

Review

Pesticide: A Contemporary Cultural Object

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Abstract: The article provides a narrative review of the social and cultural interpretation of pesticides in contemporary society. In so doing, it highlights the main fields of exploration investigated by social scientists concerning the perception and role played by these products among farmers and consumers. Following the WHO definition, pesticides are chemical compounds used to kill pests, including insects, rodents, fungi, and unwanted plants. They are contemporary cultural artefacts that social sciences explore in synergy with other disciplines to highlight their socio-cultural connections at both local and global levels. Specifically, the use of these products is connected with power relations, which are embedded in and reflect imbalances and inequalities in access to rights and resources, as well as specific articulation of the perception of risk arising from environmental contamination in terms of individual and collective psychophysical health. Furthermore, pesticides fit into various environmental conceptions and multiple local knowledge systems, representing the intersection of different cultural heritages, worldviews, and rationales that make the tradition–modernity dichotomy complex and dynamic. In this respect, therefore, pesticides can be understood not just as mere tools for agricultural practice but as vital windows through which to investigate multiple layers of meaning to support transitions towards sustainable pest management systems, both environmentally and socio-culturally.

Keywords: pesticides; anthropology; perception; risk; environmental knowledge



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1. Introduction

Following the WHO definition, pesticides include numerous groups of specific products, such as insecticides, fungicides, herbicides, garden chemicals, household disinfectants, and rodenticides, which are utilized for both pest destruction and protection [1]. Over one thousand different pesticides are used around the world. They are commonly categorized as synthetic pesticides when they are based on human-made chemicals that do not exist in nature, or biopesticides, which are naturally occurring or derived materials, especially from living organisms such as plants, fungi, and bacteria [2].

Considering their prominence and widespread use, the study of pesticides has been approached by different disciplines, such as chemistry, agronomy, economics, and medicine, in order better to develop new products and assess their effects. The case of Scottish barley cultivation proposed by Stetkiewicz and colleagues is emblematic in this regard because the integrated pest management (a practical and eco-conscious method for controlling pests, which utilizes a blend of different and synergic techniques) they analyze was developed through different disciplinary lenses to achieve a more holistic view of crop care and pesticide use [3]. More recently, pesticides have been at the center of the debate in social sciences, specifically in anthropology, which has explored their stance as cultural objects fully integrated into the web of political, economic, emotional, and heuristic relationships. At the heart of this inquiry lies the profound impact of pesticides on natural ecosystems and human health, raising critical concerns about their widespread use [4]. Scholars have

scrutinized the diverse perceptions and narratives constructed around pesticides, alongside the hopes and intentions guiding their application [5]. In so doing, the geographic and social imprints of agricultural methods were uncovered, revealing how they intertwine with local forms of social organization and collective histories rooted in specific landscapes, as Abate and colleagues present by referring, for example, to the African context [6]. The emerging gendered dimensions of pesticide usage shed light on the nuanced social dynamics at play, specifically on the complex power dynamics and structural violence inherent in their deployment, and the myriad strategies employed by communities to mitigate the adverse effects of pesticides [7].

Following and unfolding this debate, this article aims to present the main results of the discussion, providing a comprehensive outline of the cultural reality of pesticides in contemporary society. In so doing, the article opens by presenting the methodology and sources used for the literature review, moving to present the key areas where the debate has its focus. These will be discussed with the support of the exploration of an ethnographic case study.

2. Materials and Methods

To present the emerging outline of the cultural significance of pesticides in contemporary society, this article presents the results of a narrative literary review of the ongoing debate in social sciences. A narrative literature review is a comprehensive, critical, and fluent synthesis of existing research. Unlike systematic reviews or meta-analyses, this type of review tends to be more qualitative and interpretive and allow for one to explore the breadth of a subject, discuss the findings of various studies, and present an overarching story that captures the evolution of thought, debates, and key themes within a field [8].

The research was conducted between December 2023 and February 2024. It examined both academic and grey literature sources identified using Google Scholar, Scopus, and EBSCO services. Selection criteria encompassed the topic (pesticides as a socio-cultural object), the interdisciplinary approach (anthropology, environmental sciences, political and economic sciences, and medicine), and the period of publication (1990–2024). While the primary focus was on English language sources, materials in Italian and Spanish were also included. Regarding the journal articles, Figure 1 presents the categorization of the sources. This thematic categorization also serves as a useful compass for navigating through the other titles included in the bibliography, which comprise monographs, chapters in anthologies, or grey literature.

