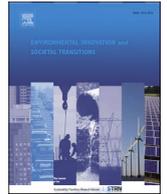




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# Discursive struggles over pesticide legitimacy in Switzerland: A news media analysis

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## ABSTRACT

Societal concerns about pesticides and their negative effects have increased significantly in recent years. These concerns cumulated into discursive struggles over pesticide legitimacy. Although the emerging transition towards low-pesticide agriculture has become an important area of research, our understanding of those pesticide discourses and their function in (de)stabilizing the pesticide regime is still limited. This study reveals the discursive elements by investigating topics, storylines and discourse coalitions and links them to policy and regime changes. The paper's argument is being built on the case of pesticide discourses in Switzerland. A corpus of 2,523 articles from the mainstream and farming press covering the period from 2011 to 2022 is analyzed by combining topic modeling and discourse analysis. The results show how two broad, distinct discourse coalitions competed by employing de- versus re-legitimizing storylines. They also indicate that the external contestation rather led to a (preliminary) regime stabilization than to its destabilization.

## 1. Introduction

Agricultural pesticide use and its reduction pathways are highly contested. Driven by societal concerns about the adverse effects of pesticides on the environment and human health, discursive struggles over the legitimacy of pesticides have strongly increased (Young et al., 2022). Legitimacy here refers to the perceived consonance of pesticides with their institutional environment, i.e. a socially constructed set of beliefs, norms, values, and practices in the pesticide context (Scott, 2008; Suchman, 1995). In discursive struggles, some actors mobilize narratives to problematize and delegitimize the established use of pesticides, whereas others seek to (re)legitimize it (Binz et al., 2016; Markard et al., 2016; Rosenbloom et al., 2016). The struggles become visible in contrasting topics (e.g., *food security*, *water pollution*) and storylines (e.g., *pesticides are needed to produce food*, *pesticides pollute water*) that different actor groups coalesce around. They thereby seek to influence public policies, which in turn can determine the pace and direction of agricultural change (Markard et al., 2021). These discursive elements and their relations to changes in pesticide policy and in the socio-technical system of agriculture have received relatively little attention from scholars although they could be part of lock-in mechanisms and important factors in explaining change (Buschmann and Oels, 2019).

Drawing on the prominent analytical dimensions of transition research (landscape, regime, and niche), this paper is interested in how discourse links to changes in policy and at the regime level. The regime represents the so-called “grammar” behind well-aligned

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and fairly stable configurations of socio-technical system elements (Frank and Schanz, 2022; Rip and Kemp, 1998). Such elements include infrastructures, markets, norms, policies, rules, social structures and technological artefacts (Fuenfschilling and Truffer, 2014; Rip and Kemp, 1998). In other words, the regime is where the use of pesticides is engrained in the socio-technical system of agricultural production.

Through its reliance on pesticides, modern agriculture provides for high productivity and food security. However, on the downside of massive pesticide use there are numerous and well-documented negative effects on the environment. These contribute most notably to biodiversity loss (e.g., Hallmann et al., 2017; Potts et al., 2010; van Swaay et al., 2006) and pollution of water bodies (Stehle and Schulz, 2015), drinking water sources (Kiefer et al., 2019) and agricultural soil (Riedo et al., 2021; Tang et al., 2021). Moreover, pesticides used to protect crops are suspected to be carcinogenic, thus threatening human health (e.g., Alavanja and Bonner, 2012; Jones, 2020). Although the reduction of pesticide use and risks has made it to the top of European policy agendas in recent years, the reduction targets are continuously missed (Möhring et al., 2020). Against this backdrop, calls have been made for a fundamental sustainability transition of agricultural production with low- or eventually no-pesticide use (Jacquet et al., 2022).

Overall, there are signs that the pesticide regime is coming under increasing pressure in many European countries (European Commission, 2020; Lamine et al., 2010; Pe'er et al., 2020). This pressure is largely driven by societal concerns, which have grown in the study period (2011–2022) (e.g., Schaub et al., 2020). A typical response to growing concerns voiced by social movements or interest groups that question the legitimacy of single technologies, such as a specific pesticide, is phase-out (Turnheim and Geels, 2012). The ban of the agrochemical DDT in many countries throughout the 1970s and 1980s is a prominent case that was retrospectively described as having played a key role in regime changes, for example through destabilization processes (Levain et al., 2015).

In the sustainability transitions literature, struggles over technology legitimacy and associated regime changes were understudied but are now receiving more attention (e.g., Mattioni et al., 2022; Novalia et al., 2021; Runhaar et al., 2020). Whereas most studies focus on the energy transition (e.g., Isoaho and Markard, 2020; Markard et al., 2021; Rosenbloom, 2018), recent research on agricultural transitions has begun to analyze the construction of legitimacy for agri-technologies developed in response to environmental regulation in the Netherlands (van der Velden et al., 2022) and compared different governance perspectives on pesticide regime destabilization along with related discursive shifts in Germany (Frank and Schanz, 2022). However, it remains underexplored how current discursive struggles over pesticides and their legitimacy unfold in detail, and how these discourses link to policy changes and a (de)stabilization of the incumbent pesticide regime. Deepening our understanding of the discourses helps to take an important source of pesticide regime (de)stabilization into account.

This paper thus explores the (de)legitimation of pesticides through a discursive lens. Focusing on the discursive dynamics surrounding pesticides, it untangles which topics were discussed and how certain storylines were used to delegitimize or (re-)legitimize pesticides and to support or oppose (radical versus incremental) reduction pathways. In addition, I discuss how the discursive struggles link to regime (de)stabilization. Two research questions orient the study: (1) How were pesticides discursively (de)legitimized; and (2) how does the discursive (de)legitimation of pesticides link to policy change and regime (de)stabilization?

Empirically, these questions are investigated with a study on the discourses surrounding pesticides in Switzerland. Public concerns about pesticides have provoked a highly controversial debate in the country, which led to and was reinforced by the launch of two popular initiatives.<sup>1</sup> The initiatives proposed the strict regulation of pesticides but were ultimately rejected at the voting poll.<sup>2</sup> Nevertheless, they have left a strong imprint on current pesticide policies (Finger, 2021), which makes the Swiss case an interesting one to study the links between discourses and policy change.

Because news media is a central arena of discourses (Markard et al., 2021), tracing the discourses in the news media allows capturing a broad array of actors participating in a political debate (Leifeld, 2013). However, this approach entails the key challenge of dealing with potentially large amounts of data. Utilizing such data becomes possible by building on advances in computational text analysis (e.g., Repo et al., 2021). In transition research, computational methods can be expected to be particularly useful when employed in combination with traditional methods such as discourse analysis (Savin and van den Bergh, 2021). The study at hand thus employs a mixed-methods approach consisting of structural topic modeling (Roberts et al., 2019) and argumentative discourse analysis (Hajer, 1995, 2006). Based on a large corpus of 2523 newspaper articles covering the mainstream and farming press, the paper tracks the public discourses about issues arising from the prevalent use of pesticides over roughly 11 years (from 2011 to early 2022) in the German language region of Switzerland.

The article makes three contributions to the literature. First, by systematically identifying the topics associated with pesticides, the key storylines and the discourse coalitions, the study offers a nuanced understanding of pesticide discourses in Switzerland. Second, examining the interplay between discourse, policy and regime changes yields insights into the role and the effects of discourse in low-pesticide transitions. These insights are relevant beyond the Swiss case for other countries in Europe as they strive to reduce pesticide use and transition to a more sustainable agricultural production. Third, the article enriches the methodological repertoire in transition

<sup>1</sup> Popular initiatives are a special feature of Switzerland's direct democratic system that allows citizens to develop and articulate a proposal to revise the federal constitution. Both popular initiatives proposed stricter pesticide policies. Whereas the first initiative, "For a Switzerland without artificial pesticides," aimed at banning all synthetic pesticides from agricultural and non-agricultural uses and banning all import of food produced with synthetic pesticides, the second initiative, "For clean drinking water and healthy food," wanted to strongly tighten the entry criteria for direct payments to farmers (i.e., the cross-compliance requirements) (Federal Chancellery, 2023). Signature collections started in 2016 and 2017, respectively, and easily reached the 100,000 required signatories, so that the initiatives were put to the vote of the Swiss people on June 13, 2021.

<sup>2</sup> See <https://www.admin.ch/gov/en/start/documentation/votes/20210613/popular-initiative-for-clean-drinking-water-and-healthy-food.html> and <https://www.admin.ch/gov/en/start/documentation/votes/20210613/popula-initiative-for-a-switzerland-without-artificial-pesticides.html>.

studies by illustrating the combined application of text mining techniques for analyzing a large dataset and argumentative discourse analysis to zoom into a subset of the data.

