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Original article

Bibliometric study on tobacco production: references for sustainable local development

Estudio bibliométrico sobre producción del tabaco: referentes para el desarrollo local sostenible

Estudo bibliométrico sobre a produção de tabaco: referências para o desenvolvimento local sustentável

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ABSTRACT

Tobacco is a plant cultivated throughout almost the entire planet. Despite being harmful to human health, its cultivation and preparation means the generation of jobs for thousands of families and a great significance for the economy. For better yields of tobacco crops and greater effectiveness in its processing, the scientific community strives in researches that allow the achievement of superior results. For this reason, the objective of this work was to describe the behavior of scientific publications in Scopus about tobacco production, as a reference to promote sustainable local development. A descriptive, non-experimental, retrospective and descriptive bibliometric study was carried out with a quantitative approach, using theoretical and empirical methods. The results showed that in the study period 2012-2021, the scientific production of this topic increased, with articles

predominating among the types of documents, highlighting the authors Baldwin, Fischer, Schillberg and Commandeur, with Baldwin coinciding as the author with the greatest impact on the topic. The journal with the highest number of contributions was Frontiers in Plant Science, while those with the highest impact index were PLoS ONE and Plant Biotechnology Journal. The bibliometric study carried out constituted a reference for entrepreneurs to consult bibliographies on successful experiences in terms of current trends in tobacco production, with the generation of employment, increased income in the communities and the creation of capacities being the most important effects of sustainable local development.

Keywords: tobacco production; bibliometric study; local sustainable development.

RESUMEN

El tabaco es una planta cultivada a lo largo de casi todo el planeta. A pesar de ser nocivo para la salud humana, su cultivo y preparación significan la generación de fuentes de trabajo para miles de familias y un gran significado para la economía. Para mejores rendimientos de los cultivos de tabaco y mayor efectividad en su procesamiento, la comunidad científica se esmera en investigaciones que permitan el logro de resultados superiores. Por tal motivo el trabajo tuvo como objetivo describir el comportamiento de las publicaciones científicas en Scopus acerca de la producción del tabaco, como un referente para impulsar el desarrollo local sostenible. Se realizó un estudio bibliométrico descriptivo no experimental, retrospectivo y con enfoque cuantitativo, utilizando métodos teóricos y empíricos. Los resultados mostraron que en el período de estudio 2012-2021, la producción científica de este tema aumentó, predominando los artículos entre los tipos de documentos, resaltando los autores Baldwin, Fischer, Schillberg y Commandeur, coincidiendo Baldwin como el autor de mayor impacto en el tema. La revista que más contribuciones aportó fue Frontiers in Plant Science, mientras que las de mayor índice de impacto fueron PLoS ONE y Plant Biotechnology Journal. El estudio bibliométrico realizado constituyó un referente para que emprendedores consulten bibliografías sobre experiencias exitosas en cuanto a tendencias actuales sobre la producción del tabaco, siendo la generación de empleo, el incremento de ingresos en las comunidades y la creación de capacidades los efectos de mayor importancia que propicia el desarrollo local sostenible.

Palabras clave: producción de tabaco; estudio bibliométrico; desarrollo local sostenible.

RESUMO

O tabaco é uma planta cultivada em quase todo o planeta. Apesar de ser prejudicial à saúde humana, seu cultivo e preparação significam a geração de fontes de trabalho para milhares de famílias e um grande significado para a economia. Para obter melhores rendimentos das culturas de tabaco e maior eficácia em seu processamento, a comunidade científica se empenha em pesquisas que permitam alcançar resultados superiores. Por esse motivo, o trabalho teve como objetivo descrever o comportamento das publicações científicas no Scopus sobre a produção de tabaco, como referência para impulsionar o desenvolvimento local sustentável. Foi realizado um estudo bibliométrico descritivo não experimental, retrospectivo e com enfoque quantitativo, utilizando métodos teóricos e empíricos. Os resultados mostraram que, no período de estudo de 2012 a 2021, a produção científica sobre esse tema aumentou, com predominância de artigos entre os tipos de documentos, destacando-se os autores Baldwin, Fischer, Schillberg e Commandeur, sendo Baldwin o autor de maior impacto no tema. A revista que mais contribuiu foi a Frontiers in Plant Science, enquanto as de maior índice de impacto foram a PLoS ONE e a Plant Biotechnology Journal. O estudo bibliométrico realizado constituiu uma referência para que os empreendedores consultem bibliografias sobre experiências bem-sucedidas em relação às tendências atuais sobre a produção de tabaco, sendo a geração de empregos, o aumento da renda nas comunidades e a criação de capacidades os efeitos de maior importância que promovem o desenvolvimento local sustentável.

Palavras-chave: produção de tabaco; estudo bibliométrico; desenvolvimento local sustentável.

