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Reforming EU Pesticides Regulation, Rebuilding Public Support: Evidence from Survey Experiments in Six Member States

an ACES policy report

Zeitlin, J.; Weimer, M.; van der Duin, D.; Kuhn, T.; Jensen, M.D.

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**Reforming EU Pesticides Regulation, Rebuilding Public
Support: Evidence from Survey Experiments in Six Member
States**

An ACES Policy Report

Jonathan Zeitlin, Maria Weimer, David van der Duin, Theresa Kuhn and
Martin Dybdahl Jensen

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Abstract

The authorization and use of pesticides in the European Union (EU) have become increasingly controversial and politically salient over the past decade. In particular the European Commission's decision to re-authorize the use of glyphosate, the active substance in Bayer/Monsanto's Roundup, after it had been classified a 'probable human carcinogen' by the International Agency for Research on Cancer (IARC), was highly controversial and triggered a lively debate on how to reform EU pesticide regulation. In this policy report, we assess whether and how specific reforms to decision-making procedures could impact public support for EU pesticides regulation, including acceptance of authorization decisions on controversial substances such as glyphosate. To do so, we first identified the main challenges of European pesticides regulation exposed by recent developments, including (but not limited to) the glyphosate controversy, as well as the actual and potential reforms proposed by the EU institutions, civil society organizations, academic commentators, and other stakeholders. We grouped these challenges and related reform proposals into four dimensions, namely: 1) the organization of the decision-making process; 2) the factors considered when authorizing pesticides; 3) sources of evidence and potential conflicts of interest; and 4) post-market monitoring and review of authorized pesticides. We then conducted a pair of linked online survey experiments on public attitudes toward reform of EU pesticides regulation in June 2020 among a representative sample of the adult population in six Member States (France, Germany, Italy, the Netherlands, Poland, and Sweden, n=9022). Our results show that the introduction of systematic post-authorization monitoring and review, and consideration of all relevant scientific studies in the authorization decision are the two most promising reforms to increase public support for pesticides regulation. Moreover, if a hypothetical glyphosate authorization decision is taken under a decision-making procedure that citizens (strongly) support, they are more likely to accept it even if they previously opposed this outcome. Our findings are particularly relevant given that glyphosate is currently again undergoing a renewal procedure in the EU.

Keywords: European Union, risk regulation, governance, pesticides, decision making, public opinion

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Executive Summary

The authorization and use of pesticides in the European Union (EU) have become increasingly controversial and politically salient over the past decade. Glyphosate, the active substance in Bayer/Monsanto's Roundup and the world's most widely used herbicide, was classified in 2015 as a 'probable human carcinogen' by the International Agency for Research on Cancer (IARC), leading to large numbers of lawsuits and high damage awards to affected users in US courts. In the EU, glyphosate's re-authorization by the European Commission in 2017 (for an abbreviated five-year period) was hotly contested, triggering broad public distrust in the adequacy of the current European regulatory framework to ensure a high level of protection for public health and the environment.

The ensuing policy debate on how to reform EU pesticide regulation has identified key challenges and produced important reform proposals. While some reforms have been implemented and others are under discussion, little is known about what the public thinks of them, and whether they could increase public support for both EU pesticides regulation and individual authorization decisions. The issue of public support is crucial for several reasons. First, the current glyphosate authorization expires in 2022 and any future EU decision on re-authorization would be undermined by the absence of public trust and acceptance of the decision-making process. Second, as part of its Green Deal the EU seeks a transition towards sustainable agriculture. The European Commission has recently committed to propose measures to reduce 'the risk and use of pesticides by 50%' by 2030, as part of its 'Farm to Fork Strategy' for sustainable food systems. Public support is crucial for future EU measures in this field. Yet, as this and earlier surveys have shown, citizens' concerns about the negative effects of pesticides on human health and the environment have increased over the past decade, while satisfaction with EU and national regulation has declined.

In this policy report, we assess whether and how specific reforms to decision-making procedures could impact public support for EU pesticides regulation, including acceptance of authorization decisions on controversial substances such as glyphosate. To do so, we first identified the main challenges of European pesticides regulation exposed by recent developments, including (but not limited to) the glyphosate controversy, as well as the actual and potential reforms proposed by the EU institutions, civil society organizations, academic commentators, and other stakeholders. We grouped these challenges and related reform proposals under four dimensions, namely: 1) the organization of the decision-making process; 2) the factors considered when authorizing pesticides; 3) sources of evidence and potential conflicts of interest; and 4) post-market monitoring and review of authorized pesticides. We then conducted a pair of linked online survey experiments on public attitudes toward reform of EU pesticides regulation in June 2020 among a representative sample of the adult population in six Member States (France, Germany, Italy, the Netherlands, Poland, and Sweden, n=9022).

