

## Publications

# Use of the Impact Factor in Agriculture

by Brett Holte, Sue Ernst, Beth Guertal, and Bill Raun

Historically, research has been evaluated by whether or not it resulted in a measurable product. Work by Uphoff (2003) notes that systems that are less dependent on external inputs have better prospects for sustainability so long as they meet the needs of producers and consumers. While somewhat unrelated, this article highlights a dynamic system whereby success is measured from different perspectives: specifically, how do we measure the value of a specific paper and/or journal to the research community, yet with the knowledge that society was somehow benefitted as well?

The concept whereby librarians could use information concerning citation rates as a method of selection was first proposed by Gross and Gross (1927). While not a perfect tool for evaluating the quality of articles, Hoeffel (1998) suggested that the Impact Factor (IF) had the advantage of existing and was a good method for scientific evaluation. Garfield (2005) commented that when evaluating faculty, most people do not have or care to take the time to read the articles any more. As such, having immediate access to an acceptable metric accommodates both need and convenience.

Present publishing trends indicate that the likelihood of using the IF as a decision-making tool should continue. In other more applied words, the IF as we know it is just not going away. Our present IF is computed by dividing the number of citations in the Journal Citation Reports (Thomson Reuters, 2015) by the total number of “citable items” published in the two previous years, as recorded in the Thomson Reuters Web of Knowledge. As per the work of McVeigh and Mann (2009), items counted in the denominator of the IF are identified in the Web of Science database and have the index type set as either article, review, or proceedings paper. These document types identify the scholarly contribution of the journal to the literature and are thus counted as “citable items” in the denominator of the IF.

Nonetheless, not all items published in a journal are considered “citable items.” An IF of 1.0 means that, on average, the articles published one or two years ago have been cited one time. Garfield (1999) noted that the IF of a journal reflects the frequency with which the journal’s articles are cited in the literature.

Each year, IFs are provided by the Journal Citation Report (Thomson Reuters, 2015). It is important to note that IFs have increased in acceptability considering the lack of other metrics to evaluate different scientific journals (Garfield, 1955).

Work by Judge et al. (2007) noted that the pressure from journals and universities for prestige has been a key element driving citation rates. Further comments coming from Bordons et al. (2002) indicated that applied use of the IF in the research evaluation process was influenced strongly by the publication strategy of scientists. Considering that this has/is taking place, should faculty be trained/instructed on where to publish and/or is this something they already know? More importantly, if in fact publishing in target journals were a priority, how does this, in turn, impact the stakeholder that paid the bill for said research?

The H-index (HI) developed by Hirsch (2005) is a newer index developed primarily to evaluate the scientific output of individuals primarily in research roles. Hirsch (2005) goes on to justify this type of quantification for evaluation and comparison purposes among university faculty. A distinct advantage of the HI is that it can be used to evaluate both journals and individual scientists (Hirsch, 2005).

## Computation of the Impact Factor

The Journal Citation Reports (JCR) are presently published by Thomson Reuters. They include impact and influence metrics from 2014 data relative to published journal articles. This report includes > 11,000 journals in 237 disciplines, from 82 countries. The IF ranking system is based on the number of times an average article is cited during the previous two years and can range dramatically. It is generally agreed that cross-discipline comparison and judgment of individual papers or researchers is not valid. Van Noorden et al. (2014) noted that current day bibliometricians avoid methods that simply count citations when they want to measure a paper’s value and instead prefer comparing counts for papers of similar age and in comparable fields.

Issues arise when considering how the IF is computed. Garfield (1999) reported that citation studies should account for the scientific field or discipline. He further noted that the citation density (the number of references cited per article) will be lower for mathematics versus life sciences. Work by Dong et al. (2005) noted that the citation half-life is the median age of the articles that were cited in the year for which the half-life is reported. For this work, it is important to note that agricultural research has a very long citation half-life compared with literature coming from the medical industry.

Amin and Mabe (2004) indicated that the IF can be thought of as the average number of citations that the average article receives per annum in the two years after the publication year.

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Nonetheless, disparity exists concerning the value of the IF. Baum (2011) noted that the IF had little credibility as an indicator of quality for either the journals or the articles they publish. He further reported that attributions of journal or article quality can be incorrect more than half the time.

Work by Fooladi et al. (2013) reports that while the IF attracts more attention and is being used more than other measures, it has been subjected to criticisms that overcome the advantages. They further note that extensive use of IF may result in altering editorial and researchers' behavior, which could compromise the quality of scientific articles.

### Impact Factor Application

Considering that the IF and H-index are now well-established metrics, how can a given journal or society increase the impact factor, if in fact, it was deemed a priority?

The easiest way to increase the IF is via the inclusion of review papers (Garfield, 1996). As has been reported, review papers, and especially those with "Review" in the title are more heavily cited and can increase the IF. Of further note is that papers with shorter titles receive significantly greater numbers of citations (Chawla, 2015).

Comments from McPeck (2012) noted that science administrators have abdicated promotion and tenure decisions to non-scientists, and that has led to the use of quantitative metrics such as the IF. This superficially appears to be a more rational and reasonable way to evaluate the quality of a scientific journal rather than biased opinions of people. He further suggested that after all, we are scientists and why wouldn't we value numbers over opinion?