INTRODUCTION

Local development has gained more and more space in governmental strategies, it is based on economic growth as a primary factor of development. Different approaches to local development have been made throughout history, focusing its attention and broadening the dimensions implicit in its conceptualization. It is closely related to the proactive attitude of the actors of a locality, region or territory to identify and take advantage of the resources provided by the environment in which they develop and to value the endogenous potentialities they have, whether economic or social, cultural, historical, environmental or of any other type that results in local economic development (Zirufo Briones & Pelegrín Entenza, 2023).

The development of human capital is of vital importance to increase technological innovation in agriculture and foster local development, which contributes to benefits for society and the economy, achieves growing and sustainable results, improves food security and the quality of life of the inhabitants (Díaz Gutiérrez, 2020).

Tobacco is a crop that is considered native to the Americas because it was already being cultivated in this region when the Spaniards arrived. It is a plant belonging to the *Nicotiana* genus of the Solanaceae family, characterized by its large leaves, its large size, and its strong nicotine alkaloids in its leaves. Several varieties of *Nicotiana* are registered, the two most known and worked by farmers are *Nicotiana tabacum* with a more pleasant and strong flavor and *Nicotiana rustic*, with less pleasant flavors. It is cultivated in many developing countries worldwide, where it plays a vital role, from the social and economic point of view, because it is a labor-intensive product, therefore, it is considered a generator of jobs (Enriquez Garcia et al., 2021).

The botanical description according to León Moreno et al. (2020) mentions that it is classified as follows.

Taxonomic classification of the tobacco crop

- Scientific name: *Nicotiana tabacum L.*
- Common name: Tobacco
- Kingdom: Plantae
- Division: *Magnoliophyta*
- Class: *Magnoliopsida*
- Order: *Solanales*
- Family: *Solanaceae*
- Genus: Nicotiana
- Species: *tabacum L.*

According to González and Gurdián (1998), tobacco is one of the few crops that reaches the world market entirely based on leaves, it is the most cultivated non-edible commercial plant in the world. For many countries it is of importance in financial and economic policy. Its main use is for smoking, specifically by inhaling its powder.

The production and marketing of cigarettes and other tobacco leaf products involves four stages: raw material production, industrialization, product shaping, distribution and sale.

In charge of transforming tobacco leaf, the tobacco industry (Cortés Hernández et al., 2019), has evolved over time and has been maintained, given that it has adapted to cultural, social and political changes and has favored economic dynamization in the places where it has generated its production.

The industrialization for obtaining products of optimum quality depends on the fulfillment of all the established parameters from the reception of the raw material, its processing, manufacturing, to the final packaging.

The interest of the international scientific community in tobacco production is growing, so it is highly demanded by the actors of the value chain, research that includes soil and seedbed preparation, crop rotation, irrigation, fertilization, pest control, genetic improvement, edaphoclimatic conditions (climate, temperature, humidity), as well as improvements in the industrial process.

Scientific production has also increased, achieving the materialization of the knowledge generated and socialized through information institutions. There are countless journals, databases and platforms that assume this function.

Bibliometrics makes it possible to describe phenomena, trends and regularities that occur in a given field of science (Hernández González et al., 2023), it also studies the quantitative aspects of the production, dissemination and use of the information recorded, for which purpose it develops models and mathematical measures that, in turn, serve to make forecasts and make decisions about these processes (Vargas Leal, 2023).

The indicators used in this discipline constitute necessary scientific tools because they allow the quantification of science in an objective way, since they are enhanced by the explosion of current knowledge and its compilation in bibliographic databases. There is no doubt that, despite the objections that can and should be made, bibliometric indicators facilitate the understanding of research activity (Camps, 2008).

Taking into account the importance of the subject worldwide, the following article aims to describe the behavior of scientific publications in Scopus on tobacco production, as a reference to promote sustainable local development.

MATERIALS AND METHODS

The bibliometric study is a descriptive, non-experimental, retrospective study with a predominantly quantitative approach.

Non-experimental: The variables are not intentionally manipulated; the behavior of these variables is observed as they are manifested in their natural context.

Descriptive: It evaluates and collects data on different variables, aspects or dimensions of the phenomenon to be investigated.

Quantitative: because the researcher collected mainly numerical data, which he analyzes by means of mathematical-statistical procedures. There is no influence of the researcher on the phenomena observed.

According to the fundamental objective of the study, the following research methods were used.

- Theoretical
    - Analytical-Synthetic: to determine and discover links between the theoretical issues addressed about metric studies and the procedures to be used for institutional domains.
    - Deductive-Inductive: taking into account the generalities of the procedures of metric studies, the indicators used to describe the scientific production from the characteristics of the domain.
- Empirical
    - Documentary analysis method: a literature review is carried out to address the theoretical aspects and locate the topics related to bibliometrics.
    - Bibliometric method: based on univariate and multivariate bibliometric indicators, the scientific production on "Tobacco production" in Scopus, the period 2012-2021 is analyzed.
    - Mathematical methods: mean, median and percentage values are determined to analyze indicators and make comparisons.

