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# Comments on "Past, current and future of biomass energy research: A bibliometric analysis" by Mao et al. (2015)

Mao et al. recently published a paper in this journal entitled "Past, current and future of biomass energy research: A bibliometric analysis" [1]. In this paper, keywords were employed to search titles, abstracts, and keywords in the Science Citation Index (SCI) database. These keywords also contained *KeyWords Plus* by SCI, which provides search terms extracted from the titles of papers cited in each new article listed in *Current Contents* [2], but those articles that can only be found in by *KeyWords Plus* are more likely to be unrelated to the analyzed topic. In addition the "front page" filter – which covers only articles with keywords in their "front page", including the title, abstract, and author keywords – might avoid introducing unrelated publications for analysis [3]. Since any results and discussion depend on the data abstracted by a search filter, an inappropriate filter may lead to inaccurate results and wrong conclusions.

In my view many of the related results presented in the original paper [1] are not acceptable, especially those provided in Table 8, because of the use of inappropriate search filters. The authors state in Section 3 of their results that the following phrases were used to search titles, abstracts, and keywords in the database of the Science Citation Index (SCI): "bio-mass energy" or "biomass energies" or "bio-mass energy" or "bio-mass energies" or "biofuel*" or "bio-fuel*" or "bioenergy" or "bio-energy" or "bioenergies" or "bio-energies" or "biogas" or "bio-gas" or "bioelectric*" or "bio-electric*" or "bioethanol" or "bio-ethanol" or "biodiesel" or "bio-diesel". However, many documents unrelated to this study were also analyzed because of using *KeyWords Plus*. These include, for example, four highly cited articles in Table 8 of the original paper entitled "A comparison of chemisorption kinetic models applied to pollutant removal on various sorbents" [4]; "Pseudo-second order model for sorption processes" [5]; "Affective picture processing: the late positive potential is modulated by motivational relevance" [6]; and "Sarcopenia: European consensus on definition and diagnosis" [7]. None of these papers are related to "past, current and future of biomass energy research".

Mao et al. also concluded that, "It can be observed that the most highly cited article is entitled "Pseudo-second order model for sorption processes" authored by Y.S. Ho and G. McKay, which was published in *Process Biochemistry* in 1999, with 2652 citations." However, inspection clearly shows that this article is not related to "Past, current and future of biomass energy research". Table 1 presents a new table eliminating the influence of *KeyWords Plus*, showing the total number of citations since publication to the end of 2013, $TC_{2013}$ [8,9] and $TC_{2013}$ per year, $TC/Y$ [10].

There are also several other mistakes in the original paper [1] that can be found by checking the data and the methods followed in it. The most frequently used document type was "Article" which accounted for 84% not 80.1% of total publications. Further, the document type results are not correct. The articles pertaining to biomass energy in the SCI-EXPANDED are available in 27 not 28 languages. English is the dominant language in 33,391 not 31,835 records. The authors report as original that "Table 1 presents key characteristics of the biomass energy related publications between 1998 and 2013″ but these issues had been discussed earlier in a review of published wetland research [27]. Further, the authors report that during 2001–2013, the average number of authors in a paper was found to be less than one in 2006 and 2007, but it is not possible to have less than a single author for publications.

Elsewhere, Ho and his co-workers (2009) [28] have developed a method of combining article titles, author keywords, and *KeyWords Plus* to provide important clues for research hotspots and this was extended in 2010 [29]. This analysis, including title words, author keywords, and *KeyWords Plus* together can minimize some limitations, such as the uncompleted meaning of single words in title, the small sample size for author keywords, and the indirect relationship between *KeyWords Plus* and the research emphases [30]. Furthermore, a new method, "word cluster analysis", has been successfully applied to find the research hotspots in a field.

