results of this research have been consistent in showing that researchers who got their doctorates from Brazilian, followed by UK universities, were more skeptical concerning the impartiality of international journals’ policies and their editors and reviewers’ attitudes toward Brazilian science and scientists than those who came from U.S. universities.

Furthermore, results have also been consistent in that women, as well as researchers with fewer publications agreed more often that there is discrimination than men and researchers with more publications. By the same token, researchers with more hours of training in scientific writing in Portuguese (in this case, above 60 hours) totally disagreed with the statement above, whereas seven of the 10 researchers with 60 hours or less (including no training) agreed.

Comments on this statement:

> Nowadays, considering the quality of Brazilian scientists and of those in the agricultural sector, particularly EMBRAPA scientists, this kind of information is not true. This, however, may be true among editors/reviewers who discriminate against Third World scientists. (#12)
If the article brings a great contribution to science, location is not important. (#1)

Organizations that are internationally known have greater chances to publish in international journals. (#7)

[...] only if there are problems with the working conditions for the development of research with appropriate methodology. (#9)

Good papers, properly written, normally receive positive feedback for publication. (#13)

Yes. Many of the Brazilians who publish in international journals have done their graduate studies overseas. (#2)

Discrimination underlined comments by #7 and #2. The other comments, however, expressed these scientists' belief that their articles would be published if they had good content and linguistic quality and if the topic represented a significant contribution to science.

At this point it seems that researchers had mixed feelings about their perceptions of international journals' policies and actual attitudes towards developing countries' scientists. On the one hand, they wanted to believe that their articles would be published if the content and L2 were of good quality. On the other hand, they knew that there were a number of constraints affecting their success in publishing, such as: 1) economic constraints for many developing countries to do research according to the developed world criteria; 2) discrimination based on gender, country of doctorate, L2 writing abilities, personal relationships with the journals' editors and reviewers, international visibility, workplace international visibility, among others.

Working Hypothesis 6: Brazilian scientists believe that publication topics that are considered priorities by editors of international journals are similar to the Brazilian priorities for scientific development.

Most researchers responded negatively to this statement, or 8 out of 13. Here again, women responded mainly as false (6 out of the 8 female participants) as compared to men (2 out of 5). Besides gender, country of doctorate also proved significant in determining researchers' perception on this topic: all of those that agreed with the statement had their doctorates at U.S. universities, supporting the findings above that U.S. graduates seemed to be
less critical than U.K. and Brazilian universities' graduates concerning publication in international journals. Researchers with fewer publications largely answered false to the statement (7 out of nine), whereas most researchers with 190 publications or more answered true (3 out of 4 researchers).

Comments on this statement;

- It depends on the area and the kind of research. In genome research, for instance, there is no difference, but in applied research ...there are. (#1)
- Technical and scientific innovation should be a priority in all countries. (#9)
- Obviously, our priorities are different. However, there is such a wide range of journals that there will always be one that will accept good papers from Brazil. (#7)
- It depends on the specialization. In some cases the priorities are the same, in others they are exactly the opposite. (#6)
- This is true in agronomy. (#12)
- Certainly, many articles never get published because they fall into this category. (#13)
- Obviously, our priorities are different. However, there is a wide range of journals that there will always be one that will accept good papers from Brazil. (#7)

The answers to this statement supported my hypothesis that the more in contact with English schools and academia, the less researchers would feel discriminated, as all of those who answered positively did their doctorates either in the U.S. or U.K. However, the fact that several respondents mentioned that this issue depended on specialization, particularly in terms of basic or applied sciences, indicated to a need for understanding researchers' relationships with international journals as also determined by specialization.

Working Hypothesis 7: Brazilian scientists value publication of research articles in international specialized journals as more important than in Brazilian journals even when the research topics are not in the best strategic, political, or scientific interests of Brazil.
Nine of the 13 respondents agreed with the statement above, including all in plant pathology and genetics, the crop scientist and the economist. The entomologists were evenly divided. Similarly to the data from Statement 6, gender, country of doctorate, number of publications, in addition to extent of writing training seemed to influence researchers’ attitude significantly, in the way they value the two kinds of publication.

