

# CITATION ANALYSIS AS TOOL FOR COLLECTION USE AND MANAGEMENT AT THE LIBRARY OF A RESEARCH INSTITUTE

**Bart Goossens**

Research Institute for Nature and Forest  
Gaverstraat 4, 9500 Geraardsbergen, BELGIUM

[Bart.Goossens@inbo.be](mailto:Bart.Goossens@inbo.be)

**Dr. Marc Pollet**

Research Institute for Nature and Forest  
Kliniekstraat 25, 1070 Brussels, BELGIUM

[Marc.Pollet@inbo.be](mailto:Marc.Pollet@inbo.be)

## Abstract

---

In April 2006, the Flemish Institutes for Forestry and Game Management and for Nature Conservation merged into the Research Institute for Nature and Forest (INBO). Ever since, a new policy and research program has been implemented and 10 new research and 3 support groups were established. And although the electronic collections of the libraries of both institutes were incorporated into a central repository, the physical did not yet. A new collection development policy is currently worked out and will be implemented in 2011. In this process, bibliographical citation analysis seems to be promising as tool for collection management decisions.

In a first attempt to validate its usefulness, a data set of thirty scientific papers published by researchers from five different INBO research units during 2007-2010 was analyzed. About 23% of the cited journal issues were available in the INBO library's collections, with more than 50% of zone 1 and 2 journals, and 17% of zone 3 journals *sensu* Bradford. This pattern in zone 1 journals applied to all but one of the investigated research units. Possible measures to enhance accessibility to full text scientific papers in the near future are discussed.

## Introduction

---

In April 2006, the Research Institute for Nature and Forest (INBO) was established from the merge of two Flemish governmental organisations, the Institute for Forestry and Game Management (IBW) and the Institute for Nature Conservation (IN). Whereas research at IBW and IN was mainly driven by fundamental research, INBO focuses more strongly on the support of the nature and forest policy and decision makers in Flanders. In this respect, priorities shifted towards applied, concurrent and question-driven research, and more fundamental research projects are carried out by partner scientific institutions including universities, unless they are situated in one of the long-term research objectives of INBO.

Together with the merge, an internal reorganisation was implemented. Two research departments (Biodiversity & Natural Environment; Nature management & Sustainable Use) were erected each comprising five research units, as well as a third department (Advice & Information - A&I) to provide general support to all INBO personnel. The A&I department encompasses three different service units providing assistance with e.g. lab and statistical analyses, ICT and library matters, but is also responsible for the production of reports and scientific advices. The new organisational structure and research scope created new challenges to the library's operations. It was decided to cope with this in an innovative and efficient way including periodical review and validations. Improving the library services and offering a sustainable investment in information technology and education of the library staff were put forward as primary goals.

One way to evaluate a collection development policy is by citation analysis which has been studied for over eighty years (Gross and Gross, 1927). It's based on the method of counting and ranking the frequency documents are referred to in bibliographies, footnotes, and/or indexing tools (Baker and Lancaster, 1991). Citation analysis can be applied to select and deselect materials as it provides insight into the materials that are selected by various user groups (Dickinson et al., 2009). Citation analysis is not without problems. Self- and in-house citing is mentioned as one of the most basic problems of citation analyses, as it appears to be substantial, with approximately 10 to 30% of all citations falling into this category (MacRoberts and MacRoberts, 1988; Tagliacozzo, 1977). For the present study, however, we expected these problems to be rather small. We come to this assumption based on the normative theory, which states that bibliographies are lists of influences and that authors cite in order to give credit where credit is due; that is, when an author uses information from another's work, he will cite that work (Smith, 1981).

For the first time, a citation analysis was performed at INBO. Our goals were (i) to investigate what proportion of references cited by INBO researchers is available in the INBO library, (ii) to investigate if the observed pattern is comparable in the different research units and what are the factors that affect it, (iii) and to explore if and in what way the current service can be optimized.