At present, the Google Scholar H-index is reported to provide faculty with an added tool to verify the quality of the journals where they publish (Hodge and Lacasse, 2011). This is especially important when faculty from an entirely different discipline are asked to evaluate the merits/value of fellow colleagues.

### Discussion

In agriculture, it is important to include stakeholders when considering exactly what the "impact factor" is for both published and unpublished research. Nonetheless, stakeholder input has not been, and likely never will be, included within the academic question of "impact."

Differentiation is also required, considering how the IF is used in academia and industry. Shouldn't industry be allowed to evaluate the IF of a journal publication or the



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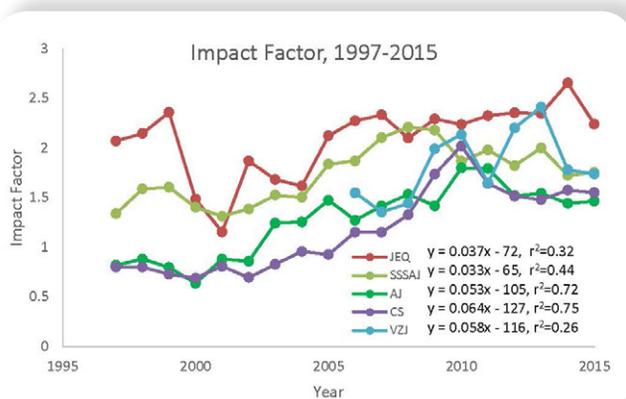


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**Fig. 1.** Impact Factor (IF) for the *Journal of Environmental Quality* (JEQ), *Soil Science Society of America Journal* (SSSAJ), *Agronomy Journal* (AJ), *Crop Science* (CS), and *Vadose Zone Journal* (VZJ), 1997–2015.

perceived contributions of select faculty in universities? One paper might be cited many times in an “academic” niche but have little use or relevance on the applied side, or industry side where concepts, work, and ideas are put into practice. Trends in H-values/IF over the past 25 years indicate that increases in the performance of specialized journals have been in response to popularity and altered research priorities while growth for other journals reflects prestige and popularity (Olden, 2007). This same concept applies to whether or not a certain publication or product had a good “state impact factor” versus “national impact factor” versus “international impact factor.” An example is the Oklahoma State University hand planter that may have an incredibly low impact factor via published journal articles but is widely used in the developing world for increasing grain yields and alleviating hunger (Omara et al., 2015).

Impact Factors for the *Journal of Environmental Quality*, *Soil Science Society of America Journal*, *Agronomy Journal*, *Crop Science*, and *Vadose Zone Journal* from 1997 to 2014 are reported in Fig. 1. Data for the *Vadose Zone Journal* have only been available since 2006. All five journals show a positive and significant trend to increase over this time period, yet all illustrate variability over this time period ( $PR > F$ , 0.01, slope component).

How does this IF sit with colleagues in industry or our producers in the field who may have a very low opinion of a given research paper? Is their input/knowledge of value, and if so, how is it used? The trends in Fig. 1 suggest that the IF has indeed increased since 1997, but has our composite research work had this same positive impact on society in general that would be hypothetically expected?

All things considered, the need exists to publish scientifically sound papers where others will read the work and ultimately use it. If ASA, CSSA, and SSSA are going to cooperatively use the IF and H-index for evaluating/grad-

ing the value of the published research coming from our membership now totaling more than 10,100, endorsement of these indices is needed. Our Societies should provide the needed leadership and direction that both our membership and agricultural administrations need to properly employ these modern metrics. Because IF importance is expected to grow, our Societies can increase journal popularity by soliciting relevant and timely reviews that will be widely read and cited.

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## References

- Amin, M., and M. Mabe. 2004. Impact Factors: Use and abuse. *Int. J. Environ. Sci. Technol.* 1(1):1–6.
- Baum, J.A.C. 2011. Free-riding on power laws: Questioning the validity of the Impact Factor as a measure of research quality in organization studies. *Organization* 18:449–466.
- Bordons, M., M.T. Fernandez, and I. Gomez. 2002. Advantages and limitations in the use of the Impact Factor measures for the assessment of research performance in a peripheral country. *Scientometrics* 53(2):195–206.
- Chawla, D.S. 2015. In brief, papers with shorter titles get more citations, study suggests. *Science*, 25 Aug. 2015. doi:10.1126/science.aad.1669.
- Dong, P., M. Loh, and A. Mondry. 2005. The “Impact Factor” revisited. *Biomed. Digit. Libr.* 2(7):1–8.
- Fooladi, M., H. Salehi, M.M. Yunus, M. Farhadi, A.A. Chadegani, H. Farhadi, and N.A. Ebrahim. 2013. Does criticisms overcome the praises of journal Impact Factor? *Asian Soc. Sci.* 9:176–182.
- Garfield, E. 1955. Citation indexes for science: A new dimension in documentation through association of ideas. *Science* 122(3159):108–111.
- Garfield, E. 1996. How can Impact Factors be improved? *Br. Med. J.* 313:411–413.
- Garfield E. 1999. Journal Impact Factor: A brief review. *Can. Med. Assoc. J.* 161(8):979–980.
- Garfield, E. 2005. The agony and the ecstasy—the history and meaning of the journal Impact Factor. *Int. Congr. Peer Review*. Chicago, 16 Sept. 2005.
- Gross, P.L.K., and E.M. Gross. 1927. College libraries and chemical education. *Science* 66:385–389.
- Hodge, D.R., and J.R. Lacasse. 2011. Ranking disciplinary journals with the Google Scholar H-index: A new tool for constructing cases for tenure, promotion, and other professional decisions. *J. Soc. Work Educ.* 47:579–596.
- Hirsch, J. 2005. An index to quantify an individual’s scientific research output. *Proc. Natl. Acad. Sci.* 102(46) 16569–16572.
- Hoefel, C. 1998. Journal Impact Factors (letter). *Allergy* 53:1225.
- Judge, T.A., D.M. Cable, A.E. Colber, and S.L. Rynes. 2007. What causes a management article to be cited—article, author, or journal? *Acad. Manage. J.* 50:491–506.

