

Structure and development of scientific journal publications on organic agriculture: A scientometric review

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Abstract

By means of basic scientometric indicators 2,801 peer-reviewed articles on organic agriculture (ORG) obtained from the so-called 'Web of Science' are compared with the general agricultural literature (AGR) (136,712 articles). Apart from development and publication growth we review bibliometric data on author, institution, country and language to produce insights on the structure of international publishing on ORG.

Introduction and objectives

In view of increasing global importance of organic agriculture there are also growing research activities worldwide concerning organic farming (Willer 2009). Tendencies of an institutionalization of organic research as well as increased networking and coordination of research agendas can be observed (Lange et al. 2005) especially at European level (Niggli et al. 2008, Schmid et al. 2009) but also globally (Willer 2009). Repeated efforts have been made to describe an original 'organic research' approach but still, the term 'organic research' remains hard to define (e.g. Watson et al. 2008).

Agricultural science in general as well as research on organic farming produce a continuously growing number of scientific journal articles (Watson et al. 2008, Siegmeier and Möller 2013). Traditionally, in organic agriculture, research focus and knowledge transfer are particularly directed towards practitioners (Bull 2007, Lange et al. 2005, Lockeretz 2002) and so-called 'grey literature' is of great importance. Peer-reviewed articles predominantly serve the publication within the research community in order to establish or raise the scientific reputation. In this context peer-reviewed articles have been assigned a potential for de-ideologization that could lead to an approximation with the science mainstream and an increased appreciation for organic agriculture (Lockeretz 2002). In addition, evaluation and performance assessment of researchers and institutions increasingly include and focus on peer-reviewed output. Therefore journal papers gain in importance also for 'organic research' and its funding. This article analyzes bibliometric characteristics in order to obtain insight into the structure and distribution of ORG literature and its status within AGR literature in general. The study illustrates the development of ORG papers published in scientific journals over the past 35 years (1977-2011). The goal is to identify possible trends in publication growth and publication dynamic by means of scientometric indicators.

Material and methods

The present study is based on the analysis of articles listed in the International Science Citation Index (ISI) of Thomson Reuters ('Web of Science'). A topic search (TS) within title, abstract and keywords for "organic farm*" OR "organic agriculture" was conducted for the years 1977-2011 and all languages. An analogous search was run with the terms "farm*" OR "agriculture". The main set of 136,712 agricultural articles (AGR) and the subset of 2801 articles (2,05 %) relating to organic farming (ORG) were analyzed and compared in regard to publication growth and dynamic by means of the scientometric indicators *mean annual percentage rate* (MAPR) and *doubling time* (2T) (Vinkler 2010). In order to display structure and distribution of the organic agricultural literature we also reviewed bibliometric data on author, institution, country and language of all articles.

Development and dynamic

First journal publications on ORG appeared in the 1970s. For the period 1977-1990 sporadic numbers are listed in ISI with a maximum of 5 articles/year and no ISI entry in 1985. Since 1991 at least 10 articles and since 2001 a minimum of 100 articles have been published annually (Fig.1). With 325 papers in 2011 ORG publications comprised 2,8 % of all newly published AGR papers that year (peak: 3 % in 2009).