All the men agreed with the statement, as compared to four out of the seven women and all of the researchers who had their doctorate in the U.S., as compared to only one-third of those who studied in the U.K. and in Brazil. Researchers in both ends of the continuum in number of hours in training agreed with the statement, whereas those with between 40 and 60 hours of training disagreed (3 out of the 5 researchers in this category). Nonetheless, all researchers with 91 publications or more thought the statement was true.

Comments on this statement:

- True, because CNPq and CAPES\(^1\) value 30% higher the articles published in international journals when evaluating researchers’ curricula. (#12)
- This is not about the scientists, but about the funding organizations that evaluate the scientific production of a scientist, such as CAPES, where articles published in international journals receive more points. (#1)
- This is very much influenced by the evaluation criteria that Brazilian organizations have adopted. (#5)
- ...I believe that researchers more oriented towards applied research do not value an article more just because it was published in an international journal. (#6)
- Funding agencies value articles published in English higher, but I still believe that it depends on the subject. It is useless to write a great "treatise" about something regional because it will also lack an audience. Few people will be interested on reading such article. (#7)

Beyond discrimination issues, to which researchers responded in the previous statements, Statement 7 sought to understand researchers’ values concerning publication in national and international journals even when the topic was not in the best interest of Brazil.

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\(^1\) CAPES and CNPq are the two main Brazilian funding organizations for research and graduate studies in the country and overseas, and are active nation widely.
The reason for this was to better understand the extent of researchers' needs for promotion, international visibility, and funding, and therefore, their efforts to publish internationally. This statement also sought to help evaluate the need for IAPAR and EMBRAPA to invest in training or hiring of professionals to increase researchers' performance in terms of publications. As a result of the answers, it was reasonable to conclude that beyond differences among researchers, they needed to publish in international journals because that was, basically, the best way to have better curricular evaluations and therefore, increase the chances to obtain funding for their projects.

**Working Hypothesis 8: Brazilian scientists consider inappropriate the comments made to their submitted research articles, by editors and reviewers of international journals.**

Most researchers (10 out of 13) did not consider the comments they received inappropriate, particularly men (100%). All of the researchers in plant breeding, plant pathology, and soil fertility, disagreed with the statements, as did all the male researchers, as compared to five of the eight women. All of the researchers who had their degrees from U.S. universities disagreed, as compared to two-thirds of those from U.K. and Brazilian universities. Two of the researchers who had published between 37 and 46 publications agreed with the statement. The three respondents who agreed with the statements either did not have any training, or had little training (0, 16 and 56 hours, respectively).

Comments on this statement:

- A researcher who submits articles for publication must be ready for criticism. (#1)
- I have received some absurd and arrogant comments; however, I have always responded to them and have been successful in my arguments. (#7)
- It depends on the comment. This happens more often when the comment is clearly based on prejudice against authors from the Third World. Other than that, I believe that those Brazilians who consider these comments inappropriate would otherwise say the same to those comments from Brazilian journals. (#6)
I don’t think we judge them inappropriate. However, some reviewers certainly question us in a way that they don’t with their fellow researchers in the First World. (#5)

Not always. Many comments are useful. (#13)

My working hypothesis 8 sought to identify researchers’ perceptions of comments they normally received from international reviewers and editors as based on prejudice or not. Although some researchers reported that there could be prejudice, the majority agreed that the comments were appropriate. In fact, several respondents seemed to take feedback to their articles as learning experiences and even as opportunities to discuss specific issues in their fields of expertise. The implications of these results were that working with the revised texts may indeed be a valuable pedagogical resource because researchers would feel very comfortable to argue for content and, therefore, improve style more easily.

Working Hypothesis 9: Brazilian scientists know little about the editorial policies of international specialized journals.

Eight of the 13 respondents agreed with the statement that scientists know little about the editorial policies, among them all the entomologists and two-thirds of the plant physiologists and those in soil fertility, plus the crop scientist. Knowledge of editorial policies seemed to be more commonly accepted by men (4 out of 5) than among women (4 out of 8). It also seemed to be more widely accepted by those who had published more (5 out of the 7 who had 91 publications or more) than the others (2 out of the 5 with 60 publications or less). Besides, US graduates (3 out of 4) were followed by UK (2 out of 3) and by Brazil graduates (3 out of 6) in considering the statement above true.

