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Integration between Anthropotechnology, Technology Transfer and Food Traceability Systems: A Systematic Review of the Literature

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Abstract: This study analyzes the relationship between Anthropotechnology, Technology Transfer and Food Traceability systems through a systematic review of the literature. Although Technology Transfer and Anthropotechnology have been widely related in contexts such as public health, industrial processes, and Industry 4.0, their integration with food traceability systems still remains theoretically underexplored. The research applied the Methodi Ordinatio multicriteria method to build a scientifically relevant portfolio from the Scopus and Web of Science databases, resulting in 15 full text articles for in-depth analysis. The bibliometric analysis, carried out with the VOSviewer software, identified three central thematic nuclei: Anthropotechnology, Technology Transfer and traceability systems, with the human dimension being the main conceptual link between them. Content analysis revealed that nine studies simultaneously address Anthropotechnology and Technology Transfer, only one relates Technology Transfer and Traceability, and none explicitly integrates the three axes. The results show a relevant theoretical gap, indicating that food traceability has been analyzed predominantly from technical and regulatory perspectives, without incorporating anthropotechnological variables associated with cultural, organizational and cognitive adaptation. The study contributes by proposing a conceptual integration of these three fields and by indicating directions for future research in socio technical agrifood systems.

Keywords: Anthropotechnology; Technology Transfer; Traceability

1. Introduction

In recent decades, the growing complexity of production systems and the intensification of technological flows at a global level have shown that technology is not a neutral element, but rather a phenomenon conditioned by organizational, cultural, and cognitive variables (SAID; ABDULLAH, 2025). In this context, technology transfer (TT) is consolidated as a strategic process, but also as a complex socio-technical dynamic, which requires considering barriers and challenges beyond the technical aspect, especially in scenarios of rapid change (e.g., Industry 4.0), in which human, organizational and cultural factors emerge as determinants for effective adoption and implementation (WISNER, 1995a).

From the anthropotechnological perspective, one of the main challenges of technology transfer lies in the effective adaptation of technology to the receiving context. Wisner (1995) states that international technology transfer implies the coexistence of "two cultures" in the operator's mind: his local culture and the one that inspires the imported technology, which generates maladjustments that can only be understood through the ergonomic analysis of work and situated cognition (WISNER, 1995). In the same sense, the introduction of new technologies in recipient countries can cause significant social and organizational impacts if human and cognitive factors are not adequately considered (WISNER, 1995).

Anthropotechnology, understood as a discipline focused on the adaptation of technologies to specific sociocultural contexts, arises precisely to address these problems. Binder, Almeida and Monteau (1999) demonstrate that anthropotechnological analyses allow the identification of deep organizational causes in industrial accidents related to technology transfer processes. In a complementary way, Gomes and Kovaleski (2017) introduce the concept of "anthropotechnological acclimatization", emphasizing that technology transfer depends on socio-productive adequacy and public policies that are coherent with the local context.

More recently, in the context of Industry 4.0, the need to integrate anthropotechnological aspects in technology transfer processes has been reinforced. Kovaleski, Picinin and Kovaleski (2022) identify that the current challenges are not exclusively technical, but also organizational, educational, and cultural, highlighting the human dimension as a critical axis for success in technological implementation. This evidence confirms that TT cannot be reduced to a process of technical diffusion, but constitutes a complex socio technical dynamic.

At the same time, the agri food sector has undergone a significant transformation driven by the need to ensure food safety and quality. Technological traceability systems have been adopted as key instruments to reduce risks, increase transparency and strengthen consumer confidence (CORALLO et al., 2020). These systems make it possible to monitor and document the movement of food throughout the production and distribution stages, constituting strategic tools for risk management in complex agri food chains.

However, the literature on traceability has predominantly focused on technical, regulatory, and modeling dimensions. Tao, Wang, Chen, Tan and Guo (2025) for example, analyze advanced methodological models for the identification of sources of contamination and optimization of control systems, emphasizing statistical tools and multivariate models. Similarly, studies on the diffusion of traceability systems highlight variables such as company size, educational level, and organizational structure (CORALLO et al., 2020), but they rarely explicitly integrate an anthropotechnological framework that allows us to understand how cultural and cognitive variables influence the effective implementation of these systems.