The following section presents the theoretical background to the study. [Section 3](#) describes the mixed-methods approach adopted to identify topics, storylines and discourse coalitions. In [Section 4](#), I present and discuss the results of the analyses. The conclusions in [Section 5](#) highlight the interplay of discourse, policy changes and regime stabilization.

## 2. Theoretical background

This article builds on the literature on sustainability transitions. Sustainability transitions are long-term processes in which socio-technical systems such as agricultural production go through fundamental changes that are associated with sustainability targets ([Markard et al., 2012](#)). Typically, these targets are formulated by public policies and depend on the creation of legitimacy for focal technologies such as, in this case, pesticides. An important share of the process of creating or undermining legitimacy happens in the discursive space where struggles over technologies unfold. The (de)legitimation that may result from the discursive struggles is a source of (de)stabilizing change ([Turnheim, 2022](#)). Therefore, the paper examines two processes. First, it examines the process of pesticide (de)legitimation through a discursive lens. Second, it establishes a link between the discursive (de)legitimation and regime (de)stabilization processes.

### 2.1. Discursive struggles over pesticide legitimacy

Struggles over technology legitimacy can be intense and evolve around both novel and established technologies ([Markard et al., 2021](#)). Pesticides as an established agrochemical technology have become the target of fierce criticism in a wider debate around the unsustainability of modern agricultural production. Different actors join forces by building networks, alliances ([Kishna et al., 2017](#); [Musioli et al., 2012](#)) and discourse coalitions ([Duygan et al., 2018](#)). These coalitions mobilize a variety of strategies in order to create or undermine the legitimacy of the focal technology ([Binz et al., 2016](#); [Isoaho and Markard, 2020](#); [Kishna et al., 2017](#)). On the one side, there are calls for a more sustainable agriculture including the phasing-out of pesticides, ranging from single hazardous substances to the ban of all pesticides. To mobilize support for any kind of phase-out, an established technology such as pesticides first has to lose its legitimacy. Only if many actors question or reject the viability of the technology, there is a chance for phase-out to be passed and implemented ([Markard et al., 2021](#)). On the other side, to (re)gain legitimacy, pesticides need an integration with existing institutions ([Geels and Verhees, 2011](#)) and the acceptance or even active support by a broad range of societal actors ([Rosenbloom, 2018](#)).

A central arena in which these struggles over legitimacy and policy change unfold is public discourse. Discourse is broadly defined as “[...] particular ways of talking and thinking about an issue” ([Geels and Verhees, 2011](#), p. 913). Central features of discourse, and its analysis, are narratives or storylines because facts often get told in a story ([Hajer, 2006](#)). Public discourse is widely accessible, unlike other arenas such as parliamentary debates ([Leipprand et al., 2017](#)). It is mediated through competitive public arenas such as the media. Media discourse represents a specific type of public discourse. Many different actors can share their views, for instance on a technology and the broader policy issue. At the same time, however, it is prone to bias as access to and dependence on media to achieve goals are not distributed equally among actors ([Entman, 2007](#)). In sum, these characteristics make public discourse in the media interesting for studying processes of (de-)legitimation ([Markard et al., 2021](#)).

In addition, different media types such as mainstream and alternative media function as discursive arenas for different audiences. Whereas the mainstream media audience includes virtually everyone, the audience of media such as farming newspapers is domain specific and, in this case, includes farmers and other farm actors who regularly use them to collect information on relevant agricultural topics ([Defra 2019](#); [Shimoda et al., 1992](#)). The mainstream media present discourse from other media too but often in a highly selective and simplified way ([Ferree, 2010](#)). To better understand the details of the struggle around an agricultural issue such as pesticide use, it is therefore useful to study not only its coverage in the mainstream but also in the farming media.

In relation to policymaking, exchanges in the media happen in all stages, i.e., before, during and after formal policymaking processes. Studying struggles over legitimacy in public discourse is also crucial because policy and discourse are viewed as being mutually constitutive. Through discourse, where actors constantly position themselves toward policy issues, they contribute to the opening and closure of political space in which policies are debated and formulated ([Yearley, 2005](#)). In terms of policymaking, there are two aspects of interest here. First, the policy outcome, i.e., whether a policy change such as technology phase-out happens or not. Second, the policy processes and pathways for a phase-out, i.e., the details of the policy decision such as the pace and potential actor compensation. For policy processes, storylines are particularly relevant because those used by the seemingly unsuccessful coalition may become institutionalized as well, for example through their integration as part of a political compromise ([Markard et al., 2021](#)).

### 2.2. Regime (de)stabilization

Analyzing discursive struggles over legitimacy lends itself to exploring the link between the discourses, policy changes and regime (de)stabilization processes because these broader and external factors affect regime (de)stabilization ([Johnstone and Stirling, 2015](#)).

Regimes being the “grammar” behind certain configurations of socio-technical system elements ([Frank and Schanz, 2022](#); [Rip and Kemp, 1998](#)) reflects the idea that formal and informal rules are not just carried mentally and shared in social groups but are highly institutionalized and embedded in infrastructures and practices ([Fuenshilling and Truffer, 2014](#); [Geels, 2004](#)). These rules mutually construct and are constructed by actors in a system. In these ways, the regime accounts for the stability of an existing socio-technical system ([Geels, 2004](#); [2011](#)).

The stability of an incumbent regime itself is often ascribed to phenomena such as lock-in and inertia (Turnheim, 2022). According to a slightly different conceptualization, it should rather be seen as the outcome of active resistance to fundamental change by incumbent actors. To actively resist change, incumbents utilize various forms of power (Geels, 2014). These include instrumental (e.g., a position of authority, access to media), material (e.g., technical capabilities, financial resources), institutional (e.g., political cultures, governance structures) and discursive forms. Discursive strategies used by regime actors include identifying and defining problems, promoting solutions to problems, and providing a rationale for action. These discursive strategies unfold their power when they culminate in dominant discourses that shape what and how issues are being discussed.

Destabilization of an incumbent regime can best be understood in relation to its role in a transition process. Building on the seminal multilevel perspective, a transition denotes the phase between two states of stabilized regimes. The weakening or destabilization of a regime has been conceptualized as a process where landscape pressures (e.g., eroding legitimacy) create problems for actors or businesses (e.g., decreasing support), which undermine their commitment to the existing regime (Turnheim and Geels, 2013). The actors may thus discontinue to reproduce core elements of the regime (Turnheim and Geels, 2013) such as developing active substances for pesticides in the case of the pesticide regime. As a response to external pressure, the incumbent regime may also adapt by integrating some of the critique (Levain et al., 2015), which leads to incremental changes in the socio-technical system.

The role of incremental change in processes of regime destabilization and transition is contested. In the sustainability transitions literature, a transition by definition implies a radical shift (Darnhofer, 2015). Some scholars highlight the problematics of incremental changes in transition politics (e.g., Simoens and Leipold, 2021), whereas others suggest that there is an interplay of incremental changes, e.g. in everyday practices, and disruptive changes (Huttunen and Oosterveer, 2017). Incremental change often takes place via the development of protected niches (Lazarevic and Valve, 2020), which are juxtaposed against regimes. It has been argued that cumulative incremental changes at niche level can represent one phase of a gradual destabilization of the incumbent regime (Turnheim and Geels, 2013) or instead result in its further stabilization, which in turn stabilizes the broader socio-technical system.

### 3. Materials and methods

This article uses a mixed-methods research design that integrates the strengths of inductive machine learning for a quantitative assessment of newspaper coverage (distant-reading) and a discursive approach for an in-depth qualitative analysis (close-reading). I apply this mixed-methods approach to a corpus of Swiss newspaper articles on pesticides.

#### 3.1. Research case

Switzerland serves as the empirical case for investigating pesticide discourses. It is a highly relevant and instructional case for three main reasons. First, the country has early on invested in the promotion of a multifunctional, sustainable agriculture (Mann, 2018) and currently has one of the highest levels of agricultural subsidies in Europe<sup>3</sup> (Federal Office for Agriculture [FOAG], 2021). Second, nevertheless, the agricultural sector's pesticide use alone produces external costs that are estimated to range from 100 to 500 million Swiss francs per year (Guntern et al., 2021), which appear high in relation to the sector's gross value added of 4.1 billion Swiss francs (FOAG, 2021). Third, an increasing awareness of such imbalances may be one of the reasons for the extremely controversial societal debate about pesticides that the country has recently seen. This debate has led to the launch of two popular initiatives. Despite the Swiss idiosyncrasies, the case has many similarities with and implications for other countries. Pesticide pollution is a severe problem globally and has given rise to similar societal concerns and pressures in other countries as well.