For information processing, Microsoft Excel 2007 was used, contemplating as fundamental fields: authors, author code (ID), affiliation, title, year of publication, descriptors, number of citations, type of documents and source of information.

The population consisted of 2422 documents on the topic "Tobacco production" (retrieved in Scopus from 2012 to 2021). To determine the sample to be studied, all the documents were reviewed because, despite excluding in the search strategy the terms "health", "treatment", "smoking", publications associated with these topics and of a social nature and applications for the pharmaceutical and energy industry were retrieved. Finally, a sample size of 971 articles was obtained.

For the study, stages were established to facilitate its realization: familiarization with the subject "Tobacco production" and selection of the database, determination of the search strategy and indicators to be used, selection of the sample, processing of the data obtained and analysis of the results.

The research covers the scientific production referring to the thematic Tobacco Production, framed in a period of 10 years from 2012 to 2021 in the Scopus database that constitutes one of the sources of evaluated scientific information of greater coverage and international relevance. Google Scholar was used as another source of information to collect information on authors, journals, institutions and other aspects that required standardization.

The population includes all articles published on the topic "Tobacco production" at the international level, within the Scopus database in the period 2012-2021. The sample is intentional non-probabilistic, in order to select it, articles that did not provide the information according to the proposed objectives were excluded from the population.

RESULTS AND DISCUSSION

The search and retrieval of data was performed, taking into account the subject of interest and using the search equation: (TITLE-ABS-KEY (tobacco AND production) AND NOT TITLE-ABS-KEY (health AND treatment) AND TITLE-ABS-KEY (smoking)) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO

(PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012))

For the selection of the indicators, it was followed the premises of other bibliometric studies where the behavior of scientific production on various topics has been investigated (Campos Soto et al., 2020), using in this case those related to productivity, dispersion and visibility and impact.

Productivity indicators

- Annual Productivity: This is defined as the total number of articles published in a one-year period. Changes in this indicator reflect increases or decreases in research on the subject matter.
- Type of documents: Publications can be consulted in different formats. This indicator makes it possible to compare what percentage each format represents of the total sample.
- Productivity by author: Total number of articles that each author has published, either as principal author or co-author (Spinak, 1996).
    - Primary author: The first (or only) author listed on the title page of a paper.
    - Secondary author: All authors of a document who are not listed first on the title page.

Distribution of authors according to productivity levels

Authors were grouped according to the groups proposed by Lotka (Spinak, 1996):

- *Small producers*: Authors who produce only one article.
- *Medium producers*: Authors who produce between 2 and 9 articles.
- *Large producers*: Authors who produce 10 or more articles.

Transience index

Percentage of transitory or occasional authors within the sample analyzed.

Method of calculation: Transience index (TI) = (TA/Ta) * 100 %.

Where: TA: Transitory author, Ta: Total number of authors identified in the sample.

Transitory author (TA): Whose names appear only once in the indexes of bibliographic sources (Spinak, 1996).

- Productivity by descriptors: This is defined as the number of times the same descriptor is used to index articles within the sample analyzed.
- Productivity of articles by journals: Total number of articles published by each of the periodicals identified in the sample on the subject analyzed.

Dispersion indicator

Bradford's law: Bradford's law states that a small number of journals, which make up the core, concentrate a similar number of articles as a large number of journals, grouped in areas of greater dispersion (Miranda Arguedas, 1990).

The minimum number of articles that are necessary to define a zone in an ordered list of journals, consistent with Bradford's law, is calculated:

Bradford's Minimum Zone (BMZ) = NR1a / 2

NR1a: Total number of journals producing 1 article

Impact indicators

The impact indicators have been analyzed according to different variables to determine the influence of tobacco production studies in the scientific literature:

- Most cited references: documents with the highest number of citations received.
- Authors with the highest impact index in their production: expresses the number of articles by an author, which have received a given number of citations and is determined I* = Impact index = citations/documents.
- H index: it represents the number of articles (h) of the journal that have received at least h citations. It quantifies both the scientific productivity of the journal and the scientific impact (Jain et al., 2021).
- SCImago Journal Rank (SJR) index: This is understood as the average of weighted citations received in the selected year by the papers published in the selected journal in the previous three years (Jain et al., 2021).

In order to measure the impact constituted by the bibliometric study on tobacco production for local development, the procedure was applied (Pérez Mendoza et al., 2016), which starts from the use of the expert method. When obtaining the values of importance granted by the experts, the calculation procedure is carried out, explained below.