## **Material and methods**

---

All peer-reviewed papers of INBO researchers published between 2007 and 2010 and available in ISI SCI were collected using information obtained from the ISI Science Citation Index (Thomson ISI, 2011). Only papers with an INBO researcher as senior or first author were included in the analysis. The complete reference, journal title, number of citations, and relevant information on the first author of each publication were recorded.

In order to compare patterns between research units based on a sufficiently large data set, papers were selected from 5 different research groups that published at least 6 papers in the above 4 years period. For each research unit we further selected 6 publications with the highest number of citations. If possible, 6 different authors per research unit were included.

For the citation analysis, the first author, journal title abbreviation and year of publication were recorded. We added the publication type (journal vs other) and citation type (in-house

vs. external) to the records. Cited journals were matched with the physical collections of our institute. Digital issues of journals were thus not included in this study due to the fact that digitization projects at INBO have only started quite recently. To pool the journal frequency data, we applied Bradford's Law (Bradford, 1948). According to this Law, on any subject, a small group of core journals (zone 1 journals) will provide 1/3 of the articles on that subject, a moderate number of less-core journals (zone 2 journals) will provide a second 1/3 of the articles on that subject, and a large number of peripheral journals will provide the final 1/3 of the articles on that subject. We finally estimated the availability (in our library) of the core journals of the citations in the 6 papers for each research unit.

## Results

The total number of peer-reviewed scientific papers published by INBO researchers (as first author) between 2007 and 2010 was 68, with a total number of 4,180 citations. Five of the 10 research units published at least 6 papers between 2007 and 2010 (see Table 1). These top-5 research units represent 79,4% of all publications that were recorded in 2007-2010, with the research unit Species Diversity as the most productive with 27,9% of all publications.

**Table 1. No of publications and citations of the most productive 5 research units**

<b>INBO research unit</b>	<b>No. publications</b>	<b>No. citations</b>
Species Diversity	19	1,336
Ecosystem Management	13	815
Environment and Climate	9	444
Ecosystem Diversity	7	533
Monitoring Biodiversity Policy	6	319
<b>Total no. publications</b>	<b>54</b>	<b>3,447</b>

The 30 selected publications (6 for each research unit, see Material and methods) resulted in a total number of 2,348 references. The research unit Species Diversity represents 30% of all citations, while the research group Monitoring Biodiversity Policy accounts for only 13,5% of the citations.

In-house (incl. self-) citation ratios prove to be very low (see Table 2), on average 1.6% of all citations used, and with only a very low variation between the different research units (1.0% - 2.1%). Our previous assumption that this type of citing would not strongly affect the results of the present study appears to be correct.

**Table 2. Comparison between in-house and total citations**

<b>INBO research unit</b>	<b>In-house citations</b>	<b>Total citations</b>
Species Diversity	15	707
Ecosystem Diversity	5	503
Ecosystem Management	7	471
Monitoring Biodiversity Policy	6	319
Environment and Climate	5	348
<b>Total</b>	<b>38</b>	<b>2,348</b>

A total of 1,811 out of 2,348 citations or early 77% of all citations referred to papers published in journals (Table 3), which is comparable with the commonly used number of 80 percent for the sciences in general (Bowman, 1990).

**Table 3. Comparison of the publication type of citations in 5 research units**

<b>INBO Research unit</b>	<b>% books <sup>‡</sup></b>	<b>% journals</b>	<b>Total (%)</b>
Ecosystem Management	4,7	15,4	20,1
Ecosystem Diversity	5,7	15,7	21,4
Environment and Climate	2,3	12,6	14,8
Monitoring Biodiversity Policy	2,3	11,3	13,6
Species Diversity	8,1	22,0	30,1
<b>Total</b>	<b>23,0</b>	<b>77,0</b>	<b>100</b>

<sup>‡</sup> *also including proceedings, reports, annuals, etc ...*

The journal citations (1,811 from 574 journals) were further analyzed. According to our application of Bradford's Law, 30 journals are considered as core journals, 17 of which are present in INBO's library (Fig. 1). Journals of zones 1 and 2 encompass together 119 of the 574 journals. The remaining almost 80% of the journals were cited less than 3 times, and 57% of the journals were cited only once.