#### 3.2. Data sources and corpus creation

This study draws on newspaper data to examine the media coverage of pesticides. I chose two categories of newspapers as data sources. The first category entails the most-read daily mainstream newspapers including two tabloids (see Table 1) and is expected to cover the public discourses in the wider Swiss population. The second category comprises the most important farming newspapers to capture the discourses within the farming sector. This selection allowed tracking similarities and differences in the presumably audience-biased discourses of these media landscapes.

I collected a total of 3203 articles published over roughly 11 years (from January 2011 to mid-April 2022). This temporal scope was chosen because during those 11 years, pesticide issues became a major concern for the wider population and consequently gained political trajectory. Moreover, a number of changes to (inter)national pesticide policies were made (see Supplementary Data). Geographically, the collected data covers the German language region of Switzerland.<sup>4</sup> The articles were downloaded from the media database Swissdix Essentials<sup>5</sup> using the search terms "Pestizid\* OR Pflanzenschutzmittel\* OR Agrarinitiativ\* OR Agrar-Initiativ\* OR

<sup>3</sup> Agricultural subsidies amounted to 2.9 billion Swiss francs in 2021 (Federal Statistical Office, 2022).

<sup>4</sup> German was the main language spoken for 62% of Swiss inhabitants in 2021 (Federal Statistical Office, 2023).

<sup>5</sup> See <https://essentials.swissdix.ch/>.

**Table 1**  
Descriptive statistics of newspaper data per source.

Newspaper type	Newspaper	Number of articles	Share [%]
Mainstream	Tagesanzeiger (print and online)	328	13.00
	Neue Zürcher Zeitung (print and online)	340	13.48
	20 minuten (print and online)	184	7.29
	Blick (print and online)	228	9.04
<i>All mainstream</i>		<i>1080</i>	<i>42.81</i>
Farming	Schweizer Bauer (print and online)	846	33.55
	BauernZeitung (only print available)	550	21.80
	Die Grüne (only print available)	47	1.86
<i>All farming</i>		<i>1443</i>	<i>57.21</i>
<b>All</b>		<b>2523</b>	<b>100</b>

Trinkwasserinitiativ\* OR Trinkwasser-Initiativ\* OR TWI OR 19.475".<sup>6</sup> The search string yielded also duplicate and irrelevant articles. Applying the procedure described in the Supplementary Data, articles identified as duplicates or irrelevant were excluded from the dataset. After these preparatory steps, 2523 articles entered the analysis<sup>7</sup> (see Table 1 for descriptive statistics).

### 3.3. Analytical strategy and procedures

The analysis proceeded in two methodological steps. First, given the large amount of data available, I identified structural topic modeling (STM; Roberts et al., 2019) as a suitable tool for quantitatively assessing the entire corpus of 2523 collected newspaper articles. Second, I chose argumentative discourse analysis (ADA; Hajer, 1995, 2006) to zoom into a subset representative of the identified topics (10–15 articles per topic, i.e., approximately 10 % of the full dataset). The schema in Fig. 1 illustrates the interplay of the two methodological steps and additional analyses performed such as topic correlations. The two steps were used complementary and in approximately equal parts in the analysis. However, in the presentation of the results, those generated from ADA make up a larger part of the section owing to their qualitative nature.

#### 3.3.1. Structural topic modeling

Topic modeling is an automated approach to assess the content of large datasets. It uses natural language processing techniques to make human language machine-readable. For text classification, topic models such as STM can use unsupervised machine learning where no pre-existing categories of text are fed into the model; instead, the algorithm defines categories for the underlying text (e.g., Blei and Lafferty, 2007). STM is an innovative probabilistic mixed membership model in the tradition of the latent Dirichlet allocation (Blei et al., 2003). It has become a popular method for example for modeling the framing of newspapers (e.g., Dehler-Holland et al., 2022). The key innovation of STM is "[...] that it permits users to incorporate arbitrary metadata, defined as information about each document, into the topic model" (Roberts et al., 2019, p. 1), such as, in this case, publication date and document source. In doing so, information from these covariates were leveraged to trace the dynamics of the topics discussed over time, the differences in topic coverage between the mainstream and farming newspapers, and the association of the topics' prevalence with the mainstream versus the farming newspapers. The automated content analysis performed required various steps to clean and pre-process the data, select an optimal number of topics, choose a final model and validate this model. A detailed description of these steps is provided in the Supplementary Data.

#### 3.3.2. Argumentative discourse analysis

ADA lends itself well to analyzing the use of language in political processes through an argumentative lens (Markard et al., 2021) and has been usefully employed by a number of recent contributions to sustainability transitions (e.g., Ampe et al., 2020; Isoaho and Markard, 2020; Lowes et al., 2020; Markard et al., 2021; Rosenbloom et al., 2016; Rosenbloom, 2018). Two key concepts in ADA are storylines and discourse coalitions. First, because statements often have the form of a narrative, storyline refers to a condensed statement that summarizes complex narratives and is used by people as "shorthand" in discussions. Second, discourse coalition refers to "[...] the ensemble of a set of story lines, the actors that utter these story lines, and the practices through which these story lines get expressed" (Hajer, 2006, p. 70). In the second methodological step of this study, I systematically examine the narrative patterns, i.e.,

<sup>6</sup> This translates to "Pesticid\* OR Plant protection product\* OR Agriculture initiativ\* OR Agriculture-Initiativ\* OR Drinking water initiativ\* OR Drinking water-Initiativ\* OR TWI OR 19.475". Note that TWI refers to "Trinkwasserinitiativ" (Drinking water initiative) and 19.475 refers to the parliamentary initiative 19.475 "Das Risiko beim Einsatz von Pestiziden reduzieren" (Reducing the risk of pesticide use), which was the unofficial counterproposal to the two pesticide initiatives.

<sup>7</sup> Note: The dataset consists of unequal numbers of articles from the two landscapes (1,080 from mainstream, 1,443 from farming press). Thus, a direct comparison of the frequency of coverage in the mainstream versus the farming press will yield limited insight. In addition, articles from BauernZeitung and Die Grüne were only available in the database from 2019 onwards, so that the only farming media included in the corpus prior to 2019 is Schweizer Bauer. This influences the reversal of the ratio between mainstream and farming press coverage from 2019 on as depicted in Fig. 2. The potential influence on the results that the sudden appearance of articles from BauernZeitung and Die Grüne in the dataset in 2019 has was assessed; this is reported as robustness check in section 4.1 and in the Supplementary Data.