In this sense, although Technology Transfer and Anthropotechnology have been widely related in different contexts, such as public health (GOMES et al., 2021) or in hospital management (SOUSA; PROENÇA, 2004), the simultaneous integration of Anthropotechnology (AT), Technology Transfer (TT) and Food Traceability (TF) remains underexplored. The evidence from the portfolio analyzed indicates that studies tend to address AT+TT or TT+TF, but rarely the three axes in an articulated way.

Therefore, there is a relevant theoretical gap: if traceability is a technology transferred and applied in complex agrifood systems, its effective implementation should also be analyzed from an anthropotechnological perspective, considering the organizational, cognitive and cultural adaptation of the actors involved.

In this context, the present study aims to analyze the relationship between Anthropotechnology, Technology Transfer and Food Traceability, through a systematic review of the literature, complemented by bibliometric and content analysis of the selected portfolio. Thus, it seeks to contribute to the conceptual integration of these three fields and to propose a theoretical basis for future research.

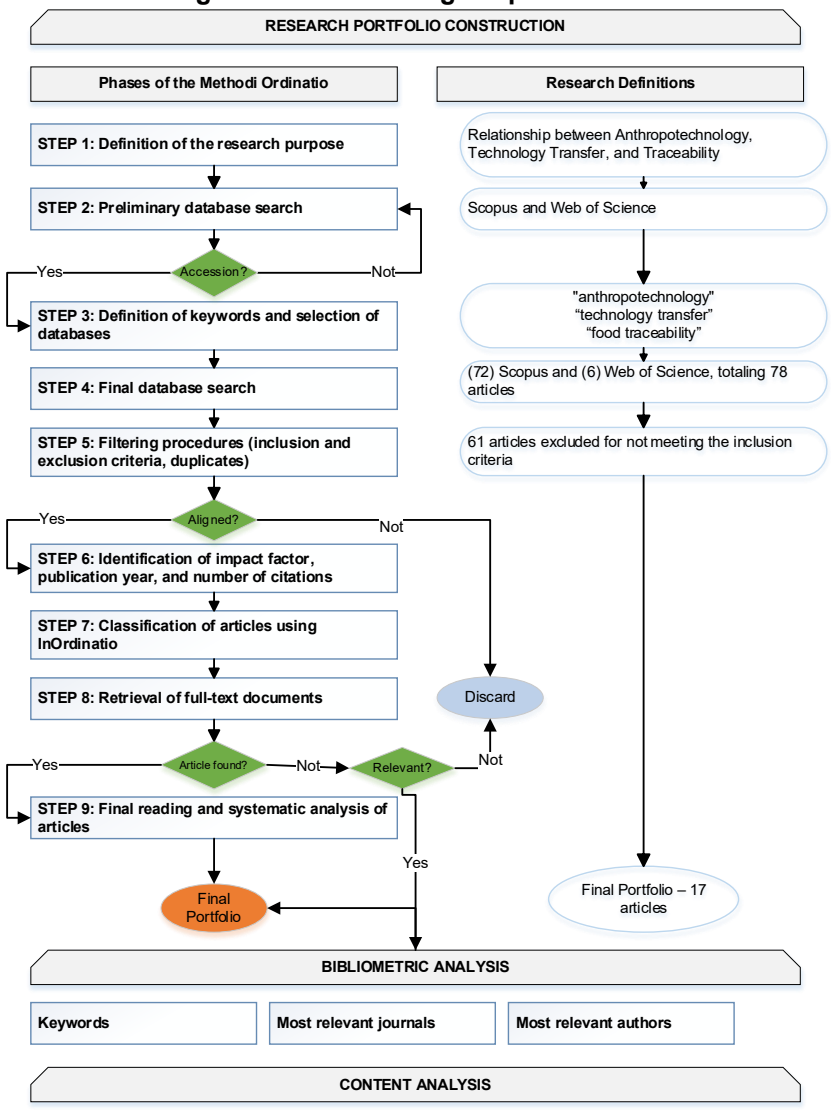
2. Methodological Procedures

The methodological procedures are described in three stages: construction of the research portfolio (2.1), bibliometric analysis (2.2) and content analysis (2.3). Figure 1 describes these steps in detail.