In the first conjoint survey experiment respondents were asked to rank and rate randomly assigned policy packages covering all four above-mentioned dimensions of proposed reforms to

EU pesticides regulation as well as an additional fifth dimension related to food prices. The second survey experiment examined the public acceptance of individual pesticide authorization decisions using glyphosate as an example. The purpose of the second experiment was to ascertain whether citizens are prepared to accept authorization decisions taken under the ‘right’ regulatory procedure, even when such decisions go against their prior expressed preferences on policy outcomes. For that purpose, respondents were asked a number of questions to determine their knowledge of and preferences towards glyphosate. Subsequently, they were asked to review one of reform packages that they had supported most during the conjoint experiment and to state whether they would be willing to accept a decision (either ban or approval) on glyphosate based on that reform package even if it went against their prior expressed preference.

Our results show that citizens have strong views about which reforms to decision-making procedures should be adopted to improve EU pesticides regulation. Foremost among these is the introduction of systematic post-authorization monitoring and review, with the possibility of removing the pesticide from the market in the case of unexpected negative effects, which increases respondents’ probability of support for a proposed reform package by 22.1 percent. The second most strongly supported reform is the inclusion in authorization decisions of all relevant scientific studies or only studies conducted by an independent public body, each of which increases respondents’ support for a proposed decision-making procedure by 15.2 and 15.1 percent respectively relative to reliance only on studies conducted on behalf of the manufacturer. A third reform proposal that attracts substantial public approval is consideration in pesticide authorization decisions of effects on small and organic farmers (in addition to those on human health and the environment), which increases the likelihood of support among respondents by 7.7 percent.

By contrast, our respondents were less concerned about the level at which pesticide authorization takes place. Support is strongest for taking authorization decisions at a combination of EU and national levels – the current status quo – which increases the likelihood of approval of a proposed policy package by 6.1 percent relative to decision making at the national level alone and 6.6 percent relative to the EU level only. At least in this policy field, EU citizens appear to care more about how decisions are taken than about where: about the substance of the regulatory governance process itself rather than the issue of more Europe or less Europe. And even a hypothetical increase in food prices of 3 percent diminishes respondents’ probability of support for a proposed reform package by only 7.7 percent.

The most popular combination of reforms (comprising systematic post-authorization monitoring and review, inclusion of all relevant scientific studies, consideration of effects on small and organic farmers, and decisions taken jointly at EU and national levels) attracts broad support among respondents to our survey of 72.3 percent (falling to 64.7 percent if it led to an increase of 3 percent in food prices). But if the EU adopted these proposed regulatory governance reforms, would citizens be more prepared to accept pesticide authorization decisions even when they run counter to their substantive preferences, for example in cases such as glyphosate? The results of second experiment clearly demonstrate that the answer is yes. Respondents’ odds of accepting a hypothetical glyphosate authorization decision opposed to their prior expressed

preferences are more than twice as high when it is taken under a decision-making procedure they support, a probability that increases along with the strength of their support for the proposed procedure. Even for ex-ante opponents of glyphosate, who are less likely to accept a hypothetical outcome counter to their prior expressed preferences, an authorization decision taken under a procedure they support reduces the probability of opposition by 40 percent. Our study therefore provides robust evidence that the adoption of proposed reforms preferred by citizens could not only help to rebuild public support for EU pesticides regulation, but also enhance acceptance of controversial authorization decisions.