As in hypothesis 7, researchers in both extremes of the continuum, for number of hours in training, agreed with the statement. Researchers in the lower part of the continuum had never had any training whatsoever, and they reacted similarly to those who had the greater number of training hours for scientific writing in Portuguese (more than 150 hours). The researchers who were in the 0-hour training, however, did not talk about themselves (in this sample, they were prolific writers). Data showed, therefore, that training was not necessarily related to productivity or knowledge about editorial policies.
Comments on this statement:

- Those interested in publishing must be aware of the journal policies. (#9)
- Most scientists are not even aware of such policies for national journals. (#12)

Hypothesis 9 was included because I wanted to investigate the possibility that researchers felt discriminated although not considering their contribution to decrease such discrimination. One of doing so would be to become aware of journal policies, which would theoretically increase researchers’ chances of molding their articles to suit the priorities and requirements of each journal. The fact that so many respondents agreed with the statement might indicate that there could be an institutional effort to increase researchers’ awareness of journal policies as a way to increase international visibility by means of publication in international journals.

It seems reasonable to say that most researchers agreed that there was some kind of discrimination by international journals' editors and reviewers against Brazilian or other developing countries' science and scientists. Women seemed to be more sensitive and outspoken concerning discrimination than men. The degree of discrimination seemed to be discipline-specific in most cases. Researchers who did their doctorates in Brazil felt more strongly about the various manifestations of discrimination by the international journals than those who did it in the U.K. Although with exceptions, however, US graduates seemed to be stronger believers in the objectivity of the sciences and of the journals’ attitudes toward developing countries’ scientists than graduates from the U.K. and Brazil.

Most researchers said that the scientific priorities of international journals were not similar to the Brazilian priorities. A larger percentage of women than of men expressed this perception, although they also suggested that this topic is discipline-specific. Gender- and country-based differences were found as all men and all researchers with doctorates from U.S. universities agreed that Brazilian scientists value publication in international journals higher than in national ones, as compared to four of the 7 women and one-third of the researchers who studied in Brazil or the U.K. Respondents mentioned that CAPES and CNPq valued publications in international mainstream journals higher than in national journals, and that this kind of publication was used to evaluate scientists’ curricula for funding and graduate programs also by other organizations.
Most researchers, particularly men and those who graduated in the U.S. considered overall appropriate the comments they received from editors and reviewers of international journals. Most researchers also believed that Brazilian scientists knew little about the editorial policies of international journals.

Overall, gender, discipline, and country where the doctorate degree was obtained were particularly important in determining research participants' perceptions of international journals' policies, editors and reviewers. In accordance with the literature review on this topic, many researchers felt that editors and reviewers acted as gate-keepers of knowledge, particularly of the knowledge created in developing countries, even if these countries' scientists were trained in countries such as the U.S. and the U.K.
CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This study indicates that, in order to understand L2 scientific writing and publishing performance of agricultural researchers working in governmental organizations in developing countries, it is advisable to undertake three levels of analysis: (a) the researchers' perceptions of their workplaces; (b) the researchers' perceptions and their language constraints; and (c) the researchers' perceptions of international journals' policies and their impact on researchers' international scientific visibility. It is clear to me that L2 scientific writing in government research organizations in Brazil (and likely in several other developing countries) occurs at the crossroads of the demands of internal organizational demands to respond to diverse audiences, the researchers' motivations and the professional constraints to write and publish particularly for the international scientific community, and international scholarly journals. This study is based on the researchers' perceptions of the dynamics of each of the three levels mentioned above.

In this chapter, my goals are: (1) to present the main conclusions concerning the researchers' point of view about the three aspects above; (2) to present a brief discussion of the potential role of professional communicators in organizations such as IAPAR and EMBRAPA; (3) present recommendations for organizational action and research; and (4) recommend a training strategy for researchers at IAPAR and EMBRAPA.