2.1 Construction of the article portfolio

This study conducted a systematic review of the literature through the application of the multicriteria method Methodi Ordinatio, developed by Pagani et al. (2015). This approach enables the construction of a portfolio of articles with high scientific relevance based on the use of the InOrdinatio equation, which classifies studies based on three main criteria: impact factor (IF), number of citations (Ci) and year of publication. Based on the nine steps that make up the Methodi Ordinatio, the portfolio of articles was structured, as detailed in Figure 1.

Figure 1 – Methodological procedures



Source: Authorship (2026)

Step 1: The intention of the research was to understand the relationship between anthropotechnology, technology transfer and food traceability.

Step 2: Keywords were defined and preliminary searches were carried out.

Step 3:Based on the initial results, the Scopus and Web of Science databases were chosen to compose the analysis. Information regarding the combinations of keywords used, as well as the number of studies retrieved in each database, is detailed in Table 1.

Table 1 – Final Search in databases

Keyword Combination	Scopus	Web of Science
-TITLE, ABST,KEYWORDS"anthropotechnology" AND ("technology transfer" OR "knowledge transfer" OR "technology diffusion" OR "technological transfer") AND ("food traceability" OR "food tracking" OR "traceability system*" OR "food supply chain traceability")	0	0
-"anthropotechnology" AND ("technology transfer" OR "knowledge transfer" OR "technology diffusion" OR "technological transfer")	18	2
-"anthropotechnology" AND ("food traceability" OR "food tracking" OR "traceability system*" OR "food supply chain traceability")	0	0
-("technology transfer" OR "knowledge transfer" OR "technology diffusion" OR "technological transfer") AND ("food traceability" OR "food tracking" OR "traceability system*" OR "food supply chain traceability")	11	0
-"anthropotechnology"	43	4
TOTAL	**78**	

Source: Authorship (2026)

Step 4: With the combination of keywords defined in step 3, the definitive searches were carried out, without applying a time frame. This procedure resulted in the identification of 78 articles in total, as indicated in Table 1.

Step 5: After performing the final searches in the databases, filtering procedures were applied to exclude duplicate articles, books and book chapters, as well as studies that addressed topics outside the scope of this search. The results obtained from this filtering process are presented in Table 2. The inclusion and exclusion criteria adopted in this study are described in Frame 1.

Table 2 – Filtering procedures

Filtration Process	#artigos removed
Duplicate articles	25
Exclusion of papers presented at conferences, books, and book chapters.	18
Deleting out-of-scope articles	18
Total number of deleted items	61
Resulting number of items in the final portfolio	17

Source: Authorship (2026)

Frame 1 – Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Articles from academic databases. Studies related to the themes of Anthropotechnology, technology transfer and traceability.	Articles focused on the area of health, construction and other topics that are out of scope.

Source: Authorship (2026)

Step 6: With the consolidation of the final portfolio, information related to the Impact Factor (IF), the Number of Citations (Ci) and the Year of Publication (PublishYear) were collected

for each selected article. The IF was obtained through the Journal Citation Reports (JCR) metric, accessed on the CAPES portal. In turn, the number of citations was collected on the Google Scholar platform.

Step 7: After collecting the variables, the InOrdinatio Equation (1) was applied

$$InOrdinatio = (IF/1000) + \alpha*[10-(Researh\ year-Publication\ year)] + (Ci) \quad (1)$$

In this study, a value of 5 was assigned to parameter α. As a result, a portfolio of 17 articles was obtained, organized according to their scientific relevance, as shown in Table 3.

Step 8: Of the 17 articles, only 15 were found in their full version, thus moving on to the next step.

Step 9: Final reading and systematic analysis of the articles

2.2 Bibliometric analysis

The bibliometric analysis aimed to contextualize the portfolio of articles, identifying the most recurrent keywords, the most relevant journals and the most prominent authors. For data collection and analysis, the VOSviewer software (V1.6.18) was used.