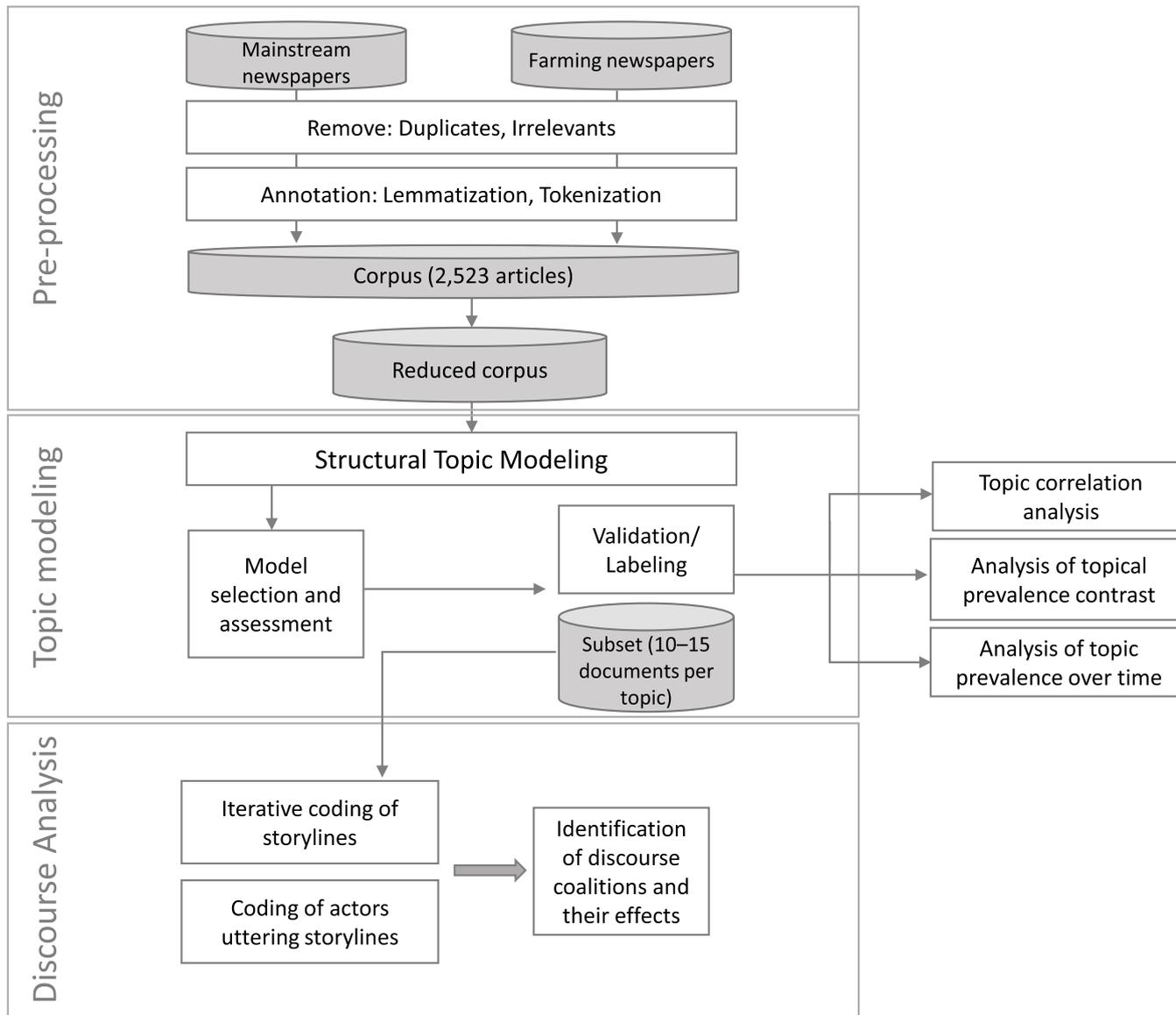


Fig. 1. Schematic representation of pre-processing, modeling, text and discourse analysis steps. Own illustration based on Dehler-Holland et al. (2022).

which storylines were used and by whom. To do so, I use the subsample of the most representative 10–15 articles per topic that has been used to validate the model from STM and to label the topics in the previous step. Details on the qualitative coding procedure are provided in the Supplementary Data.

#### 4. Results and discussion

Starting with the descriptive presentation of the frequency of media articles in the mainstream and the farming press, I also discuss key events and identify different phases of the pesticide debate. Next, I present and briefly discuss the results from topic modeling in Section 4.1 and the identified main storylines and discourse coalitions in Section 4.2. Section 4.3 further interprets the findings on the discursive (de)legitimation of pesticides by linking them to policy changes and the (de)stabilization of the incumbent pesticide regime. In Section 4.4, I outline limitations and directions for further research.

The period of analysis can be divided into three phases, 2011/2013 to 2017, 2018 to mid-2021, and post-2021. I used major political and other real-world events to distinguish these phases, which I explain in more detail below. Fig. 2 provides an overview of the three phases, the key events (see also Supplementary Data) and the frequency of articles published in the two newspaper landscapes.

In phase 1 (2011/2013 to 2017), the societal debate about pesticides slowly emerged. During this time, a few external events such as the publication of international reports (International Agency for Research on Cancer, 2015a; 2015b; World Health Organization and Food and Agriculture Organization of the United Nations, 2016a; 2016b) stimulated the media coverage of pesticides. In Switzerland, the emerging societal concerns are likely to have contributed to the launch of the two popular initiatives aiming to restrict pesticide use (cf. Schaub et al., 2020), for which signatures were collected in 2016 and 2017.

Phase 2 (2018 to mid-2021) was marked by the submission of the two Swiss popular initiatives in the first half of the year 2018. The societal debate thus gained trajectory and was increased by the campaigning around the initiatives (Finger, 2021). Accordingly, a strong increase in coverage of pesticides in both media landscapes can be observed. This observation is in line with the societal concerns tracked by Schaub et al. (2020) using Google Trends data but is likely also influenced by the keywords used which included the names of the initiatives. In 2021, when the referenda were held, the coverage in both media landscapes reached a peak.

In phase 3, the post-vote phase from mid-2021 onwards, the data collected for this analysis does not allow identifying a clear pattern. Nevertheless, it hints towards a strong decrease of coverage in the mainstream press, whereas the farming press seems to have kept reporting on it rather much. This seems plausible because the consequences of the policy outcome (i.e., a pesticide reduction path) are heavily discussed within the farming sector, whereas for the broader population, this is no longer a topic of high relevance or the issue is deemed settled.

##### 4.1. Topics

The estimation of a model with 21 topics resulted in 19 interpretable and hence labeled topics, ranging from agricultural subsectors (e.g., viticulture, fruit and vegetable cultivation), political aspects (e.g., federal politics and parliament, referendum campaigns, rural–urban gap in voting behavior) and actors (e.g., agrochemical industry, farmers' associations) to environmental aspects (e.g., biodiversity, groundwater pollution), the farming sector's remedies (e.g., water protection compliance, precision farming) and social aspects (e.g., farmers and society) (Table 2).

The topic correlation graph (Fig. 3) yields insights about the relationships between the identified topics. Positive correlations between topics indicate that these topics are likely to be discussed within the same document (Roberts et al., 2019). Four thematic clusters are particularly noticeable in the newspaper coverage of pesticides. The associated topics address *environmental aspects*, *water issues*, the *farming sector's remedies (practices to reduce pesticide use and risks)*, and *political issues*.

Next, by examining the contrast between topical prevalence for the two groups (mainstream and farming press), it becomes evident that certain topics were much more discussed in one newspaper type versus the other (Fig. 4). Topics #1, 2 and 3 (cluster *farming sector's remedies*) as well as topics #4 (farmers and society), #17 (farmers' associations) and #19 (fruit and vegetable cultivation) were strongly covered by farming newspapers compared with mainstream newspapers. On the contrary, the topics #9, 12 and 15, which concern environmental aspects and more precisely the toxicity and risks associated with pesticides, and #6 and 21 (cluster *water issues*) were more strongly discussed in the mainstream than in the farming newspapers. Similarly, the mainstream press covered political aspects (topics #5, 10, 14) more heavily. Topics #13 (vertical farming) and #18 (bee mortality) are close to the middle but still mainstream press-leaning, whereas the inverse is the case for topics #7 and 16, which concern agricultural subsectors, and for topic #20 (agricultural policy). The latter are relatively close to the middle but still farming press-leaning.

Overall, a rather clear pattern of how differently pesticides were discussed in the mainstream and in the farming press became visible. It appears that the mainstream press focused more on topics related to pollution through and harmfulness of pesticides, whereas the farming press strongly covered remedies and solutions by the farming sector. These results remained largely stable when checking for bias stemming from the construction of the dataset (i.e. availability of articles from BauernZeitung and Die Grüne only from 2019 on; see details in the Supplementary Data). However, it can be assumed that the two media landscapes analyzed use different vocabulary when discussing highly domain specific topics. Using the topic *Alternative crop protection* as an example, I therefore examined the influence of a topical content covariate. This allows for the vocabulary used to talk about a particular topic to vary (Roberts et al., 2019). Indeed, this showed that the farming press used vocabulary associated with agronomical (non-technical) alternatives to pesticides, whereas in the fewer reports on the topic by the mainstream press, reference was made to technological solutions such as gene technology and drones. The word lists and additional details are provided in the Supplementary Data.