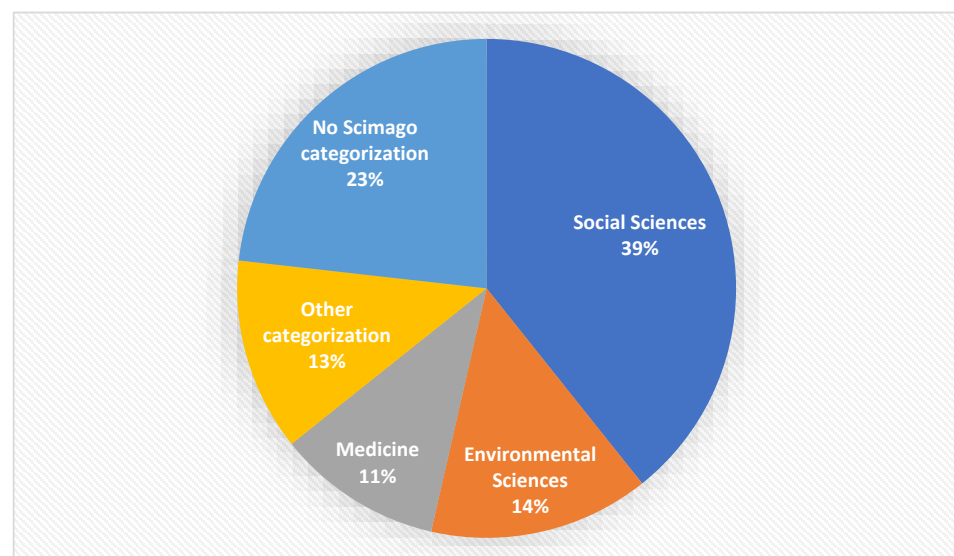


Figure 1. Clusterization of the sources used according to Scimago Journal & Country Rank subject area and category related to the selected journals.

The individual sources were identified initially by interrogating the search engines so that they included references to pesticides in the title, and/or abstract, and/or body. After the screening of the individual identified sources, aimed at ensuring that the sources provide an ethnographic and/or theoretical contribution to the cultural analysis of remedies, the final sources were selected for the present discussion.

Particular attention has been paid to ethnographic studies that explored the multifaceted effects of pesticides due to their holistic approach that encompasses cultural, social, environmental, and health-related dimensions [9]. Ethnography is the distinctive anthropological methodology that involves the researcher immersing themselves in the studied context, relying on participant observation, repeated conversations, interviews, and other methods of data collection. Ethnography also implies critical writing that develops into an in-depth analysis that allows for access to numerous levels of social and cultural meaning that stratify and interpenetrate the same object, such as pesticides, or the same practice, such as pest management.

The selected publications explore case studies from Europe (8), Africa (6), Latin America (22), North America (11), and Asia (5). Other publications approach the main argument in more general terms or in a transnational way.

3. Results

For each selected publication, the content was analyzed by identifying the main subject of discussion, the problem explored, the area investigated, and the research methodology, summarizing its contribution succinctly (Appendix A).

This initial reworking allowed for the identification of three main areas on which the discussion impacts: pesticides and power relationships; pesticides and risk perception; and pesticides, environmental conception, and local knowledge. The following paragraphs discuss each of these topics.

3.1. Pesticides and Power Relationships

Pesticides are deeply entangled in a web of power relations, intricately woven at both global and local levels. Their use demands analysis by considering the conditions preceding the introduction of such products and must be viewed in terms of the transformations they bring about. Power relations tend to solidify imbalances and inequalities in access to rights and resources. This phenomenon is described using various terms.

In their study of the Swiss rural context, Willemin and Backhaus introduce the concept of slow violence to capture the gradual, unseen, and delayed destruction of agricultural knowledge and plant species dispersed across time and space [10]. Grandia uses the same expression related to Guatemala area [11]. On the other hand, Evia uses the expression “structural vulnerability” to account for the “soybeanisation process” transforming Uruguayan agribusiness towards transgenic practices, with severe health implications for poorer and more vulnerable social groups living in an environment polluted by the massive use of synthetic pesticides [12].