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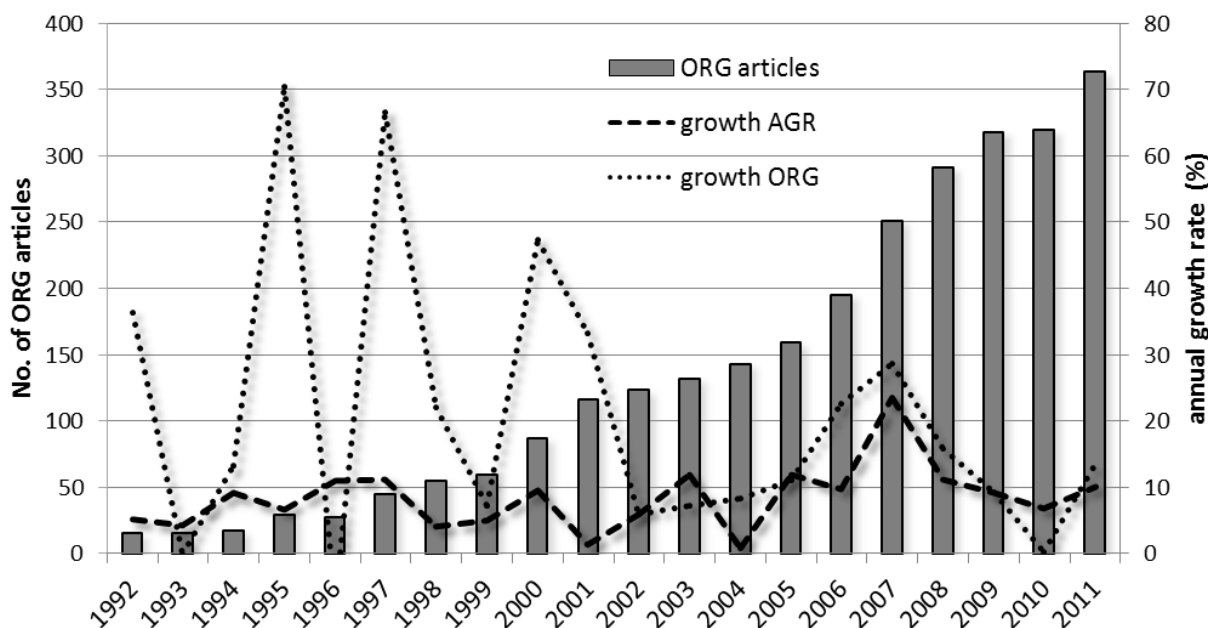


Figure 1: Articles on organic farming (ORG) listed in the ISI (1992-2011) and publication growth rates for general agricultural (AGR) and ORG articles

The publication growth rate over the past 20 years (MAPR1992-2011) is 20.2 % for ORG articles. This rate of a relatively young sub-field can hardly be directly compared with the established agricultural sciences in general (MAPR1992-2011 = 8,4 %) (Fig.1), which produced more than 12,700 articles in 2011. The length of cumulative doubling of a field of publication within a defined time span (2T) provides a logarithmized and therefore relatively un-biased indicator for the comparison of corpi of literature significantly differing in quantity (Vinkler 2010). Doubling times of ORG and AGR publications are very similar (Tab.1).

Table 1: Doubling times of the organic and general agricultural literature

	Doubling time (2T)		
	1992-2011	2002-2011	2007-2011
organic farming (ORG)	6.5 yrs	3.4 yrs	1.9 yrs
agriculture (AGR)	5.8 yrs	3.3 yrs	1.9 yrs

Structures and stakeholders

The distribution of scientific publications is generally characterized by exponential patterns ('Bradford's Law of Scattering'; Vickery 1948). This is also true for the analyzed AGR and ORG literature: Two authors each published more than 20 articles, 4 authors 15-19 articles, and already 18 authors are listed with 10-14 articles on ORG. The distribution of publications according to country of origin, author affiliation (Tab.2), and journal follows the same pattern.

English is the prevailing language in AGR and ORG literature (90 % and 89 %). Papers in German make up a share of 3 % (AGR) and 6 % (ORG). The only other languages with more than 1 % of agricultural articles listed in ISI are French and Portuguese (<2 %). On one hand English is the predominant language in global science, on the other hand English speaking countries are dominating agricultural publications. The US, Great Britain, Canada, Australia and India are involved in the publication of roughly 50 % of all AGR articles; institutions in the US alone account for about 25 % of all AGR papers in this study.