Column 1: Effects of applying the proposed measures. Column 2: Weighting given by the experts for each effect. Column 3: Percentage of the starting situation for the analysis. Column 4: Estimated, also in percent, how much the situation should vary once the proposed measures have been applied. Columns 5 and 6: It is calculated, according to the weighting given to each main effect and the relative valuation made, the number of points to be given to each main effect in each situation (5) = (2) $_x$ (3) / (4) (6) = (5) $_x$ (4) / (3).

Starting from the total sum of points in each situation it is possible to calculate the increase in effectiveness as follows: Projected effectiveness increase = [(a) / (b) - 1] $_x$ 100.

Where:

(a): Points assigned to the projected situation.

(b): Points assigned to the baseline scenario

Calculation and analysis of indicators

<u>Productivity indicators</u>

- Annual productivity

The scientific production under study shows an increasing trend during the period 2012-2021 (Figure 1, item a), with the highest number of papers in the years 2020 and 2021; however, the increase has not been stable over time. The highest interannual variations in terms of number of papers are shown in 2016 and 2020, when the variation rate expresses the highest values (23.81 and 22.55 %, respectively). The lowest variation rate was in 2013, which showed a value of 20% (Figure 1, item b).

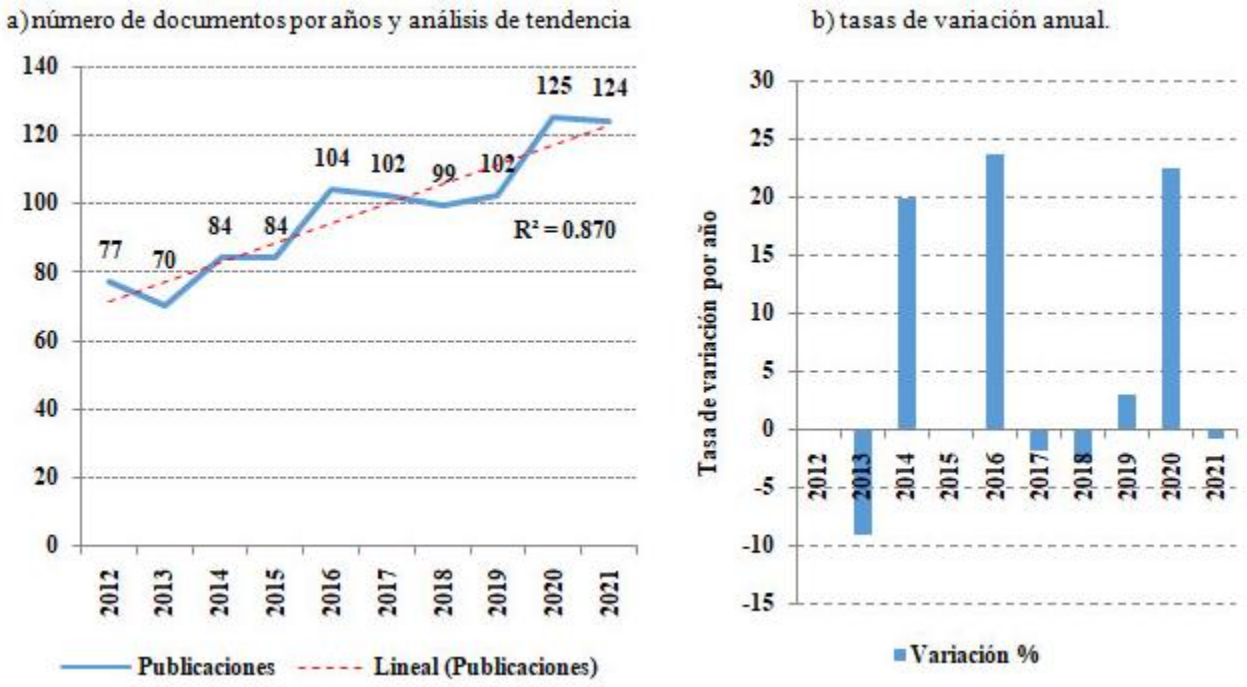

Figure 1. Annual productivity of the subject "Tobacco production" in Scopus from 2012 to 2021
Source: Own elaboration

- Document typology

The format of the publications rescued for the sample is: original articles, conference papers, reviews, book chapters, notes and short articles. 91.8 % correspond to original articles, being the preferred format when writing scientific papers on the subject, followed by conference papers and reviews with 3.6 % and 3.4 % respectively, the rest is represented by 1.2 %.

- Productivity by authors

The number of authors identified in the sample analyzed was 5276, of which 20 (0.37 %) have acted as authors in five or more articles. The researchers with the highest productivity within the thematic area of tobacco production in the period studied were: Baldwin I. T. (12), Fischer R. (11), Schillberg S. and Commandeur U. (7) and Vann M. C., Saito K., McDonald K. A., Buyel J. F. and Menassa R. (6).