Imbalance refers first of all to the workplace. In this regard, Gamlin uses the term “daily violence” to refer to the living and working conditions of Huichol laborers on tobacco plantations in the Mexican state of Nayarit, highlighting both the repetitiveness of this condition and the normalization and acceptance of the risks it produces [13]. Similarly, Rao, Arcury, and Quandt underline farmworkers’ lack of control in the workplace, referring to the education gap as one of the key elements exploited to create the subordination of Latino immigrant workers in the USA [14].

Power imbalance also refers to the imbalance between global capital and markets, or the Global North and the local condition of the rural communities. Galt suggests a structural imbalance between “northern privilege” and “environmental injustices” perpetrated in the Global South where agricultural activities are conducted [Galt], while Abbassi, in his research in Canada [15], and Sintora Romero [16], in his work in California, discuss the ongoing tensions between goals related to maximizing economic profit and the health of

the local population. This tension can assume intergenerational repercussions, as in the case of Latino communities explored by Sánchez Barba [17], where massive pesticide exposure, strongly linked to chemical exposure, impacts the cognitive development of children.

In this respect, Williams, in his historical ethnography of the Mississippi Delta, suggests that pesticide intensification develops according to a complex interplay between pesticides, plantation politics, and civil rights [18] that take the shape of what he defines as “agro-environmental racism”. This term is used to highlight “the recursive relationship between the structural and ideological dimensions of agrarian racism and the racially uneven environmental effects of agricultural production” [19] (p. 244). On a different note, O’Brien conducts his fieldwork in the neighborhoods of Belmont and Greenpoint in New York, indicating that the fractures in plants’ protection system are closely related to social fractures in the community network and that the most socially exposed segments of society are those most unprotected from pesticide exposure and thus health risks [20]. These results are confirmed by Checker [21].

Together with race, another crucial factor of fragility is gender. This is attested in the work of Ardien Morvan, Fabienne Goutille, and Alain Garrigou in Tanzania that shows that women are most exposed to farming difficulties and pesticides exposure because they are rarely landowners of the fields they cultivate and are treated as mere laborers. It is therefore not surprising that they often bear the difficult and dangerous task of applying chemical products. Moreover, the burden of domestic work falls predominantly on women, who are also exposed at home to secondary contamination, performing tasks such as washing the work clothes of all family members. More generally, Morvan suggests that even in a context where people share common goals like land ownership and social improvement, the two groups perceive the risk differently [22].

3.2. Pesticides and Risk Perception

Considering the severe repercussions that exposure to pesticides can have on human health, scholars have investigated this aspect, exploring how exposure and sickness are both perceived and experienced. In this regard, the first contribution is to raise awareness of situations of risk unaccounted for by official reporting. This is the case, for example, in the studies conducted by Caisso in Cordoba, Argentina, documenting the impact of agrochemical exposure and cancer spreading among teachers in the province [23]; or the one by Guillette among children of the Yaqui population in Mexico that shows decreases in resistance, eye–hand coordination, short-term memory, and drawing abilities, with significant differences in cognitive and motor skills compared to non-exposed children [24]; or the one by Guthman and Barbour among Mexican migrants, in which they show the inadequacy of pesticide notification and how the gap in the Worker Protection Standard guidelines jeopardizes farmworkers, especially women [25].

This thread of research is directly linked to the exploration of forms of risk perception by local communities. Snipes and colleagues investigate farmworkers’ beliefs and attitudes regarding pesticide exposure risks in Lower Yakima Valley, USA [26]. The research demonstrates the influences of financial pressures in driving the farmers to underestimate risk and to rely on fallacious beliefs concerning risk protection and safety. Other cases of undervaluation of risk are explored in Indonesia, where a “tsunami of pesticides” invaded the rice-producing areas because of the “Green Revolution” driven by blind optimism concerning the impact of chemicals [27], or in Mexico, where Polanco Rodriguez and colleagues investigate the continuation of the use of banned products, such as organochlorine pesticides, among Maya communities to find communities lacking specific knowledge concerning the impact of these remedies and the presence of false beliefs on the safety of these products [28].