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## Meetings

## Industrial Hemp: Building a Market Structure

## Meeting to Cover Plant to Seed to Processing to Selling

by Susan V. Fisk

Hemp is projected to be an “up and coming” industry in the agronomy and plant science field over the next few years. What once was a good business through the late 1940s started to flounder after the 1937 “Marihuana” Tax Act, and by the late 1940s, not even the USDA was interested in the crop. U.S. production eventually stopped.

So, how does the United States bring back the hemp industry? There are plant breeding issues, agronomic issues, and then there are basic market infrastructure issues as well. Why grow—or research—hemp if you can’t sell it or its derivatives?

These questions and more will be answered at *The Science of Industrial Hemp* conference, to be held in Denver, CO, 28–29 July 2016. The meeting is co-sponsored by CSSA and ASA.

Sean Murphy, publisher of *Hemp Biz Journal*, started his publication due to the dearth of information regarding the hemp industry. “No one was looking at the breakdown of hemp industry segments,” Murphy says. “If we are going to invest in these hemp industries, we need data.” And so, he hired a team of researchers and compiled the first issue in September 2015.

“Now that hemp is back in America, we need information on everything, from seed to plant, the harvesting required, and marketplace connections to sell product,” says Eric Carlson who works for the Cannabis Chamber of Commerce. “There is a lack of info about ‘who are the buyers’ and ‘how do we process into a market commodity.’”

Carlson is also in the hemp industry as a business owner. He has supply contracts for food companies and has patented a fiber processing technique. Both Carlson and Murphy are speakers at the meeting.

Hemp’s “sibling plant,” marijuana, has gotten a lot of attention, which has been bad for the hemp industry. The main ingredient that people value marijuana for—THC (tetrahydrocannabinol for those so inclined)—is found in only very low doses in hemp. In fact, to be able to grow hemp, the crop must have less than 0.3% THC.

On the positive side, hemp has many other attributes. It can be grown as a fiber crop, an oilseed crop, and some varieties are even good for food products as high-protein ingredients. But, the “bad rap” given to marijuana has stalled the rise of the hemp industry.

Regulations are still mostly state by state, causing confusion for researchers and potential growers and investors. These topics will be covered during the meeting as well.

One product likely to come out of increased hemp production is a product called CBD. Both THC and CBD are “cannabinoids,” but CBD stands for “cannabidiol.” Their biological actions are different, and *Hemp Biz Journal* is preparing a report about the potential market of CBD products to be released this summer.

For more information about the meeting, visit [www.crops.org/meetings/hemp-meeting](http://www.crops.org/meetings/hemp-meeting).

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McPeck, M. 2012. Want to increase your Impact Factor? Mind Games 2.0 (blog), 11 July 2012. <http://enallagma.com/wordpress/2012/07/want-to-increase-your-impact-factor/> (accessed 1 Apr. 2016).

McVeigh, M.E., and S.J. Mann. 2009. The journal Impact Factor denominator: defining citable (counted) items. *JAMA* 302(10):1107–1109.

Olden, J.D. 2007. How do ecological journals stack-up? Ranking of scientific quality according to the H-index. *Ecoscience* 14:370–376.

Omara, P., L. Aula, B. Raun, R. Taylor, A. Koller, E. Lam, J. Ringer et al. 2015. Hand planter for maize (*Zea mays* L.) in the developing world. *J. Plant Nutr.* DOI:10.1080/01904167.2015.1022186

Thomson Reuters. 2015. Journal Citation Reports Science Edition. Thomson Reuters, New York.

Uphoff, N. 2003. Higher yields with few external inputs? The system of rice intensification and potential contributions to agricultural sustainability. *Int. J. Agric. Sustainability* 1(1):38–50.

Van Noorden, R., B. Maher, and R. Nuzzo. 2014. The top 100 papers. *Nature* 514:550–553. doi:10.1038/514550a