It is noteworthy that the most productive authors, highlighting the cases of those occupying positions 1 to 4, did not act as first author in any of their papers. Figure 2 shows their authorship behavior.

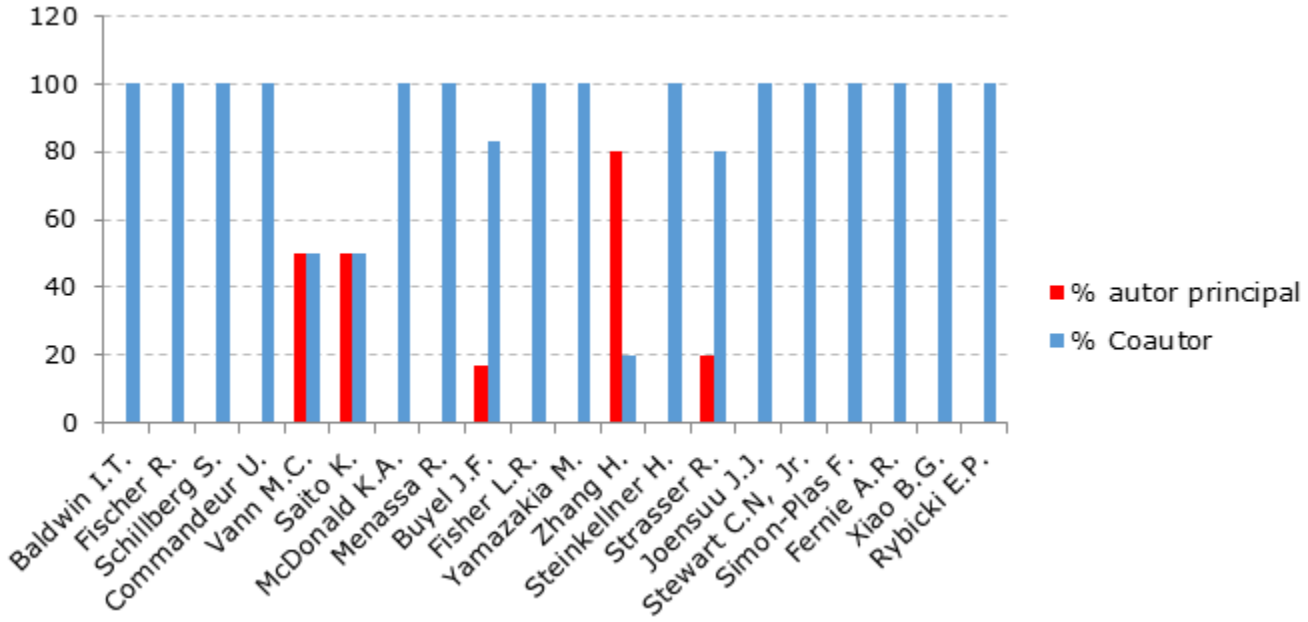

Figure 2. Behavior of authors with 5 or more contributions in terms of their role as primary or secondary author

Source: Own elaboration

Distribution of authors according to productivity levels

Small producers: 4606 (87.30%)

Medium producers: 668 (12.66%)

Large producers: 2 (0.03%)

When analyzing personal productivity, it can be seen that Lotka's law (Spinak, 1996), which states that the bulk of the documents published on a given topic coincide with a very small number of authors who are specialized in that area of knowledge, is fulfilled.

Looking at figure 3, it can be seen that the correlation between the smallest number of authors and the largest number of papers is positive, where at one extreme it is shown that a single author has

published 11 and 12 papers on tobacco production and at the opposite extreme 4606 authors have published one.

When examining the linear relationship between the variables, a Pearson correlation coefficient r = -0.51223 is obtained, which indicates that there is a high dependence between the variables and that they have a negative correlation, since they affect each other inversely proportional.

With respect to the coefficient of determination or multiple correlation, the result obtained is R^2 = 0.988, which indicates that it has a good fit.