2.3 Content analysis

The content analysis aimed to understand the relationship between Anthropotechnology, technology transfer and food traceability. To make this stage feasible, a table was prepared with the purpose of systematizing and organizing the information collected.

3. Results and Discussion

The methodological procedure adopted made it possible to order the articles according to their level of relevance, as shown in Table 3. This table provides a structured and hierarchical view of the studies, in which those with the highest scores in InOrdinatio occupy the first positions, while the others are ranked in descending order. To prepare this table, the software Mendeley (V1.19.8), JabRef (V5.2) and the Ranking Worksheet (1.0), proposed by Pagani et al. (2015), were used.

Table 3 – Ranking according to Methodi Ordinatio

Ranking	Authors	Article	Journal	Year
1	Corallo, A., Latino, M.E., Menegoli, M. and Striani, F.	What factors impact on technological traceability systems diffusion in the agrifood industry? An Italian survey	Journal of Rural Studies	2020
2	Tao, Y., Wang, J., Chen, Y., Tan, C. and Guo, H.	Development of traceability systems: A methodological overview toward effective regulation of emerging contaminants	Journal of Hazardous Materials	2025
3	Kovaleski, F., Picinin, C.T. and Kovaleski, J.L.	The Challenges of Technology Transfer in the Industry 4.0 Era Regarding Anthropotechnological Aspects: A Systematic Review	SAGE Open	2022
4	Said, N.A. and Abdullah, Z.	Anthropotechnological Perspective In Adopting Virtual Reality Training Tool Technology Transfer In Malaysia Aerospace Industry	Kajian Malaysia	2025
5	Corsi, A., Kovaleski, J.L. and Pagani, R.N.	Technology Transfer, Anthropotechnology and Sustainable Development: How Do the Themes Relate?	Journal of Technology Management and Innovation	2021
6	Gomes, M., Kovaleski, J.L., Pagani, R.N.	Offset policy and the process of technology transfer: A case study in Brazilian public health	Journal of Engineering and Technology	2021

	and Zammar, G.		Management	
7	Gomes, M. and Kovaleski, J.L.	Science and technology policy in Latin America: The political activity and the anthropotechnology in technology transfer processes	Spaces	2017
8	da Luz, A.A., Kovaleski, J.L. and de Andrade Júnior, P.P.	An anthropotechnological approach in formation of Spin-offs	Spaces	2016
9	Fu, Z., Xing, S. and Zhang, X.	Development trend of food quality safety traceability technology	Transactions of the Chinese Society for Agricultural Machinery	2013
10	Blad, S.	The impact of “anthropotechnology” on human evolution	Techne: Research in Philosophy and Technology	2010
11	Geslin, P.	The Political and the Scientific in the Practice of Anthropotechnology	Travailler	2006
12	de Sousa, A.A. and Proença, R.P.	Technology of management of nutritional care: Recommendations to qualifying the attendance in hospital food and nutrition services	Nutrition Magazine	2004
13	Wisner, A.	The etienne grandjean memorial lecture situated cognition and action: Implications for ergonomic work analysis and anthropotechnology	Ergonomics	1995
14	Hendrick, H.W.	Macroergonomics: A proposed approach for use with anthropotechnology and ergonomic work analysis in effecting technology transfer	Travail Humain	1997
15	Binder, M.C.P., Almeida, I.M. and Monteau, M.	Anthropotechnological analysis of industrial accidents in Brazil	Bulletin of the World Health Organization	1999
16	Wisner, A.	Psychological aspects of anthropotechnology	Travail Humain	1997
17	Wisner, A.	The irruption of new technologies: a new challenge for ergonomics and anthropotechnology.	Journal of human ergology	1995

Source: Authorship (2026)