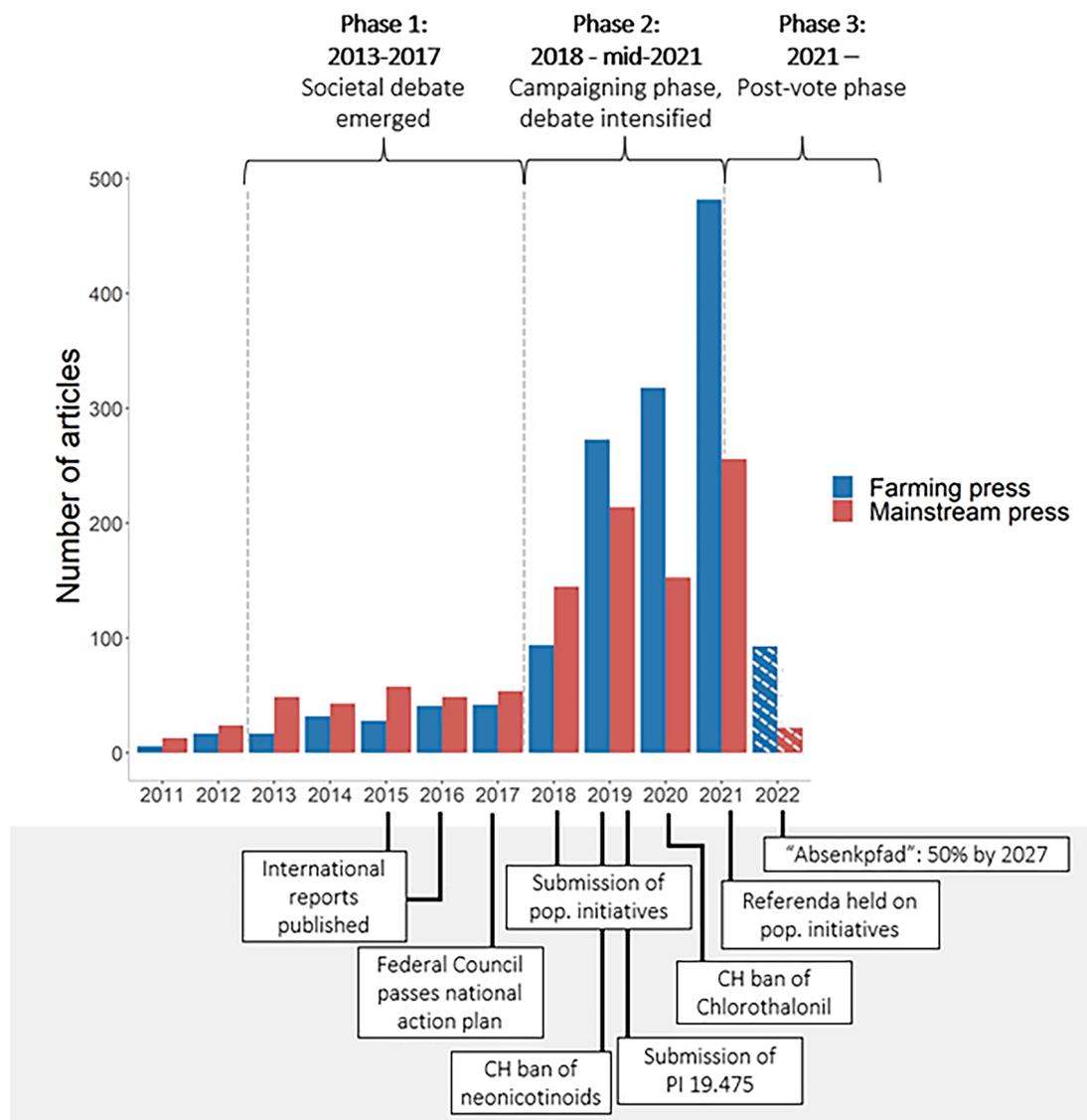


Fig. 2. Phases, key events and frequency of media articles in mainstream and farming press. The bar for 2022 is shaded because it only covers articles until mid-April 2022.

#### 4.2. Storylines and discourse coalitions

Using ADA, the discourses were categorized in terms of six main contending storylines, which framed pesticides and their use in agriculture either as polluting water (D1), threatening other species or biodiversity (D2), posing risks to human health (D3), complying with water protection regulations (L1), being reduced by farmers' alternative crop protection techniques that are in development or implementation (L2), or technology as a solution (for reducing pesticide use) (L3). These storylines relate to the topics identified through STM and form two sets, a delegitimizing (D) and a (re)legitimizing (L) set of storylines (following Rosenbloom, 2018) (see Table 3).

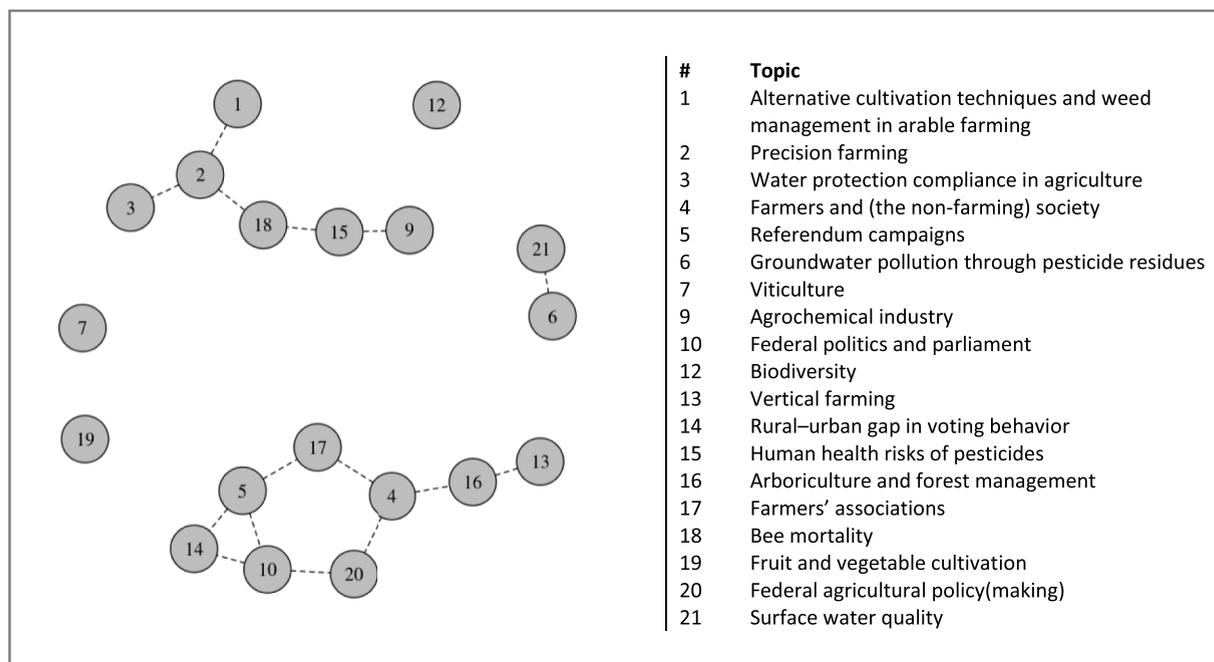
The dynamics of the storylines over time can be traced approximately by looking at the prevalence over time of the topics that are associated with each storyline (Fig. 5). Discourse coalitions are analyzed by furthermore including the actors that utter these storylines (Hajer, 2006). Overall, the topics associated with delegitimizing storylines were more prevalent in the mainstream press, whereas topics associated with (re)legitimizing storylines were predominant in the farming press. In the following, I integrate results from STM and ADA to present the discursive patterns evident in the newspaper coverage.

##### 4.2.1. Delegitimizing storylines and discourse coalitions

The delegitimizing storyline (D1) *Pesticides pollute water* was used as a shorthand to refer to issues with surface water quality and

**Table 2**  
Topic labels and prevalence.

#	Topic label	Prevalence [%]
7	Viticulture	3.09
19	Fruit and vegetable cultivation	5.01
16	Arboriculture and forest management	3.97
5	Referendum campaigns	7.39
14	Rural–urban gap in voting behavior	4.32
17	Farmers' associations	7.55
20	Federal agricultural policy(making)	4.64
10	Federal politics and parliament	4.69
15	Human health risks of pesticides	4.19
18	Bee mortality	2.66
9	Agrochemical industry	4.60
12	Biodiversity	4.15
6	Groundwater pollution through pesticide residues	4.38
21	Surface water quality	3.75
1	Alternative cultivation techniques and weed management in arable farming	5.81
2	Precision farming	4.96
3	Water protection compliance in agriculture	5.11
4	Farmers and (the non-farming) society	6.63
13	Vertical farming	4.93
8	Not interpretable	4.27
11	Not interpretable	3.40



**Fig. 3.** Topic correlation graph.

groundwater pollution. Surface water quality issues were more prevalent in the first years of the period covered by this study, i.e., until 2017/2018, and then declined. Immediately before the vote on the pesticide initiatives in 2021, the topic of groundwater pollution clearly dominated, with a peak in 2020, but only in the mainstream press; in the farming press the topic achieved only a slight increase at that time and otherwise was never covered much. The main actors that uttered the *Pesticides pollute water* storyline were the federal and cantonal offices for the environment as well as for food safety, municipalities, water suppliers and non-governmental organizations (NGOs), who reported on cases of detected pesticide metabolites that exceeded the legal thresholds in ground- and surface waters. These threshold exceedings were predominantly caused by residues of chlorothalonil, a fungicide that was banned first in the EU in 2020 and slightly thereafter also in Switzerland. One narrative invoked by this storyline was also that certain municipalities and environmental offices of the cantons downplayed or concealed measurement results; another emphasized that measurements were taken at the level of groundwater which did not mean that the drinking water was affected as well.