Mao et al. also did not cite appropriate references for related description. In Section 3.2. "Publication distribution of countries/territories and institutes", the authors state that "The 20 most productive countries/territories are ranked using the following indicators: the number of total journal articles, the number and the percentage of single country articles and internationally collaborated articles, the first author and corresponding author articles, and so on (see Table 2)" and "Fig. 2 displays the time-trend analysis of the 6 most productive countries", without reporting that Ho and his co-workers [27,31] had already compared five indicators such as total articles, single country articles, internationally collaborative articles, first author articles, and corresponding author articles. Similarly, the idea expressed in Table 3 in the original paper [1] had also been published before [27,32,33]. In section 3.5. "The most highly cited articles", these authors noticed that "The most highly cited articles are analyzed with parameters such as the total citations, average annual citations, and the country of origin, for 1998–2013 (Table 8) and that yearly variations in the number of citations can be used to trace the impact of publications." Here these authors have copied the same table and concept from papers published by Ho's group [34–36].

Generally speaking, the inappropriate use of search filters can have enormous effects on the results obtained, and thus great attention should be attached to the search filters chosen. Furthermore, citing an original paper not only respects those authors who presented a novel idea, but it also directs readers to the details of the original work [37,38]. In my view, Mao et al. should have cited the original papers for all the indicators and concepts they discuss, thereby providing greater accuracy and detailed information about the bibliometric concepts that they employed.

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**Table 1**
Most frequently cited articles during 1998–2013.

| Year | $TC_{2013}$ | $TC/Y$ | Article | Journal | Country |
|---|---|---|---|---|---|
| 1998 | 264 | 17 | Anaerobic digestion of swine manure: Inhibition by ammonia [11] | Water Research | Denmark |
| 1999 | 1748 | 117 | Biodiesel production: a review [12] | Bioresource Technology | USA |
| 2000 | 279 | 20 | Modeling and optimization of anaerobic digested sludge converting starch to hydrogen [13] | Biotechnology and Bioengineering | Taiwan |
| 2001 | 406 | 31 | Saka, S. and Kusdiana, D. (2001), Biodiesel fuel from rapeseed oil as prepared in supercritical methanol. *Fuel*, **80** (2), 225–231. [14] | Fuel | Japan |
| 2002 | 408 | 34 | Effect of pH on hydrogen production from glucose by a mixed culture [15] | Bioresource Technology | China |
| 2003 | 540 | 49 | An inventory of gaseous and primary aerosol emissions in Asia in the year 2000 [16] | Journal of Geophysical Research-Atmospheres | USA, China, Austria |
| 2004 | 471 | 47 | Global potential bioethanol production from wasted crops and crop residues [17] | Biomass & Bioenergy | USA |
| 2005 | 544 | 60 | Synthesis of biodiesel via acid catalysis [18] | Industrial & Engineering Chemistry Research | USA |
| 2006 | 1068 | 134 | Ethanol can contribute to energy and environmental goals [19] | Science | USA |
| 2007 | 409 | 58 | Metagenomic and functional analysis of hindgut microbiota of a wood-feeding higher termite [20] | Nature | USA, Costa Rica |
| 2008 | 1261 | 210 | Use of U.S. croplands for biofuels increases greenhouse gases through emissions from land-use change [21] | Science | USA |
| 2009 | 447 | 89 | Microalgae for oil: Strain selection, induction of lipid synthesis and outdoor mass cultivation in a low-cost photobioreactor [22] | Biotechnology and Bioengineering | Italy |
| 2010 | 321 | 80 | Microbial production of fatty-acid-derived fuels and chemicals from plant biomass [23] | Nature | USA |
| 2011 | 190 | 63 | Metagenomic discovery of biomass-degrading genes and genomes from cow rumen [24] | Science | USA |
| 2012 | 72 | 36 | An engineered microbial platform for direct biofuel production from brown macroalgae [25] | Science | USA, Chile |
| 2013 | 55 | 55 | Porous materials with optimal adsorption thermodynamics and kinetics for $CO_2$ separation [26] | Nature | USA, Saudi Arabia |

$TC_{2013}$: total citations since publications to the end of 2013; TC/Y: average annual citations since publication.

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