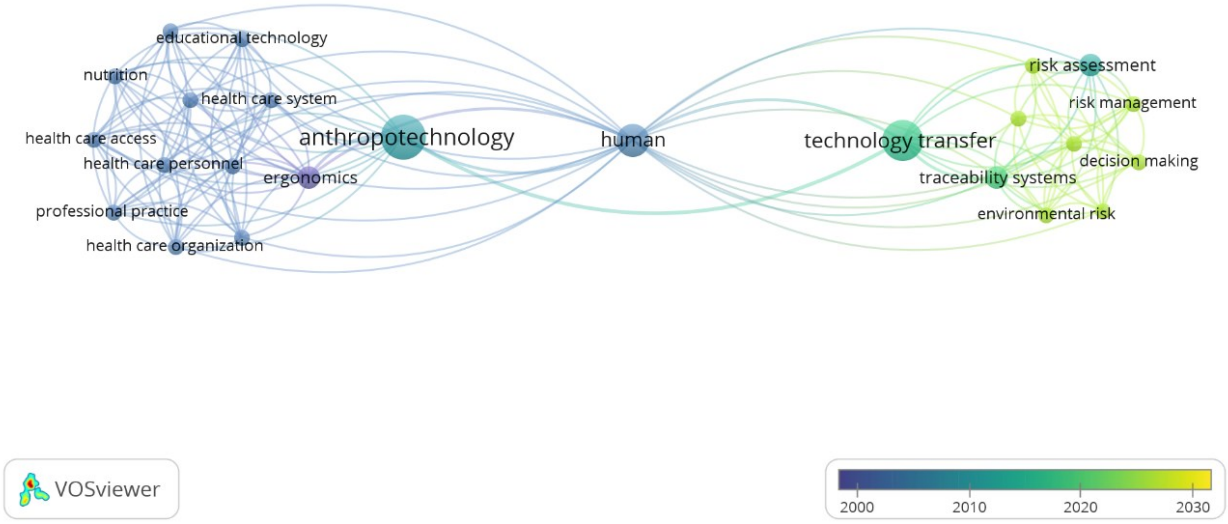
3.1 Bibliometric analysis of the final portfolio

Once the classification of the articles was concluded, the final portfolio was analyzed. Initially, a keyword map was developed with the aid of the VOSviewer software, which made it possible to identify the frequency and co-occurrence of the terms present in the studies, as illustrated in Figure 2.

In the map, it is possible to clearly distinguish three central nuclei that structure this study: "Anthropotechnology", "Technology transfer" and "traceability systems". It is observed that the term "Anthropotechnology" is associated with concepts related to ergonomics, health and education contexts, as well as the adaptation of technologies to human needs. In turn, "Technology transfer" has a greater link with topics such as decision-making, sustainability and risk management, in addition to establishing a direct connection with "traceability systems", which emerges as a technology applied to reduce uncertainties and mitigate risks.

Additionally, the map evidences the presence of the term "human" as a node of conceptual articulation, indicating that both Anthropotechnology and technology transfer share a common ground centered on the human dimension.