Although this research served its purposes of a first approximation to the topic within the specific context of Brazilian governmental agricultural research organizations, the research methodology aspects below may be considered limitations that should be accounted for in future studies:

- researchers who participated in this study may represent only those researchers who are more intensively engaged in publishing than the average of agricultural researchers in Brazil and have, therefore, more experience than others who - for a variety of reasons - do not;
- researchers in the study volunteered to participate and are not necessarily those with the greatest problems in writing RAs in English;
• the sample size (n=14) may be too small for generalizations;
• the age of researchers was not a criterion for defining the sample but both the literature and this study show that it may influence the attitude of researchers toward L2 writing and publishing.

These possible limitations to this study, however, did not influence my ability to obtain a first approximation to the problems related to L2 scientific writing among Brazilian researchers, nor to draw conclusions and suggest further actions and research.

Main Conclusions

The researchers’ perceptions of their workplaces

My analysis of the workplace allowed for an understanding of the organizational context where researchers had to negotiate their time for research and writing. This understanding led me to suggest change at the organizational level. For this study’s participants, organizations’ disperse accountability led to schedule conflicts that limited the time for training and research, including the publication of research results. Researchers would like to spend a very small percentage of their time in activities other than research and extension. They would also welcome more time for research activities, particularly for writing research papers in Portuguese and, to a slightly lesser extent, in English. Researchers’ voices informed their degree of satisfaction and their perceptions of ways to become more productive and visible in the international scientific discourse community.

The researchers’ perceptions of their language constraints

Most researchers had no or few hours of training in scientific writing in Portuguese and still fewer in English, and report their willingness to either be trained or be able to count on professionals at the organizational level. According to these research participants, training should be conducted for both Portuguese and English scientific writing, showing researchers’ goal to publish in both languages.

Training in L1 and L2 among participants might be an advantage also because researchers engaged in similar strategies when writing in both languages, whether submitting their articles to national or international journals. The strategies were the preparation of
outlines, the discussions with their peers at different point in the writing process, the writing of the first drafts in the language of publication, the submission of final drafts to editorial boards within their organizations, and the final submission to national or international journals, usually following the advice of these editorial boards as to which journal to submit the research articles.

This study’s participants also had similar kinds of problems in expressing their ideas properly and efficiently in both languages, although English was considered still more difficult in every aspect. Most researchers reported the following main difficulties when writing in English: grammar, syntax, use of scientific terminology, word and sentence order, appropriate extent of details, and arrangement of paragraphs. Researchers also reported that the comments they received from international reviewers and editors were related to the lack of consistency, discontinuity in the argumentation process, and failure to consistently introduce, link, or conclude elements. Using linking words was also frequently mentioned. The section of the research articles they submitted to international journals that received most of the corrections and suggestions was the Results and Discussion section.

The researchers’ perceptions of international journals’ policies and their impact on researchers’ international scientific visibility

Most researchers agreed that there was some kind of discrimination by international journals’ editors and reviewers against developing countries’ science and scientists. Women were more outspoken about discrimination than men. The degree of discrimination seemed to be discipline-related, however. Researchers who did their doctorates in Brazil felt more strongly about discrimination by the international journals than those who did it in the U.K. Although with exceptions, however, U.S. graduates seemed to be stronger believers in the objectivity of the sciences and of the journals’ attitudes toward developing countries’ scientists than graduates from the U.K. and Brazil are.

Most researchers said that the scientific priorities of international journals were different from Brazilian priorities. A larger percentage of women than men expressed this perception and they suggested that this topic was discipline-specific as well. All researchers with doctorates from U.S. universities agreed that Brazilian scientists valued publication in
international journals higher than in national ones, as compared to four of the 7 women and one-third of the researchers who studied in Brazil or the U.K. The reason for this seemed to be that CAPES and CNPq valued publications in international mainstream journals about 30 percent higher than in most national journals, a criterion used to evaluate scientists’ eligibility for funding or graduate programs.

Overall, gender, discipline, and country where the doctorate degree was obtained seemed particularly important in determining research participants’ perceptions of the international journals’ policies, editors and reviewers.

This study has provided several indications of the kinds of problems Brazilian researchers faced when writing and publishing their scientific articles in English, particularly in international journals. In order to deal with these problems, I have developed suggestions concerning the potential roles of professional communicators in governmental agricultural research organizations in Brazil, as well as recommendations for action and further research as follows.