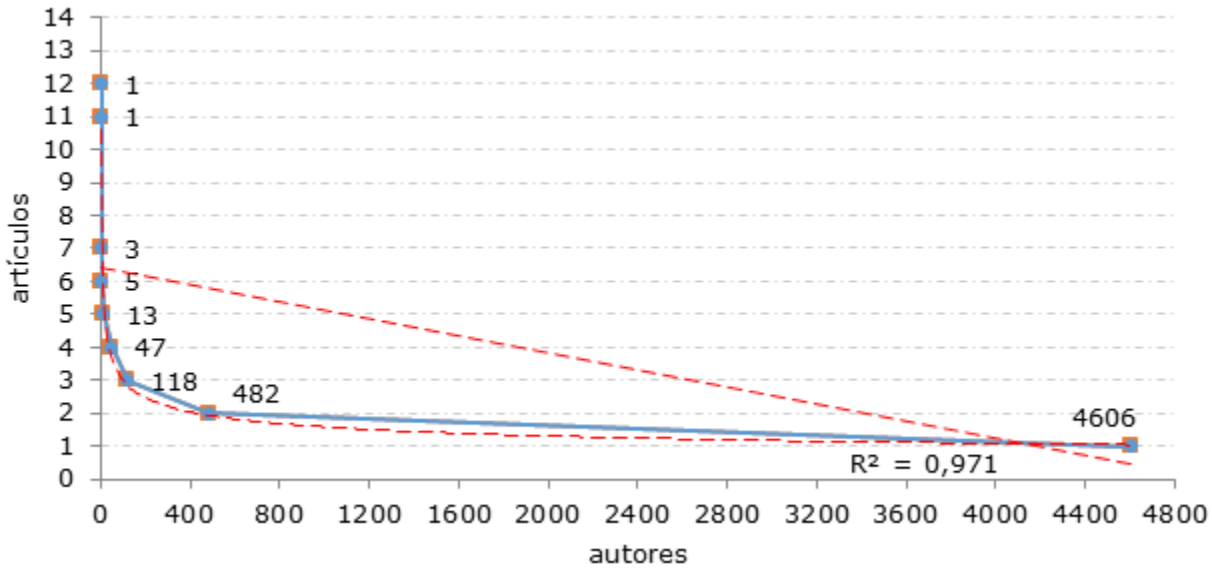

Figure 3. Correlation between the number of authors and the number of articles on the subject "Tobacco production" in Scopus from 2012 to 2021
Source: Own elaboration

Transitivity index

In the sample, 4606 authors have published only one article, so the Transience Index (TI) was 87.30 %. This value is higher than the 75% suggested by the literature, which is considered high and directly related to low levels of consolidation of the subject analyzed (Spinak, 1996).

- Productivity by descriptors

In the sample of articles retrieved, 3761 descriptors were identified. The ten most used descriptors were:

1. Tobacco (73)
2. *Nicotiana tabacum* (46)
3. *Nicotiana benthamiana* (39)
4. Reactive oxygen species (20)
5. Molecular farming (20)
6. Tobacco mosaic virus (16)
7. Transient expression (13)
8. Recombinant protein (12)
9. Photosynthesis (12)
10. *Nicotiana* (12)

As can be seen, *tobacco* and *Nicotiana tabacum* are the descriptors that start the list of those most frequently used in the sample analyzed.

- Productivity of articles by journals

A total of 239 journals published at least one article related to tobacco production, which represent more than 1% of the analyzed documents. The most productive journals during the period studied were *Frontiers in Plant Science* (87), *PLoS ONE* (80), *Plant Biotechnology Journal* (61).

Frontiers in Plant Science

Open access multidisciplinary journal, with official publication by the Swiss Frontiers Media. Ranked in quartile 1 of Scopus, in the category, in the period 2012 to 2021, it receives on average, in a time window of 3 years, a total of 38937 citations (Jain et al., 2021).

PLoS ONE

Open access multidisciplinary journal, with official publication by the Public Library of Science of the United States. Ranked in quartile 1 of SCopus, in the category *Agricultural and Biological Sciences,*

Biochemistry, Genetics and Molecular Biology, medicine and *Multidisciplinary*, in the period 2012 to 2021, it receives on average, in a 3-year time window, a total of 188716 citations (Jain et al., 2021).

Plant Biotechnology Journal

Open access, multidisciplinary journal, officially published by Ltd Wiley-Blackwell Publishers, UK. Ranked in quartile 1 of SCopus, in the category *Agronomy and Crop Science, Plant Science* and *Biotechnology* in the period 2012 to 2021, it receives on average, in a 3-year time window, a total of 6772 citations.

Dispersion indicators

- Bradford's Law

It describes the quantitative relationship between journals and scientific articles contained in the studied sample, where 971 articles were published in 239 journals and 141 journals have published a single article, calculating the value of the Bradford Minimum Zone yields 70.5.

Once the BMZ was calculated, the list of journals was arranged in descending order of productivity, forming the nucleus those journals that were most productive, whose sum of articles was similar to this value. Consistent with Bradford's law, figure 4 shows that the core is made up of only 1 journal, with 87 articles and 5 dispersion zones, with an average number of articles close to the number of articles in the core.

It can be seen that as the zones move away from the core, the number of journals increases, where, in the most distant one, 224 journals have 79 articles.