Figure 2 – Keyword map

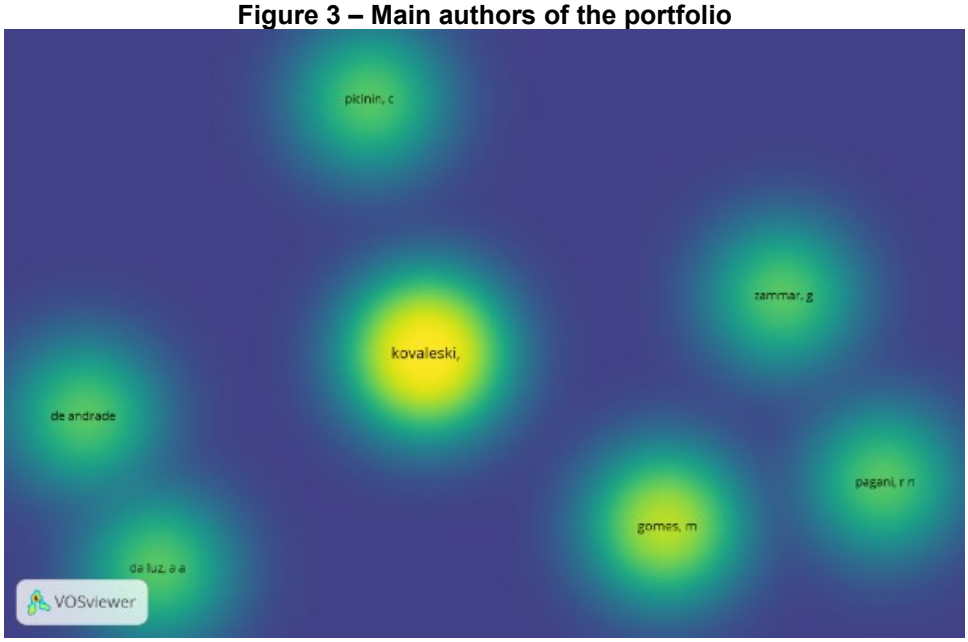


Source: Authorship (2026)

In addition, in Figure 2 it is possible to observe the temporal evolution of the themes through the color gradient. The most recent terms, represented in shades of green and yellow, focus on expressions such as risk assessment, risk management, decision making and environmental risk. This pattern indicates that the current research agenda is mainly directed towards sustainability, risk management, and decision making support.

Next, Figure 3 presents the analysis of the main authors of the portfolio. For this, the VOSviewer software was used with the density map functionality, in which the greater the density (or the size of the highlight), the greater the author's contribution to the theme. It is observed that Kovaleski stands out with four articles, followed by Gomes, with two, while the other authors present one publication each. This scenario shows that the theme is still in the process of consolidation, arousing recent and gradual interest from different researchers.

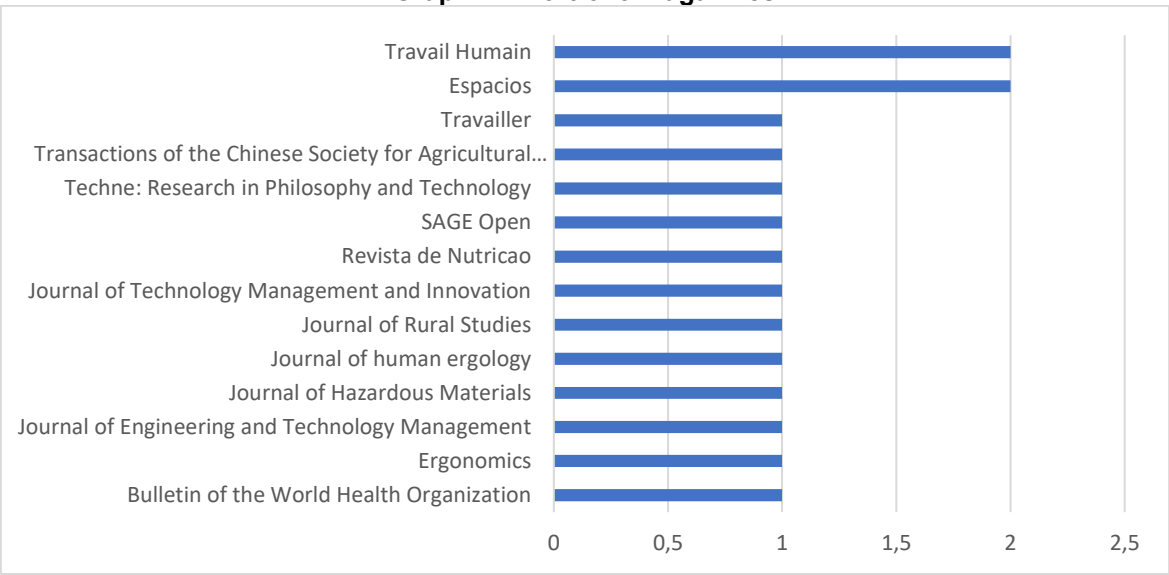
Figure 3 – Main authors of the portfolio



Source: Authorship (2026)

Graph 1 presents the journals that make up the final portfolio. It is observed that the journals with the greatest representativeness are Travail Humain and Espacios, each with two published articles. This is followed by journals such as Ergonomics and Journal of Engineering and Technology Management, among others, which contribute one article each. This panorama highlights the diversity of journals that address the theme, although with a moderate concentration in some specific titles.