Potential Roles of Professional Communicators in Governmental Agricultural Research Organizations in Brazil

Most researchers would welcome either their own training or the hiring of professionals to help with the Portuguese and English scientific writing. Researchers would like professional writers to be fluent in English, have a background in agriculture, and have experience in English-speaking countries, to facilitate communication in specific contexts. Professional writers, researchers say, would take on some of researchers’ writing responsibilities so that more time could be spent in research and publishing, therefore increasing researchers’ and their organizations’ international visibility.

As suggested by some researchers, potential roles of professional communicators at IAPAR or EMBRAPA would be:

• to help researchers improve their communication of ideas, from the very beginning of the writing process, and
to train Brazilian researchers and evaluate their progress while revising and editing their own materials for national or international audiences and journals requirements

**Recommendations for Action and Research**

**Recommendations for organizational action:**

- initiate a discussion over the actual and ideal time allocation for research and extension as compared to other activities
- develop communication teams and strategies that allow researchers more time to do research, and to write and publish their results

**Recommendations for professional communication research at the organizations:**

- compare the advantages of researchers’ training in scientific writing to those of hiring professionals to respond to the variety of demands for publications at the organizational level
- evaluate the possibility to replace internal research reports by research articles that would be submitted to journals
- identify ways to eliminate researchers’ main writing problems, both in Portuguese and English
- evaluate those writing and communication responsibilities currently undertaken by researchers that may be done by professional communicators
- test the most relevant of this research’s results with a larger number of scientists within each organization, and return my results to them, for their evaluation and use
- evaluate the need for and content of scientific writing courses or continuous training on the job
Recommendations for professional communication research at the high school and university levels:

- survey the existing courses and programs in scientific writing in Brazilian universities
- evaluate the needs for curriculum change in Brazilian high schools and universities so as to introduce or improve scientific writing of students and faculty
- assess the need for science students and faculty in Brazilian state and federal universities to be trained in scientific writing, both in Portuguese and in English

Recommendations for theoretical and applied research in L2 scientific writing in governmental agricultural research organizations in Brazil, concentrating on:

- the influence of gender, age, and scientific specialization on the motivations for writing and publishing L2 research articles
- the extent to which international journals discriminate against scientists of developing countries and among these, women and researchers in their specialization
- the influence of international peer relations and co-authorship in acceptance of articles written by Brazilian researchers
- Brazilian researchers’ potential ways to increase international visibility, particularly among Third World countries
- text-based studies of the writing and revision processes of L2 writing among agricultural researchers
- the role each actor plays in changing the original manuscripts of researchers writing in English, both at the organizational and the journals’ levels

Scientific Writing Training Program for IAPAR and EMBRAPA researchers

- Training duration: To be determined according to researchers’ needs and schedules, but should last at least 40 hours, preferably distributed throughout a month period
• Participation requirements: Participants must have a Masters and PhD degree, be working either on their RA drafts or revisions, and have integrative motivation (in the sense indicated by Sionis, 1995) to increase their actual rate of RA publication in national or international journals.

• Group formation: To the extent possible, researchers will be grouped according to:
  - RA language for publication
  - Writing or revision stages

• Training requirements: Participants will be required to work primarily on their own materials and to engage in substantive revisions and peer reviewing.

• Tentative training program:

  Introduction: Collection and discussion of participants’ perceptions of their writing needs – preliminary definition of priorities

Section 1: RAs in the context of other written, oral, visual, and electronic research communication tools

Section 2: The publication of RAs in Portuguese and in English – rhetorical analysis of organizational needs, as well as journals’ and readers’ expectations

Section 3: Writing and publishing RAs as an ideological arena (Gobbs, 1995, Collier and Toomey, 1997)

Section 4: Rhetorical problems in writing in English: an overview:
  the ‘rhetorical problem space’ in L2 writing (Kaplan 1966)
  the ‘communication strategies’ expected by L2 readers and editors and ‘situation appropriateness’ (Sionis 1995)
  the ‘rhetorical machining of RA discourse’ (Gosden 1995)