Above all, however, the research has highlighted the growing ambivalence of growers towards pesticides—a conflicted sentiment between the need for their use for productive purposes and increasing concern about their effects on producers and agricultural products. This is testified by Waltz in Western Kenya [29], as well as by Stein and Luna in Burkina

Faso and Mozambique, where the authors propose the concept of “toxic sensorium” to emphasize the embodied and emotional experiences that characterize the perception of chemicals [30]. Alongside this, the research raises the concerns of consumers who are worried about the safety of their food, which furthers the sociocultural distance between consumers and farmers in both the Global South [31] and the Global North [32].

In addition, the research illuminates risk management. In particular, the failure to implement mitigating measures emerges as a deeply political theme that directly implicates the actions of institutions and economic actors. On one hand, institutions and economic actors may lack a conceptualization of the danger, and hence the need for preventive activity, given the limitations of toxicological paradigms, as shown by Garrigou in his analysis of French viticulture. On the other hand, the lack of action can be the result of a deliberate intention to circumvent the law, as in the case studied by Sony in India [33], or the result of a moral pact between communities and producers, as in the case of Alta Val Tevere studied by Alunni, where the continuity of the profitable tobacco cultivation is supported by a “a social and individual reluctance to connect various awareness, risk factors, and the need to actively confront them through a constant and ongoing renegotiation of the risk-benefit balance, particularly between individual benefits and collective risks” [34].

3.3. Pesticides, Environmental Conception, and Local Knowledge

Pesticides are substances introduced into an ecosystem to impact it and the interspecific relationships within it. Thus, the use of pesticides entails different conceptions related to the environment and the exosystemic relationships characterizing human societies across various locations. This is highlighted by Tassan, considering the reactions of food consumers in Italy [35], and by most of the scholars who focus on the production side.

Abigail Dumes, studying Lyme-endemic areas in the United States, introduces the concept of biome-subjectivity to capture the complex relationship between humans, parasites, and the environment: pesticides enter into this network of relationships in an attempt to respond to and reduce the perception of rising environmental risk [36]. Similarly, Zola explores the efforts of beekeepers in Italy to reintroduce herbs and spontaneous plants to support bees in landscapes affected by monocultures and pesticide use [37]. Pesticides are also a factor in the relationship that links humans to the environment, but while in the first case, they are a tool to create a more accessible space for human activity, in the second, they are a detrimental factor that should be removed to allow more profitable business.

This relationship intertwines with the local environmental knowledge of peasant communities. Specifically, Wyckhuys et al. [38] show in their comprehensive review of the connection between pest management and rural populations’ knowledge how the introduction of new pesticides directly increases dependence on synthetic inputs and decreases ecological knowledge. In order to contain this cultural effect, Bentley, in his ethnographic study of Honduran farmers, indicates the need for genuine involvement of farmers in the introduction of these products, specifically to avoid the emergence of conspiracy theories, resistance, or hostility [39].

4. Discussion

The research sheds light on the cultural relevance of pesticides in contemporary society [40]. In the current debate, particularly when delving into the intricacies, power dynamics, risk perception, and profound understanding of environmental interactions [41], pesticides emerge as pivotal mediators in the intricate web of human-to-human and human-to-environment relationships, often in the context of mutual interrelationships that suggest addressing human and environmental health issues on a common plane [42]. These substances, in their tangible form, transcend their mere agricultural function as tools to become integral components within the vast expanse of the global market system. Herein, agricultural practitioners are positioned at the nexus of a complex network that potentially has a global reach, particularly when considering the synthetic chemical outputs of multinational conglomerates.

Simultaneously, pesticides assume a dual role as instrumental agents in agricultural production and, by extension, of localized landscapes. At the same time, when present as residues, they characterize parts of agri-food products, which subsequently move through the global marketplace along extensive value chains that effectively dissociate the locale of production from the terminal point of consumption. In essence, pesticides are therefore characterized by their mobility, serving as beacons that illuminate a multitude of spatial interconnections. Qualitative research applied to pesticides should therefore be multiscale research to capture the local, national, and transnational implications of pesticide use and related inequalities [43].