Graph 1 – Portfolio magazines



Source: Authorship (2026)

3.2 Content Analysis

The content analysis of the final portfolio allowed us to identify the distribution and level of integration between the three theoretical axes of the study: Anthropotechnology (AT), Technology Transfer (TT) and Traceability (TF) (Frame 2).

Frame 2 – Level of integration between Anthropotechnology, technology transfer and traceability

Authors	Detail	Relationship level (1, 2 or 3 axes)	Year
(CORALLO et al., 2020)	It examines organizational factors that influence the adoption of traceability systems. It does not use the TA framework, but recognizes the human and organizational dimension in TT applied to the food sector.	TT+TF	2020
(TAO et al., 2025)	It proposes a technical-regulatory framework for traceability. It does not integrate TA or TT.	TF	2025
(KOVALESKI; PICININ; KOVALESKI, 2022)	It analyzes technology transfer in highly digitized contexts from the perspective of Anthropotechnology. It contributes to a framework for understanding that complex technologies require cognitive and organizational adaptation.	AT+TT	2022
(SAID; ABDULLAH, 2025)	Study that shows how cultural factors influence technology transfer.	AT+TT	2025
(CORSI; KOVALESKI; NEGRI PAGANI, 2021)	It relates Anthropotechnology and Technology Transfer to sustainable development.	AT+TT	2021

(GOMES et al., 2021)	It analyzes technology transfer in public health from an anthropotechnological approach.	AT+TT	2021
(M. Gomes & Kovaleski, 2017)	It presents the concept of "anthropotechnological acclimatization" in technology transfer policies.	AT+TT	2017
(KOVALESKI; PAULO; JUNIOR, 2016)	It analyzes technological absorption in spin-offs from an anthropotechnological approach	AT+TT	2016
(FU, Z., XING, S. AND ZHANG, 2013)	It describes the technological evolution of food traceability.	TF	2013
(BLAD, 2010)	It develops the epistemological basis of Anthropotechnology.	AT	2010
(SOUSA; PROENÇA, 2004)	Applies Anthropotechnology in hospital nutritional management.	AT	2004
(Wisner, 1995)	It relates Anthropotechnology in contexts of technology transfer.	AT+TT	1995
(BINDER; ALMEIDA; MONTEAU, 1999)	It applies Anthropotechnology to industrial accidents in the context of technology transfer.	AT+TT	1999
(ELLER, 2018)	It contributes with useful psychological and cognitive foundations to analyze technological adoption.	AT	2018
(WISNER, 1995)	It highlights cognitive adaptation in international technology transfer.	AT+TT	1995

Source: Authorship (2026)

Of the fifteen articles analyzed, nine simultaneously address Anthropotechnology and Technology Transfer (AT+TT). On the other hand, only one article deals with the combination of Technology Transfer and Traceability (TT+TF), two focus exclusively on Traceability (TF) and three focus only on Anthropotechnology (AT). It is important to highlight that none of the studies explicitly integrates the three axes (AT+TT+TF), showing that there is still a significant gap in the literature on the subject.

4. Final Considerations

The present study aimed to analyze the relationship between Anthropotechnology, Technology Transfer and Food Traceability from a review of the selected literature. A total of 15 articles available in their full version were analyzed. According to the bibliometric analysis, despite the relatively small number of studies focused on the theme, it was observed that the common basis shared between Technology Transfer and Anthropotechnology is the human dimension. In addition, it was possible to evidence that Traceability maintains a more direct relationship with Technology Transfer.

As for the content analysis, it is concluded that Anthropotechnology is solidly developed in the scope of Technology Transfer, especially in contexts of cultural adaptation, organizational absorption and ergonomic analysis of work in processes of technological incorporation.

In relation to the literature on food traceability, it focuses predominantly on technical, regulatory and management dimensions, without explicitly integrating anthropotechnological variables.

Finally, with regard to Technology Transfer, it emerges as an intermediate axis, but the integration with Anthropotechnology in the specific context of food traceability still remains little explored. Therefore, it is recommended that future research focus on this context.

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