Section 5: Critical textual analysis of drafts and revisions and comparison with participants’ opinions expressed and discussed during the Introduction section
Section 6: Analysis of L1 manifestations in L2 writing and writers’ autonomy in rewriting the final draft (base on Blakeslee, 1977)

Section 7: Deductive RA writing in English
Section 7: Text organization and coherence
Section 8: Grammar and syntax
Section 9: Practice writing and revising
Section 10: Follow-up of RA submissions and revision processes (strategy to be determined by the end of the course)

By developing a training framework for contributing to researchers’ improvements in scientific writing in general, and particularly in RA writing and revision, I complete the cycle within which I was able to learn about some of the variables that influence L2 scientific writing in Brazil and about the stage of theoretical development on the topic. This learning process also allowed me to make recommendations for action and further research at the organizational, educational, and theoretical levels.
APPENDIX
QUESTIONNAIRE

Section 1
1. Annual average (%) of time for: research, extension, administrative meetings, technical meetings, publications in Portuguese, publications in English;
2. How researchers feel about their schedules;
3. Annual average (%) of time for: literature review, data collection, data analysis, writing research projects, research reports, scientific articles in Portuguese and in English;
4. Discuss the possibility of scientific writers help write, revise and edit their projects, reports, grants, etc;
5. Discuss the importance of scientific articles as compared to other publications at the organization level;
6. Discuss the importance of publishing scientific articles in English as compared to Portuguese
7. How does or could the organization where they work help researchers have more time to write and publish articles in English;
8. List all publications (title, journal, language) in the last two years;
9. Comment on experiences and ideas not mentioned in this part of the questionnaire.

Section 2
1. List courses and training programs that helped you learn or improve your scientific writing;
2. List courses and training programs that helped you learn or improve your English, particularly your English scientific writing;
3. Discuss the content of the courses that were most helpful for your development of scientific writing skills;
4. Comment on the need (or not) for scientific writing courses in Portuguese and English at your organization. Suggest the content.
5. Comment on the need (or not) for scientific writing courses in Portuguese and English at Brazilian universities. Suggest the content.

6. Write at least 3 differences you consider important when you write scientific articles in Portuguese and English.

7. Rank the main difficulties you have when you write articles to be published in English (list of 7 items provided).

8. Write about the ways you have solved the difficulties mentioned above.

9. List the steps you normally take to write in English, for publication in Brazilian journals (list of 6 items provided).

10. List the steps you normally take to write in English, for publication in international journals (list of 6 items provided).

11. List the parts of your articles (Abstract, Introduction, Materials and Methods, Discussion of Results, Conclusions) where you normally have most of the corrections in the articles sent to international journals.

12. Rank the types of corrections (list of 4 items provided), suggestions (list of 6 items provided), and comments (list of 3 items provided) you get most often from reviewers and editors in international journals.

13. Describe your main motivations for publishing in English, in Brazilian journals.

14. Describe your main motivations for publishing in English, in international journals.

15. Comment on cultural differences between Brazilians and English speaking people (particularly from the US and England) that make scientific writing difficult for Brazilians.

16. Comment on experiences and ideas not mentioned in this part of the questionnaire.

Section 3

1. Editors and reviewers of international specialized journals judge research articles written by Brazilian scientists with criteria that differ from those used to judge articles written by developed countries' scientists.

2. Brazilian scientists feel in disadvantage as far as their chances to have their research articles published in international specialized journals.
3. Brazilian scientists believe that, beyond the scientific criteria, international journals also adopt political criteria before they accept articles for publication.

4. Editors and reviewers of international specialized journals consider Third World science as being of lower quality than that of developed countries.

5. Workplace and home addresses of Brazilian scientists influence their chances for publishing in international journals.

6. Brazilian scientists believe that publication topics that are considered priorities by editors of international journals are similar to the Brazilian priorities for scientific development.

7. Brazilian scientists value publication of research articles in international specialized journals as more important than in Brazilian journals even when the research topics being accepted are not in the best strategic, political, or scientific interests of Brazil.

8. Brazilian scientists consider the comments made to their submitted research articles, by editors and reviewers of international journals, as inappropriate.

9. Brazilian scientists know little about the editorial policies of international specialized journals.
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