The geographic distribution of ORG articles is also lead by the US (444 articles; ~16%), followed closely by European countries (Germany ~13%; Denmark ~7%; England ~6%; Netherlands ~6%; Italy ~5%; Sweden ~5% and Spain ~4%). While the US dominate the agricultural sciences (AGR and ORG) according to the

total count of articles, it is European universities which are particularly active in publishing ORG articles. Organizations like Wageningen UR or SLU in less populous countries (Netherlands and Sweden) bundle resources and expertise in a 'quasi-monopoly' for agricultural publications. In the special case of relatively small Denmark there are several protruding institutions involved in ORG publications (Tab.2). Although, it has to be noted that in 2008 the Danish Institute of Agricultural Science (DIAS) has merged with the Aarhus University. Furthermore, Denmark has the highest share of ORG articles in total AGR articles of a country (8.2 %) followed by Austria (7.1), Switzerland (5.8) Sweden (5.7), Greece (4.8), Germany (4.7), Finland (4.5), Wales (4.4), Netherlands (3.6), Czech Republic (3.5), Italy (3.5), Turkey (3.1), Spain (2.5), Brazil (2.4), Norway (2.4) and Poland (2.1).

Table 2: Institutions with most journal articles on organic farming (1977-2011)

Institution	No. of ORG-articles	Share; N=2801	No. of AGR-articles (rank ^a)	ORG-share in AGR-articles (rank ^b)
Aarhus Univ., Denmark	132	4,71 %	953 (18)	13,85 % (6)
Wageningen UR, Netherlands	122	4,36 %	2395 (3)	5,09 % (13)
SLU, Sweden	100	3,57 %	1114 (10)	8,98 % (7)
Univ. Copenhagen, Denmark	78	2,78 %	1018 (13)	7,66 % (10)
Univ. of California, US	77	2,75 %	2863 (2)	2,69 % (16)
DIAS, Denmark	72	2,57 %	262 (140)	27,48 % (2)
USDA-ARS, US	68	2,43 %	3817 (1)	1,78 % (20)
FIBL, Switzerland	62	2,21 %	113 (-)	54,87 % (1)
AgResearch, New Zealand	48	1,71 %	1703 (4)	2,82 % (16)
Boku Vienna, Austria	46	1,64 %	263 (139)	17,49 % (5)
Univ. Kassel, Germany	42	1,50 %	211 (196)	19,91 % (4)
Univ. Göttingen, Germany	41	1,46 %	502 (48)	8,17 % (8)
INRA, France	41	1,46 %	1663 (5)	2,47 % (18)
Agr. Acedemy, Bulgaria	38	1,36 %	751 (28)	5,06 % (14)
Thuenen Inst./FAL, Germany	35	1,25 %	167 (-)	20,96 % (3)
EMBRAPA, Brazil	35	1,25 %	601 (40)	5,82 % (12)
Washington State Univ., US	33	1,18 %	554 (45)	5,96 % (11)
Univ. Fed. Sta. Maria, Brazil	32	1,14 %	891 (20)	3,59 % (15)
Univ. Bonn, Germany	31	1,11%	399 (76)	7,77 % (9)
Cornell Univ., US	30	1,07%	1281 (8)	2,34 % (19)

^a rank among all institutions contributing to the 2801 articles on organic farming

^b rank among the 20 institutions listed

Discussion and conclusion

Despite the publication growth in the young and innovative ORG sub-field its dynamic over the past 10 years hardly differs from the established agricultural sciences in general. However, some smaller or younger journals are not listed in the ISI (e.g. Organic Agriculture, Journal of Organic Systems) and 'grey literature' has not been considered in this study. Furthermore, the relatively unspecific topic search produces unproportionately more hits in AGR than ORG that are not strictly corresponding to agriculture but rather belong to e.g. medical science or biology. On the other hand, the limitation to title search (TI) did only partially represent the 'organic literature'. Search results and bibliometric data from ISI in general have to be interpreted carefully.

The results show that different institutions engage to different degrees in ORG publication. However, it is impossible to evaluate to what degree organic farming is merely a topic of conventional agricultural research or to what degree professionalized 'organic research' publishes in peer-reviewed journals. For this purpose content analytical steps and above all a clear definition of "organic research" would be necessary, which might be difficult to map in an ISI-search.

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