Figure 1 shows the results of the match between the cited journals and the library collections, divided in zones 1 to 3 according to Bradford's Law. The Figure reveals that over 83% of the zone 3 journals is not available in the library's collections, whereas this percentage is much higher for zone 1 and 2 journals, 56.7% and 53.9% resp.

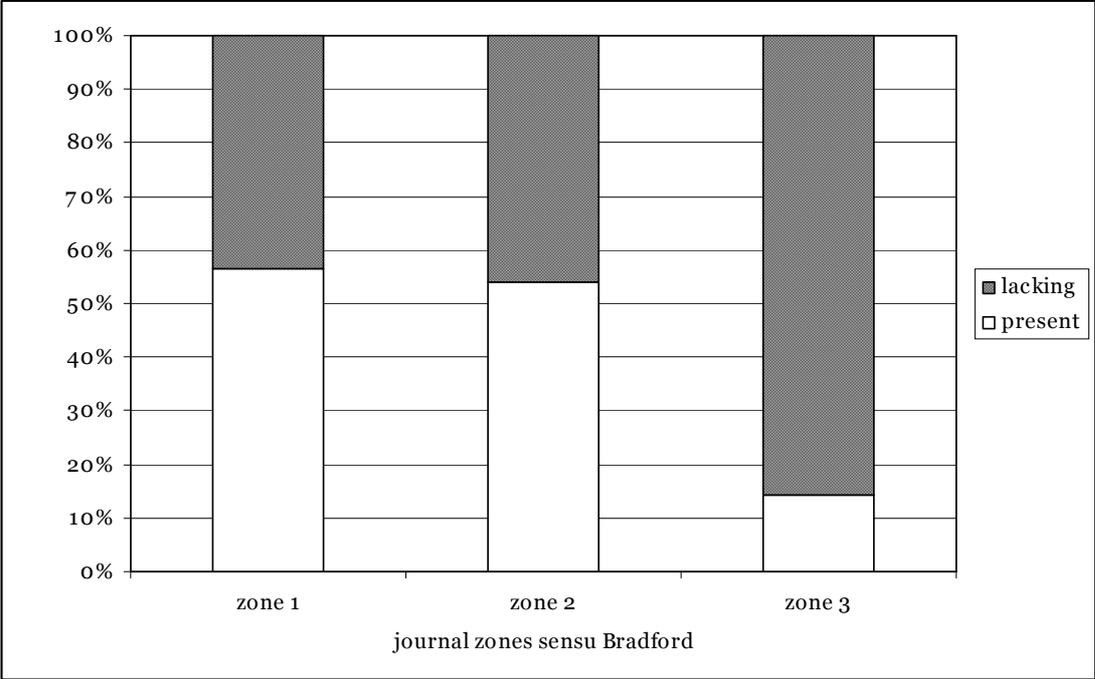


Figure 1. Comparison of presence or absence of journals in INBO's library collections, according to Bradford's zones.

Figure 2 shows the distribution of the zone 1 journals over the 5 selected research units. Strikingly, the research unit Ecosystem Management can rely on a full availability of core journals in the organisation's library despite the fact that overall no less than 134 different journals were cited (as compared to e.g. 103 and 99 journals in research units Monitoring Biodiversity Policy and Environment and Climate resp.). In the remaining research units, the percentage of available journals ranges from 33.3% and 52.9%.