Related to storyline (D2) *Pesticides threaten other species or biodiversity* were the topics of bee mortality and biodiversity. Bee

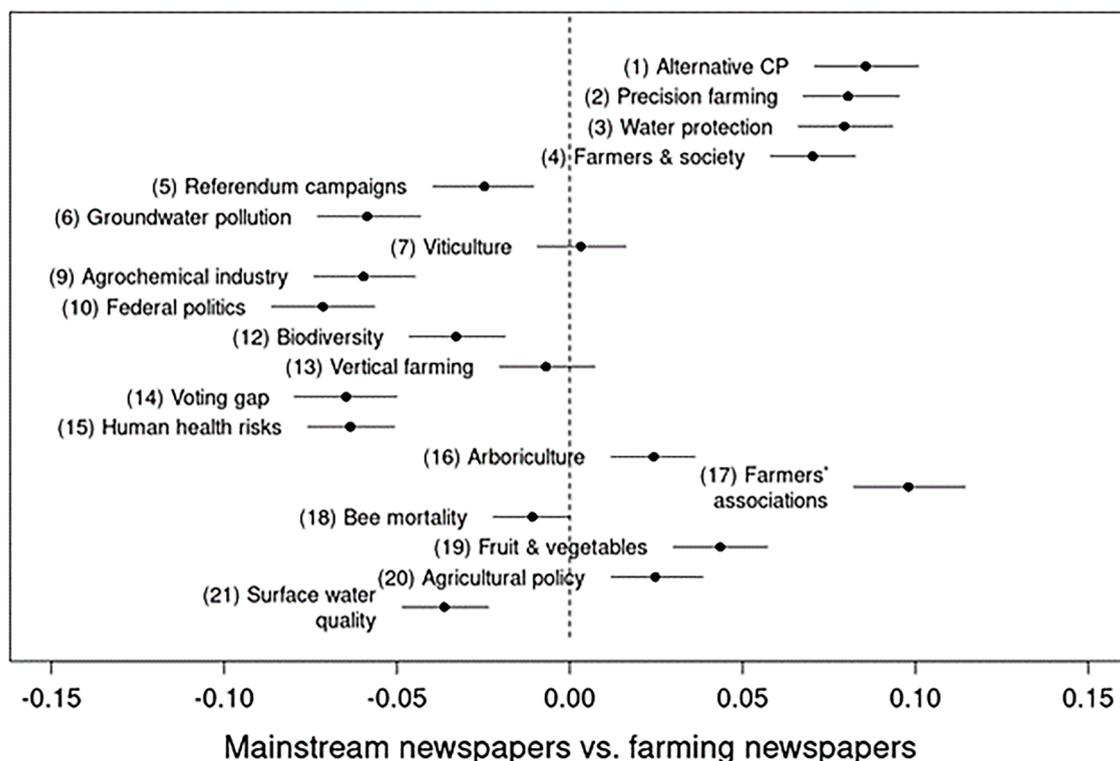


Fig. 4. Topical prevalence contrast, i.e., association of topic prevalence with mainstream versus farming press. The variable newspaper type has been used to calculate the association.<sup>8</sup> The x-axis indicates the change in topic proportion shifting from one newspaper type to the other.

mortality was a relatively prevalent topic in the mainstream press in 2013–2014, after which its coverage declined. Biodiversity was strongly covered by the mainstream press in 2017–2018, then its coverage declined a bit and saw two smaller spikes in mid-2020 and mid-2021 (the latter coincided with the time when the referenda were held). Biodiversity was heavily covered in early 2022 when its prevalence reached up to 40%. In the farming press, both topics never seemed important. The actor groups that employed this storyline were scientists, environmental NGOs and the federal and cantonal offices for the environment.

The storyline (D3) *Pesticides pose risks to human health* and the associated topic gained prominence in the mainstream press in 2019. Interestingly, the topic coverage declined sharply in 2021, right at the time of the referenda, to then spike again end of 2021. The broader narratives addressed with this storyline relate to pesticide residues found in urine samples, increased cancer risk, and effects on human sperm quality. Scientists, EU authorities and certain Swiss authorities (i.e., the Federal Food Safety and Veterinary Office and the Cantonal Department of Health) were the main actor groups that appeared together with this storyline, to a lower degree also the World Health Organization, NGOs and consumer protection organizations.

In summary, the analysis of the discursive dynamics of the set of delegitimizing storylines reveals that the storylines served as devices to argue for rapid and radical change, implemented top-down. These storylines created a sense of urgency, and they positioned the general public and the environment as victims of pesticide pollution while mainly blaming farmers and the insufficient pesticide regulation. The coalition that formed around this argumentation was made up of many non-regime actors such as (environmental) NGOs, water suppliers, municipalities, federal and cantonal offices for the environment as well as those for health and food safety, environmental and medical scientists, and the World Health Organization.

#### 4.2.2. (Re)Legitimizing storylines and discourse coalitions

The (re)legitimizing storylines found, respectively the topics associated with these, appeared to be more prevalent in the farming press (Fig. 5) than in the mainstream press. An additional close-reading of a randomly selected sample of articles (as opposed to the prior used most representative articles per topic) from the mainstream press revealed, however, that (re)legitimizing storylines were also prevalent here. In particular, the storylines of *Technology as a solution* and *Alternative crop protection* were taken up by some articles in the mainstream press.

The first legitimizing storyline (L1) *Water protection compliance* invoked the narrative of farmers who are being sensitized to water protection and a control and monitoring system as well as water protection programs that are in place. The associated topic gained

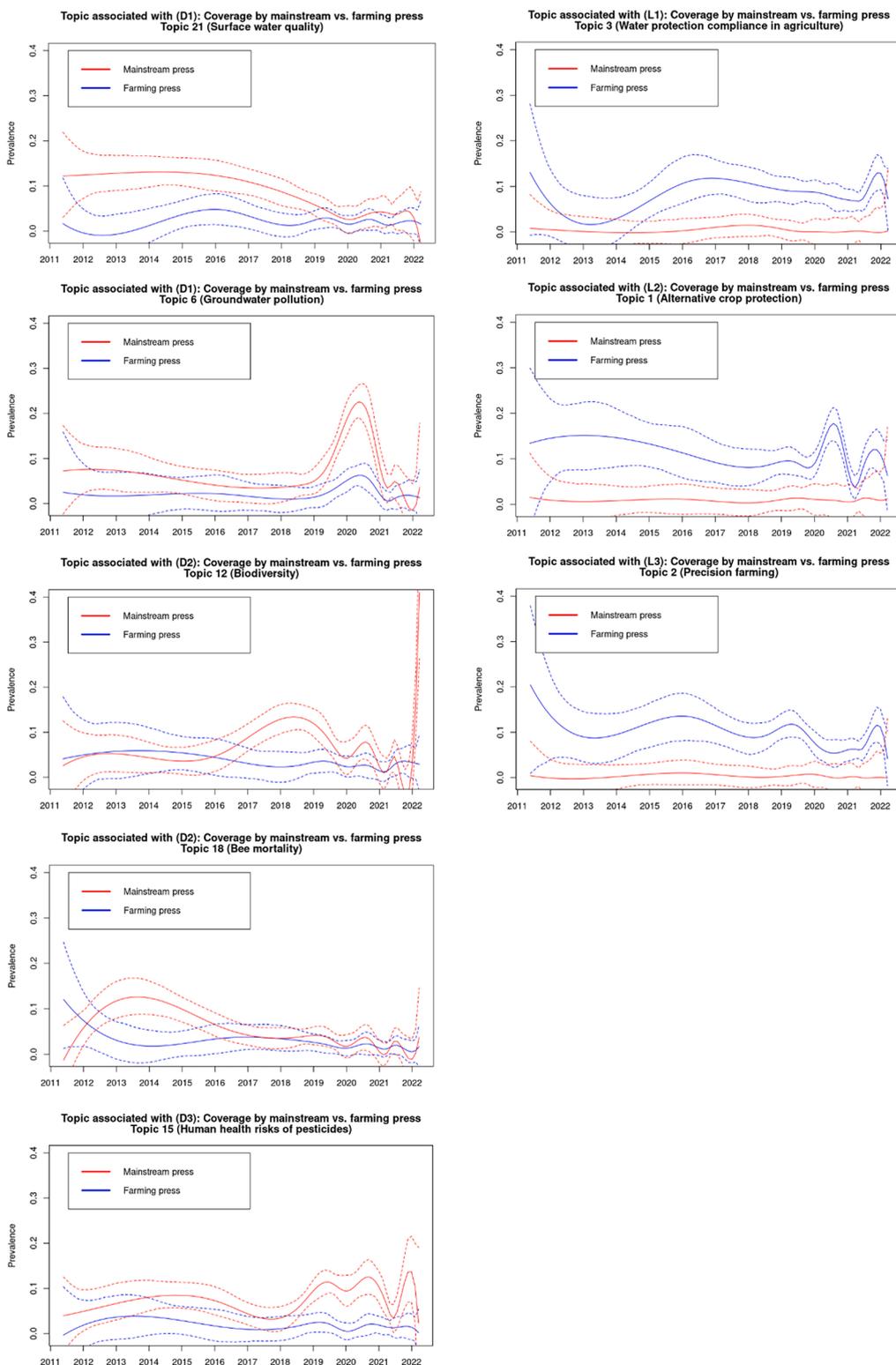
<sup>8</sup> For this, I re-estimated the model to allow topic prevalence to be a function of newspaper type, instead of newspaper, and a spline of the publication date (the latter is held at sample median for the effect estimation).