Beyond their physical presence, pesticides are cultural symbols [44], residing within an elaborate web of meanings that interlace environmental with political, productive, and corporeal knowledge. Within this intricate network, pesticides possess the transformative capacity to affect these individual components, raising expectations and apprehensions alike. Pesticides are thus profound tools, shedding light on the “landscape of fears” [45] and the different cultural interpretations related to the perception and management of risk and uncertainty [46]. Within these frames lie both individuals and collective entities, and through pesticides we can reveal the multiple layers of interaction that define engagement with the environment and other people. In light of this, the research draws a cultural outline of pesticides that overcomes a traditional and rigid dualism between global and local, tradition and modernity. First of all, their global nature extends beyond usage, encompassing the intricate processes of formulation, production, distribution, and capitalization, involving diverse substances, knowledge actors, and territories across the globe. Yet their application remains deeply localized, anchored to specific lands and to specific legal frameworks [47], their characteristics and impacts varying greatly depending on the environmental context and the individuals employing them. Amselle asserts that, despite economic globalization, cultural differences continue to shape human local societies significantly [48]. Local specificities mediate and translate global commodities and embed them in the everyday life of a community [49]. In this respect, pesticides represent objects suspended between their global origins and their local implementation, indicating a specific viewpoint from which to explore the extent and dynamic of cultural translation and hybridization of global and local knowledge. This viewpoint appears better than others, such as the process of mechanization or the financialization of farming, for which the process of translation of global knowledge into local practice appears less dynamic and plastic.

Pesticides, moreover, stand at the center of the interplay between tradition and modernity. Often scholars have indicated as “traditional” farming techniques those that allow farmers’ autonomy from the global market [50], including control techniques and products, such as biopesticides, that farmers are able to produce and reproduce on their own. More often, traditional practices are considered those that predate the Green Revolution, while current pesticides are an expression and development of the forms of rational farming introduced after WWII [51]. Thomassen suggests the contemporary world should be considered the expression of “multiple modernities” [52] to overcome terminological rigidity and to assume that all human societies undergo socio-cultural transformations under their proper circumstances. In this respect, the literature concerning pesticides has shown different approaches to these products, forms of adaptation that combined old and new practice, local and global knowledge, responding to the perceptions and understandings of local societies and enhancing the “ecological rationality” of traditional production typical of different peasant societies [53], as Ksentini’s study, devoted to combining the use of chemical and organic pesticides with traditional ancestral farming methods in Tunisian oases, highlights [54]. Each one of these trajectories represents an example of multiple modernity through which pesticides become parts of the everyday and part of the specific worldview of the community. Such a study of pesticides provides insight into aspects related to the transformation of socio-political categories such as the state, multinational corporations, the consumer, and, most importantly, the interactions among them in the landscape of

globalization [55]. In this context, socially oriented studies with respect to scientific and technological innovations fit into the landscape of the international pesticide industry and can either justify research projects in the rhetorical framework of developing countries or take into account the political and power implications in a global colonial and post-colonial framework [Brisbois]. In this postcolonial context, pesticides play an active role in creating productive and economic dependence through the intensive production–debt loop that is generated through the technology treadmill process applied in agriculture [56]. Anthropology applied to the study of pesticides in this global context, characterized by what Saxton refers to as an “agricultural hierarchy” [57], maintains a difficult balance between objectivity and advocacy [58], often experimenting with ethnographic methods in collaboration with communities faced with environmental suffering [57].

Thus, pesticides are objects capable of triggering emotions in a community while simultaneously altering their relationship with the world, developing dynamics that can be interpreted along the axes indicated by the current debate. An ethnographic example can better illuminate these points.

5. A Case Study: The Return to Milpa in Oaxaca (Mexico)

An ethnographic case study derived from extensive field research is very useful in exemplifying several aspects illuminated in the previous paragraphs. The case study revolves around the massive return to agriculture in the Mexican state of Oaxaca [59] that occurred during the COVID-19 pandemic, fitting into the trend towards a sustainable model of agriculture distancing itself from the so-called “Green Revolution” [60].

The Green Revolution, a term coined in the latter half of the twentieth century, denotes an agricultural paradigm primarily focused on augmenting food production levels based on high technological intervention [61–63]. This global agricultural trend, epitomized by what Prihandiani refers to as a “pesticide tsunami”, has been replicated across various global regions, among which Mexico was one of the first countries to experiment with it. Despite the results in terms of intensification of production, the environmental repercussions of this agricultural model are significant [64].