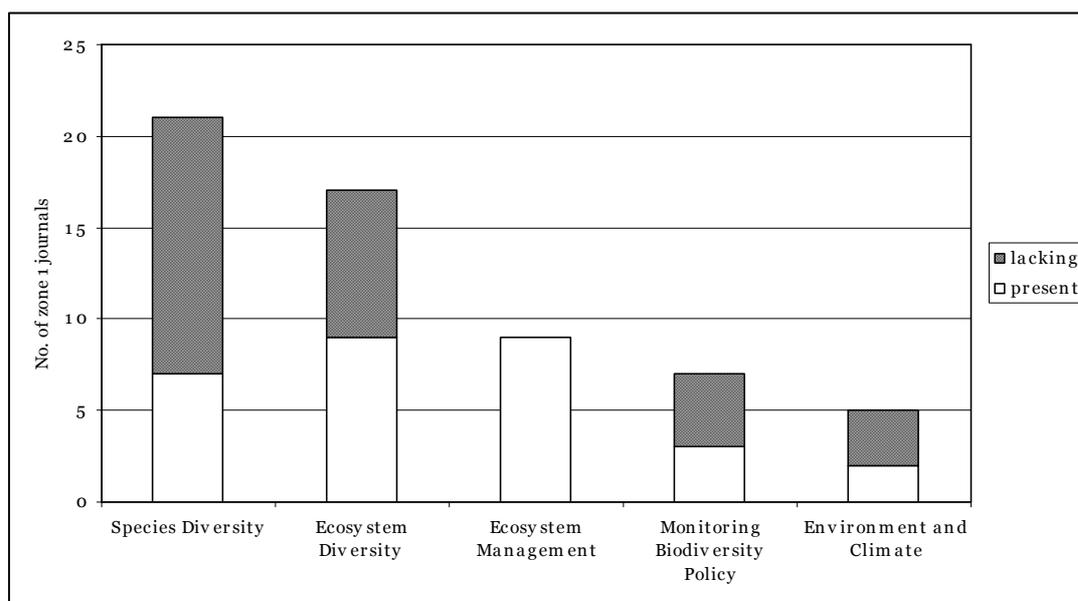


Figure 2. Comparison of the number of zone 1 journals of citations over 5 research units, present or lacking in INBO's library collections

## Discussion

Our study revealed that the INBO library holds only 22.6% of the journals that our researchers referred to in their papers published between 2007 and 2010. More than 50% of the journals assigned to zone 1 and 2 *sensu* Bradford (1948) proved available, which was the case in only 16,7% for zone 3 journals. In reality, papers from 444 different journals were not readily accessible in the physical collections of INBO's library.

This implies that researchers themselves had no other option than to do an extra effort to achieve these publications. In some cases, researchers got in touch with authors of recently published contributions directly or relied on partner institute and university facilities. In other cases they contacted the INBO library to purchase the requested papers, which required subsequent interlibrary loans (ILL) or purchases by commercial providers.

Undoubtedly, this process is very time-consuming for the researchers and possibly not very efficient. Indeed, it has happened that researchers looked for the same paper without being aware of each other's action. To improve the efficiency, the library as core information center has an important role to play in the near future.

Three major factors should be taken into account: time, budget and space. To tackle the time factor, a business analysis will be carried out among a representative group of researchers to visualise the different ways of publication search along the process of generating a scientific publication.

Available financial means tend to be constant or even decreasing, which have an obvious effect on the possible measures taken to extend the library collections. One option might focus on consortium agreements, an other on the purchase of (generally less expensive) zone 3 journals in particular.

At this moment, the library space is occupied to such an extent that additional physical collections might cause a storage problem. For this reason, a decision was made to develop a library policy focused on digital documents.

## References

---

Baker, S.L. and Lancaster, F.W. 1991. The measurement and evaluation of library services, Information resources press, Arlington, VA.

Bradford, S.C. 1948. Documentation, Crosby Lockwood, London.

Dickinson, K., Gunningham, R. and Boyd, B. 2009. Reference analysis as an aid in collection development: a study of master of architecture theses at Dalhousie University.

Gross, P.L.K. and Gross, E.M. 1927. College libraries and chemical education. Science 66, 385-389.

MacRoberts, M.H. and MacRoberts, B.R. 1987. Problems of citation analysis: a critical review. Journal of the American Society for Information Science 40(5), 342-349.

Smith, L.C. 1981. Citation analysis. Library Trends 30, 83-106.

Tagliacozzo, R. 1977. Self-citations in scientific literature. Journal of Documentation. 33(4), 251-265.

Bowman, M.S. 1990. Format citation patterns and their implications for collection development in research libraries. Collection Building 11(1), 2-8.

Thomson ISI. 2011. ISI Web of Knowledge. [online]. Available: <http://apps.isiknowledge.com/> [Accessed: April, 2011].