**Table 3**  
Contending storylines surrounding pesticides.

Set of storylines	Storyline	Illustrative example	Related to topic
<b>Delegitimizing storylines:</b> <b>Pesticide pollution</b> <i>Pesticides pollute the environment, harm human health, and threaten other species</i>	<b>(D1) Pesticides pollute water</b> <i>Thresholds for pesticide residues in ground- and surface water are regularly exceeded</i>	“The uproar was immense when the Federal Office for the Environment published its report on the quality of groundwater in Switzerland: Chemical substances from agriculture were causing ‘widespread and lasting’ damage to the water, especially in the Central Plateau, it said a fortnight ago.”	#6 #21 Groundwater pollution through pesticide residues Surface water quality
	<b>(D2) Pesticides threaten other species or biodiversity</b> <i>Insect and bird populations are in sharp decline, and the intensive agricultural production including pesticide use is a main driver of this decline</i>	“The scientists’ conclusion is clear: ‘If we do not change the way we produce food, insects will have gone down the path of extinction in a few decades,’ says the article that will appear in the forthcoming issue of the journal Biological Conservation.”	#12 #18 Biodiversity Bee mortality
	<b>(D3) Pesticides pose risks to human health</b> <i>Pesticides are suspected of being carcinogenic and damaging to fertility; there is no clear evidence of the harmfulness or harmlessness of pesticide residues found in the human body</i>	“Pesticides as possible trigger: Children in the Seeland Region are exposed to increased brain tumor risk. Bernese researchers found that the risk of brain tumors among children in the Seeland Region is higher than in other parts of Switzerland. However, the reasons for this have not yet been proven.”	#15 Human health risks of pesticides
<b>Legitimizing storylines:</b> <b>Farming sector’s remedies and reduction efforts</b> <i>The farming sector exerts all kinds of efforts to reduce pesticide use (risks), but pesticides are still needed to produce and secure yields</i>	<b>(L1) Water protection compliance</b> <i>Control and monitoring system, and programs or projects are in place, farmers are being sensitized for water protection</i>	“After the polluters at the Äächeli had been made aware of this, further measurements were performed, which showed that the values were improving. This shows that the sensitization is working as a measure, explains the expert.” “In order to make reliable statements about the effect of a reduced use of plant protection products on water quality, further years of measurements are necessary, the Office for Agriculture and Nature (Lanat) informs. An important part of the Berne plant protection project is water monitoring.”	#3 Water protection compliance in agriculture
	<b>(L2) Alternative crop protection techniques in development or implementation</b> <i>Farmers already develop and implement alternative crop protection techniques, but pesticides need to be part of the toolbox; reduction targets have to be moderate</i>	“The LBBZ Schluechthof estate will invest in the mechanization of weed control. This is done to meet society’s demand for the reduction of plant protection products, writes the LBBZ.” “Protect without harming.” “I have nothing against plant protection products. They help to secure our yields. That’s why I’m glad we can resort to them.”	#1 Alternative cultivation techniques and weed management in arable farming
	<b>(L3) Technology as a solution</b> <i>Technology can optimize crop protection and reduce (excess) pesticide use; this needs training and advisory services</i>	“Digital technologies have great potential to reduce the use of crop protection products.” “Around 60 [...] farms are participating in the five-year resource project of the Federal Office for Agriculture. With resource-saving and very precise technologies, at least 25 percent of plant protection products are to be saved.”	#2 Precision farming

prominence from 2014 on and spiked in mid-2021. Actors using this storyline included the federal and the cantonal offices for agriculture, the cantonal offices for the environment, and to a lower extent also farmers.

The narrative of farmers who already develop and implement alternative crop protection techniques but need pesticides to be part of the crop protection toolbox was invoked by storyline (L2) *Alternative crop protection techniques in development or implementation*. The topic that is contained in this storyline has been moderately covered by the farming press over the complete time span analyzed. Two peaks are visible in mid-2020 and mid-2021. The storyline has mainly been employed by farmers and agricultural advisors, extension and training centers, and by the federal and cantonal offices for agriculture. They stressed that they “are already on the way,” searching and developing alternatives to chemical pesticides, also because they feel obliged owing to the societal pressure and future phase-outs of certain pesticides or active ingredients. Moreover, they emphasized that damage thresholds are respected and that only necessary



**Fig. 5.** Coverage of key pesticide topics associated with storylines, comparison of mainstream versus farming press, 2011–2022. The plots are based on a model that allows for an interaction between time (publication date of newspaper article) and newspaper type (mainstream versus farming press). Here, newspaper type moderates the effect of topical prevalence at a given time. The prevalence of the topic(s) associated with each identified storyline is plotted as smooth function (using a spline) of time. The dotted lines depict model uncertainty (95 % confidence intervals).

crop protection treatments are performed. Frequently, it was also pointed out that the effects of alternative crop protection on yields must be taken into account.

The third storyline with which a (re)legitimation of pesticides was attempted is (L3) *Technology as a solution*. The topic of precision farming has always been moderately covered in the farming press. Periodically, it showed slight ups and downs with spikes in 2016, 2019 and end of 2021/early 2022. Agricultural advisors, extension and training centers, agri-businesses as well as the federal and the cantonal offices for agriculture were the main actors that relied on this storyline to promote the optimization of crop protection through technology. The two core statements were, first, that technology helps to reduce (excess) pesticide use and, second, that farmers need access to technology training and advisory services in order to be able to adopt new technologies.

Overall, the findings concerning these storylines point to their use as devices to (re)legitimize a large share of pesticide use. They were thus also used to argue against rapid change and stricter pesticide regulation, proposing instead incremental (and voluntary) changes that would not put too much of farmers' yields at risk. The farmers and other farm actors were positioned as problem solvers that can best take care of the externalities of pesticide use and should alone be in charge to steer the change. This became for example evident in narratives about them (striving towards) displaying responsible behavior, despite being scapegoated by the public, vowing improvements and referring to the improvements already made (i.e., risk prevention and pesticide use reduction). It has been argued in the literature that through this kind of integration of critique into the pesticide regime, the regime seeks to restabilize (Levain et al., 2015). The actors that coalesced around this set of storylines included many pesticide regime actors, i.e., farmers, farmers' associations, agricultural advisors and extension services, agri-business/industry, the federal and the cantonal offices for agriculture, and (engineering) scientists. The next section therefore moves on to discuss the links between the discursively (de)constructed pesticide legitimacy, policy changes and regime (de)stabilization.

#### 4.3. Discursive pesticide (de)legitimation, policy change and regime (de)stabilization

In addition to the results obtained through the analyses, this section adds a discussion of the changes made in pesticide policy. It then links the findings on the discursive (de)legitimation of pesticides to these policy changes and further interprets them in relation to a (de)stabilization of the incumbent pesticide regime.

The mutually constitutive nature of policy and discourse is observable in the empirical case of this article. Stricter pesticide regulation as proposed by the Swiss popular initiatives was rejected, but the discourses that presumably led to the launch of the initiatives and that spurred the debate, particularly during the campaign phase, contributed to the opening of a political space in which policies were debated and formulated.

The main policy change that occurred during the study period is the formulation of policy targets and their implementation through a package of ordinances (FOAG, 2023). A reduction path has been engrained in the federal legislation (through an amendment of the agricultural act), aiming to reduce the risks associated with the use of pesticides by 50 % by 2027.<sup>9</sup> This aim represents a quantified risk reduction target, but not a use reduction target. Use reduction is only being implemented for pesticides with increased risk potential. These may, after an amendment of the direct payment regulation, no longer be used by farmers fulfilling the cross-compliance requirements. In addition, measures against pesticide run-off and drift are made mandatory for farmers qualifying for direct payments.