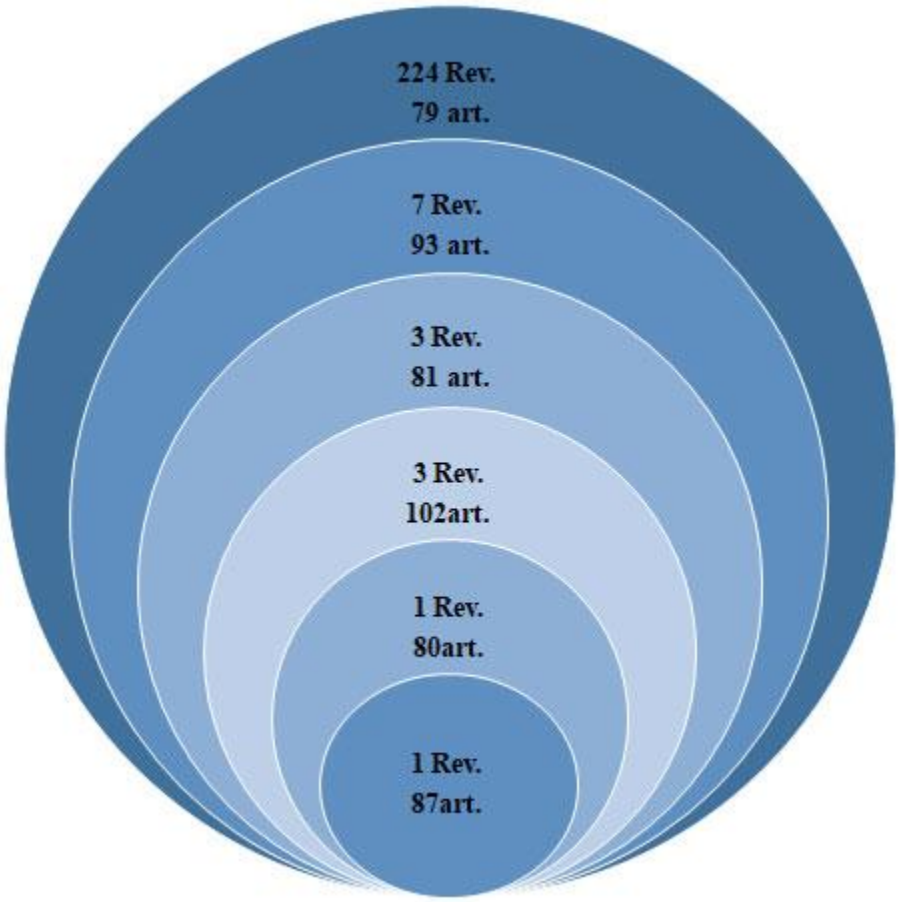

Figure 4. Bradford dispersion area of scientific journals dealing with tobacco production in Scopus (2012-2021)
Source: Own elaboration

Impact indicators

- Most cited references

The most cited papers indexed in Scopus on Tobacco Production in the period 2012-2021 are shown in table 1, appreciating the references with a number of citations greater than 200.

Table 1. Most cited papers on Tobacco production. Period 2012-2021 in Scopus

Authors	Year of publication	Title of article	Journal	Number of citations
Kromdijk J., Głowacka K., Leonelli L., Gabilly S. T., Iwai M., Niyogi K. K., Long S. P.	2016	Improving photosynthesis and crop productivity by accelerating recovery from photoprotection	Science	574
Li F., Pignatta D., Bendix C., Brunkard J. O., Cohn M. M., Tung J., Sun H., Kumar P., Baker B.	2012	MicroRNA regulation of plant innate immune receptors	Proceedings of the National Academy of Sciences of the United States of America.	424
Mur L. A. J., Mandon J., Persijn S., Cristescu S. M., Moshkov I. E., Novikova G. V., Hall M. A., Harren F. J. M., Hebelstrup K. H., Gupta K. J.	2013	Nitric oxide in plants: An assessment of the current state of knowledge	AoB PLANTS	287
Glas J. J., Schimmel B. C. J. J., Alba J. M., Escobar-Bravo R., Schuurink R. C., Kant M. R.	2012	Plant glandular trichomes as targets for breeding or engineering of resistance to herbivores	International Journal of Molecular Sciences	258
South P. F., Cavanagh A. P., Liu H. W., Ort D. R.	2019	Synthetic glycolate metabolism pathways stimulate crop growth and productivity in the field	Science	256

Lau W., Sattely E. S.	2015	Six enzymes from mayapple that complete the biosynthetic pathway to the etoposide aglycone	Science	206

Source: Prepared by the authors

- Authors with the highest impact index in their production

The authors who have written the most on the subject in the database analyzed are shown in table 2, where those with more than 6 research have been chosen. In terms of impact, Baldwin I. T. is the author with the highest number of papers (12) and has the highest impact index with 44.5. Saito K. With half of his publications, he has an impact of 40.5, occupying the second place. Schillberg S. is in third place with an index of 29.4. If we review the table, we can see that there is no direct relationship between the number of publications of the author and his impact.