During the COVID-19 pandemic, a strong reversal of this trend occurred in rural Mexico due to multiple factors:

1. Economic depression made it extremely challenging for farmers to buy chemical products such as pesticides and industrial fertilizers, especially in the context of the strong marginalization of Indigenous and mestizo inhabitants in rural areas of the southern Mexican states.
2. Renewed and widespread attention to health as a reaction to the fear of contagion led numerous farming families to follow the example of some early adopters who had already abandoned pesticides and chemical fertilizers after developing various health issues attributed to prolonged exposure to such products.
3. The pandemic was perceived as the result of a development model considered alien to the way of life of Indigenous populations in Oaxaca. This Oaxacan way of life is based on the search for harmony and balance in relationships between humans and non-humans as members of a common relational environment.
4. There was a cosmological conception of consubstantiality between humans and corn [65] and, more generally, between humans and substances ingested into the body. This implies that corruption of the food produced directly results in the weakening of the human body, making it vulnerable to viruses and diseases.

These factors led to a massive transition to a perceived traditional agricultural model, enriched by numerous elements of innovation within that tradition. The so-called traditional model is the milpa system, primarily consisting of the synergistic combination of maize, pumpkin, and beans. By its nature, milpa increases the agroecosystem’s resilience and food diversity [66], involving multiple productive, community, and ritual activities. It is oriented towards self-sufficiency rather than sales, and it is rich in symbolic and identity meanings [67,68]. The milpa is perceived as a symbol of peasant, family, and community

agriculture, contrasting with large expanses of land cultivated using industrial methods and technologies. In this case, the still vibrant knowledge associated with Milpa allowed people to survive and live dignified lives during the pandemic.

Generations of migrants returning to rural municipalities from large cities in Mexico or the United States, after losing precarious sources of economic income during quarantines, have resumed cultivating abandoned fields. This occurred through processes of relearning cultural heritage transmitted intergenerationally by the elderly generation and through new technological and agronomic proposals introduced into the territory by local NGOs (e.g., Puente a la Salud) and young individuals who attended state universities or indigenous universities (e.g., Universidad Autonoma Comunal de Oaxaca, Universidad de la Tierra). An important phenomenon in this regard is the emergence of so-called experimental farms and the production of natural fertilizers and pesticides on a domestic scale, facilitated by the advice of technicians and experts provided by NGOs.

This return-to-the-land process has had significant repercussions on the renewed valorization of peasant identity. Once seen as a symbol of backwardness, it has become a source of pride for the dignified way of life it allows, especially in contrast to life in quarantined cities. In particular, the crisis of the traditionally male-dominated money economy has encouraged the social role of women, who were historically left on the margins and charged with the provision of food through home cultivation, cooking, and product exchange.

6. Conclusions

Pesticides are cultural objects and tools that deeply affect the worldview and a community's interaction with the world. Although the research did not find publications in the international literature fully and specifically dedicated to exploring the cultural value of these products, it was able to collect individual contributions that testify to their relevance. This narrative review, thus, has reconstructed and portrayed the main trajectories of the debate, offering a first compass for researchers, professionals, and policymakers to understand the complexity of these objects. Specifically, it draws attention to three different and coexisting aspects, such as the question concerning the power relations that are conveyed and underpins the use of pesticides, the one concerning health risk perception, and their impact in the environmental perception both of farmers and consumers.

In light of the results, where research thus shows how pesticides are integral parts of local cultures and embedded within them, it encourages the exploration of these local perspectives, moving beyond a universalistic understanding of these products as they are framed within Western science. This approach goes along new research questions that emerged from the debate this review analyzed:

- What are the work challenges and pest threats faced by farmers?
- What are the pest management strategies and pesticides already used for different crops, and why?
- How do decision-making and skill acquisition processes work among farmers?
- What are the experiences of pesticides' impact on people and soil?
- What is the actual knowledge concerning the product used?
- What are the factors that motivate the choice of product?

Thus, answering these questions will provide a solid base of knowledge to develop new forms of dissemination and training, thus leading to better understanding and use of the products by the farmers, and more sustainable agriculture overall.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. The table provides a reading guide including all the publications consulted for the article clustered according to the main areas of the debate. References are provided in alphabetical orders, while it is indicated the individual reference number in the article’s bibliography squared brackets at the end of the reference.

Category	References
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Table A1. Cont.

Category	References
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	Kilby, P. <i>The Green Revolution: Narratives of Politics, Technology and Gender</i> ; Taylor & Francis: Abingdon, UK, 2019. [51]
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