A reduction path like the one adopted was the unofficial counterproposal (in the form of a parliamentary initiative, PI 19.475 "Reducing the risk of pesticide use"<sup>10</sup>) to the pesticide initiatives. The seemingly unsuccessful delegitimizing discourse coalition has been successful in institutionalizing their pollution storylines to a certain degree. The political compromise struck is an outcome of the legitimizing coalition's reaction to the delegitimizing storylines. For example, the (D1) *water pollution* storyline was countered by the (L1) storyline of *water protection compliance*, which integrated the critique by proposing or highlighting measures against pesticide run-off and drift.

Further examples for how storylines became integrated in the policy outcomes can be observed. One measure put in place is investment support for farmers to adopt new technologies (Finger, 2021). This measure aligns very well with storyline (L3), which promoted *technology as a solution*. The development of public and private pilot projects, which also heavily focus on technology adoption, and new direct payment programs align with storyline (L2) *Alternative crop protection techniques in development or implementation*, which was in addition used to advocate for moderate reduction targets.

In summary, the formulated targets are a compromise and a step forward. However, they mainly concern the reduction of pesticide risks and not of absolute pesticide use. Moreover, no binding policy instruments have been introduced, apart from the tightening of cross-compliance requirements that farmers must fulfill to be eligible for receiving direct payments. Just like the ban of single substances, this strategy lacks the ambition to change the overall functioning of conventional agriculture, which has frequently been observed by other scholars (Levain et al., 2015; Maguire and Hardy, 2009). It must thus be evaluated as incremental and not fundamental change.

The current Swiss pesticide policy is similar to the EU's policy. However, in the EU's Farm to Fork Strategy (European Commission, 2020), the targets are more ambitious in the sense that they include the reduction of quantitative pesticide use as well.<sup>11</sup> Thus, in EU policy strategies, there are signs of a paradigm shift, from a risk reduction approach to a generic quantitative reduction approach. This

<sup>9</sup> The reference period is 2012–2015.

<sup>10</sup> See <https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaefte?AffairId=20190475>.

<sup>11</sup> The targets under the EU's Farm to Fork Strategy are "to reduce the overall use and risk of chemical pesticides by 50% and the use of more hazardous pesticides by 50% by 2030" (European Commission, 2020, p. 9).

has been interpreted as a shift towards systemic change and as a case of destabilization governance (Frank and Schanz, 2022). However, because there are also no binding policy instruments, as observed by Frank and Schanz (2022), “[...] pesticide use is reined in through a gradual tightening of regulations within the risk reduction paradigm, such as selective local application bans” (p. 253).

Concerning the Swiss pesticide regime, the discourses identified and the incremental policy change described point to an opening-up of the regime, although without amounting to a serious destabilization at any point of the discursive and political struggle. The key components of the regime, for example food production based on supplies by the agri-industry and food distribution through retail, remained unaffected. This finding corroborates the conclusion by Frank and Schanz (2022) that policy change does not necessarily amount to successful socio-technical regime change. Through the integration of some of the critique, as evident in the storylines mainly employed by the coalition around the incumbent actors and in the compromise struck in the form of a reduction path, the socio-technical regime likely managed to further stabilize.

There are two further mechanisms that probably aided the regime in stabilizing. First, the singularization process of phasing-out a few “dirty ones” in order to protect the whole (Levain et al., 2015), which in this case were the bans of neonicotinoids in 2019 and chlorothalonil in 2020. The problematization of certain aspects of pesticide use, such as water pollution through chlorothalonil residues, offered a possibility to un-tie this element from the regime. Second, a substitution effect (Levain et al., 2015) for agri-businesses that were able to open a substitution line of precision farming technologies and biocontrol products (Klerkx and Rose, 2020). The strong policy focus on such innovations may serve to protect existing regimes by detracting attention from the actual pesticide use problem (Geels, 2014).

The discourse coalition of policymakers and administration (here, federal and cantonal offices for agriculture with their associated agricultural extension centers) and incumbent firms (here, the agri-tech industry) is particularly powerful in dominating the public discourse (Lindblom, 2008) and in discursively resisting fundamental change because of the actors’ positions and media access (Geels, 2014). A key consequence of these mechanisms is that by the management of incremental change, the incumbent socio-technical regime can claim its efficiency and responsibility, thereby reinforcing regime credibility and likely achieving a stabilization in the long term (Levain et al., 2015).

#### 4.4. Limitations and directions for further research

A first limitation of the discursive analysis performed in this study is that it relied on a single data source, newspaper articles. Thus, other arenas (e.g., social media, street protests) and more covert arenas (e.g., town halls) where discursive struggles unfold may not be adequately represented. However, a focus on the media is warranted as it plays a central role in how people perceive and discuss technologies and policy (Delshad and Raymond, 2013). Further research might include other discursive arenas and for example compare insights from traditional and new media channels (Stutzer et al., 2021).

Second, only articles in German are included in this study’s database because analyzing a multilingual corpus poses several challenges that can only be addressed with sophisticated corpus linguistics. Because this study pursues a substantive rather than a linguistic interest, applying advanced corpus linguistics was beyond the scope of this research.

Third, the rather distinct categorization of newspapers into mainstream and farming newspapers inevitably lead to a disregard of internal differences in the two categories. The analysis could thus be expanded upon by a more finetuned analysis at the level of the individual newspapers instead of the two broad categories. A similar limitation applies to the use of topics as a reflection of storylines when analyzing their development over time (cf. Fig. 5). Here, the model does not seem to capture the (re)legitimizing voices in the mainstream press appropriately, nor does the linking of topics with storylines allow this. Only close-reading of a randomly selected sample of mainstream articles elucidated how (re)legitimizing storylines were also prevalent in the mainstream press.

Fourth, this paper deviates somewhat from traditional ADA that includes other steps (e.g., conducting interviews with key actors) and that places discourse coalitions more in the center of the analysis. Hence, future research could focus more on pesticide discourse coalitions, e.g., by using discourse network analysis to study how discourse coalitions, and the storylines they mobilize, change over time (Markard et al., 2021).

Fifth, because the (de)stabilization process of the pesticide regime is an ongoing one, the present empirical study cannot cover this process from beginning to end, and thus the link between discourses and regime changes is expected to remain somewhat tenuous (cf. Frank and Schanz, 2022).

Finally, an important topic for future research is to better understand not just regime resistance and stabilization but also instances of past destabilization and decline of incumbent agricultural regimes.

## 5. Conclusion

Through the combined application of computational text analysis and argumentative discourse analysis on a large corpus of 2523 newspaper articles ranging from 2011 to 2022, this study provides a nuanced understanding of current pesticide discourses in Switzerland. The analysis revealed that two broad, distinct discourse coalitions competed over pesticide legitimacy. Many non-regime actors coalesced around delegitimizing storylines that sought to induce rapid and radical change in pesticide regulation, as proposed by two popular initiatives. Legitimizing storylines were employed by actors of the pesticide regime and were used to advocate for incremental and voluntary measures that would not change the overall logic of conventional agriculture in any way.

This paper contributes to the literature on the role and the effects of discourse in agricultural transition processes. It has shown that although the delegitimizing coalition has not been successful with its proposals, its undermining of pesticide legitimacy has likely contributed to opening up political spaces and contributed to the striking of a compromise. The storylines employed have thus been

institutionalized as well, albeit incompletely. The political compromise struck is a reduction path, implemented through policy measures within the cross-compliance system. From a sustainability transitions perspective, this policy change represents an incremental improvement including technological fixes. Generally, this kind of incremental change can represent one phase of a gradual destabilization of the regime or result in its further stabilization instead.

In this paper, I argued that the discursive struggles surrounding pesticide use in Switzerland have rather resulted in a further stabilization than a destabilization of the pesticide regime. In line with prior studies, the findings suggest that the regime managed to restabilize following the emergence of disruptive discourses by adjusting and integrating some of the societal critique. Thus, the overall functioning of conventional agriculture and the paradigm of risk reduction, instead of quantitative pesticide reduction, remain unaffected. Attention to pesticide issues in the mainstream press strongly decreased after the rejection of the popular initiatives and approval of the reduction path and the package of ordinances. An exception is the biodiversity topic to which attention increased, stimulated by the United Nations biodiversity conference in 2022.<sup>12</sup> Nevertheless, the discursive struggles are likely to continue, in line with the trend of more frequent popular initiatives on agriculture such as the upcoming referenda on stricter biodiversity and landscape conservation.<sup>13</sup>

### Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

The code is available from the author upon reasonable request.

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### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.eist.2023.100777](https://doi.org/10.1016/j.eist.2023.100777).

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<sup>12</sup> See <https://www.unep.org/un-biodiversity-conference-cop-15>.

<sup>13</sup> See [https://www.bk.admin.ch/ch/d/pore/vi/vis\\_2\\_2\\_5\\_1.html](https://www.bk.admin.ch/ch/d/pore/vi/vis_2_2_5_1.html).

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