As can be seen, these three authors are considered to be the most specialized in this subject within the Scopus database.

Table 2. Impact index of the most productive authors in the subject. Period 2012-2021 in Scopus

Authors	Number of documents	%	Citations	I*
Baldwin I. T.	12	1,24	534	44,5
Fischer R.	11	1,13	311	28,3
Schillberg S.	7	0,72	206	29,4
Commandeur U.	7	0,72	105	15
Vann M. C.	6	0,62	15	2,5
Saito K.	6	0,62	243	40,5
McDonald K. A.	6	0,62	147	24,5
Menassa R.	6	0,62	81	13,5
Buyel J. F.	6	0,62	61	10,2

Source: Prepared by the authors

- H index

Table 3 shows the main indexes used by the scientific community to evaluate the impact of authors, articles and journals, in order to determine their relevance in a given area of knowledge (Meriño Morales et al., 2022).

Of the ten most productive journals in the sample, those with the highest H-index are *PLoS ONE, Plant Physiology* and *Journal of Experimental Botany* with 367, 329 and 258 respectively, which shows that there is no direct relationship between productivity and the H-index.

Table 3. Impact indexes of the ten most productive journals in the sample (H-index and SRJ)

Journals	Articles	H-index	SJR Index
Frontiers in Plant Science	87	155	1,359
PLoS ONE	80	**367**	0,852
Plant Biotechnology Journal	61	124	**2,699**
International Journal of Molecular Sciences	41	195	1,176
Plant Disease	41	115	0,654
Molecular Plant-Microbe Interactions	28	160	1,099
Molecular Plant Pathology	27	114	1,619
Journal of Experimental Botany	26	**258**	**1,913**
Plant Physiology	23	**329**	**2,331**
Frontiers in Microbiology	20	166	1,314

Source: Scientific Journal Rankings, 2021

- SJR index

Based on the information provided in table 3, the SJR index is analyzed. Where *Plant Biotechnology Journal*, *Plant Physiology* and *Journal of Experimental Botany* (in descending order) are the journals with the highest index, which translates into higher impact and prestige.

It should be noted that *Plant Physiology* and *Journal of Experimental Botany* coincide among the journals with more favorable H and SJR indexes.

Assessment of the impact of the bibliometric study on tobacco production for local development

To carry out the analysis, five experts in information management were selected using the binomial method, who agreed that the main impact provided by this bibliometric study is: To provide tobacco researchers and producers with the journals and articles related to the subject with the highest update and impact to practice and develop their productions, which favors the effects on sustainable local development described in table 4. To begin the analysis, each expert was instructed to rank the items from lowest to highest, with 1 being the most important.

Table 4. Assessment of the effectiveness of the bibliometric study on tobacco production for local development

Effect	Weighting	Relative assessment		Points assigned	
		Starting situation	Projected situation	Starting situation	Projected situation
1	2	3	4	5	6
Generation of employment and increased income in communities	7	100	160	4,37	6,99
Use of fertilizers to protect the environment	25	100	120	20,83	24,99
Enables better use of existing land assets	18	100	150	12	18
Increases the quality of negotiations related to costs and risks	17	100	130	13,07	16,99
Builds capacity to provide rapid and appropriate responses to development investors	8	100	160	13,33	21,33
Total				63,6	88,3

Source: Prepared by the authors

From the assessment made by the experts, it was obtained that the bibliometric study on tobacco production carried out generates an impact of approximately 39% for the sustainable local development.

The bibliometric study on tobacco production carried out constitutes a reference for entrepreneurs to consult bibliographies on successful experiences in terms of current trends in tobacco production.

The generation of employment, the increase of income in the communities and the creation of capacities for quick response to investors are the most important effects that this bibliometric study on tobacco production has on the achievement of sustainable local development.

Scientific production related to tobacco production increased in the study period 2012-2021, with 2020 being the most productive year, with original articles predominating among the types of documents.

The most productive authors were Baldwin I. T., Fischer R., Schillberg S. and Commandeur U. with Baldwin I. T. as the author with the greatest impact on the subject.

The journal with the most contributions was *Frontiers in Plant Science*, while those with the highest impact indices were *PLoS ONE* (H Index) and *Plant Biotechnology Journal* (SJR Index).

Lotka's law and Bradford's law were confirmed as most of the production was concentrated in a small number of authors and journals.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

Carmen María Pérez Mendoza and Rosa Agnelys Hernández Rodríguez designed the study, analyzed the data, and prepared the draft.

Carmen María Pérez Mendoza and Imilka Martínez Barreras were involved in the collection, analysis, and interpretation of the data.

All the authors reviewed the writing of the manuscript and approve the version finally submitted.