1. Introduction

The authorization and use of pesticides in the European Union (EU) have become increasingly controversial and politically salient over the past decade. Glyphosate, the active substance in Bayer/Monsanto's Roundup and the world's most widely used herbicide, was classified in 2015 as a 'probable human carcinogen' by the International Agency for Research on Cancer (IARC), leading to large numbers of lawsuits and high damage awards to affected users in US courts (Benbrook 2020). In the EU, glyphosate's re-authorization by the European Commission in 2017 (for an abbreviated five-year period) was hotly contested, triggering broad public distrust in the adequacy of the current European regulatory framework to ensure a high level of protection for public health and the environment. Such public distrust and ensuing political mobilization are reflected in a European Citizens' Initiative (ECI) to ban glyphosate, which gathered over one million signatures¹ in less than five months following the re-authorization decision. Moreover, several Member States and regions have adopted bans on glyphosate, in apparent contravention of EU law, under which authorization of active substances in pesticides should occur at European level.²

Such public controversy and political contestation have stimulated a wide-ranging debate about which reforms should be adopted to improve EU pesticides regulation. While some reforms have been implemented and others are under discussion, little is known about what the public thinks of them, and whether they could increase public support for both EU pesticides regulation and individual authorization decisions. The issue of public support is crucial for several reasons. First, the current glyphosate authorization expires in 2022 and any future EU decision on its renewal would be undermined by the lack of public trust and acceptance of the decision-making process.³ Second, as part of its Green Deal the EU seeks a transition towards sustainable agriculture. The European Commission has recently committed to propose measures to reduce 'the risk and use of pesticides by 50%' by 2030, as part of its 'Farm to Fork Strategy' for sustainable food systems (European Commission 2020a). Public support is crucial for future EU measures in this field. Yet, as survey evidence discussed in this report shows, citizens' concerns about the negative effects of pesticides on human health and the environment have increased over the past decade, while satisfaction with EU and national regulation has declined.

In this policy report, we assess whether and how specific reforms to decision-making procedures could impact public support for EU pesticides regulation, including the public acceptance of authorization decisions on controversial substances such as glyphosate. To do so, we present and analyze evidence from a pair of linked online survey experiments on public attitudes toward reform of EU pesticides regulation conducted in June 2020 among a representative sample of the adult population in six Member States (France, Germany, Italy, the Netherlands, Poland, and

¹ 1,070,865; under the Lisbon Treaty at least 1 million signatures is necessary to trigger the ECI procedure.

² For overviews of EU pesticides regulation and the glyphosate controversy, see Arcuri & Hendlin (2020); Bozzini (2018); Leonelli (2018).

³ The Glyphosate Renewal Group, a group of companies seeking its re-authorization, submitted an application in 2019. The procedure is currently at the stage of risk assessment by a group of Member States.

Sweden, n=9022). The results of these survey experiments enable us to identify clearly which reforms to EU pesticides regulation would attract greatest public support in these countries, notably the introduction of systematic post-authorization monitoring and review, and consideration of all relevant scientific studies in the authorization decision. The most popular combination of reforms would be supported by 72 percent of respondents. Our results further show that respondents would be substantially more willing to accept (or not to oppose) the outcome of a hypothetical glyphosate authorization decision counter to their prior expressed preferences if it were taken under a decision-making procedure that they (strongly) support. Our study provides robust evidence that the adoption of proposed reforms preferred by citizens could not only enhance public support for EU pesticides regulation generally, but also the public acceptance of controversial authorization decisions. These findings are particularly relevant for and should inform the undergoing re-authorization procedure for glyphosate.

This report is structured as follows. Section 2 reviews the policy debate over EU pesticides regulation, focusing on the key challenges and shortcomings identified by critics of the current framework, and discussing the major reforms proposed. Section 3 compares the results of our 2020 survey with those of a 2010 Eurobarometer survey on public attitudes towards pesticides, showing how concerns about their effects on human health and the environment have increased over the past decade, while satisfaction with EU and national regulation has declined. Section 4 presents the design and methodology of our first survey experiment on public attitudes towards the reform of EU pesticides regulation and analyzes the results of this experiment. Section 5 presents the design and methodology and analyzes the results of the second survey experiment on acceptance of a hypothetical glyphosate authorization decision taken under respondents' preferred reform package. Readers not interested in the design and methodology of these experiments can skip directly to the results (Sections 4.2 and 5.2). The concluding section summarizes our main findings, and draws out their implications for EU and national pesticides regulation.

2. The EU Pesticides Regulation Regime: Key Challenges and Reform Proposals

In this section, we review the key challenges and shortcomings of the current pesticides regulatory framework identified in the EU policy debate, and consider the major reform proposals advanced by participants in this debate, including EU institutions, civil society organizations, academic commentators, and other stakeholders. We group the issues under four main headings, which we also used to structure the dimensions and options presented to respondents in our survey experiment: 1) the organization of the decision-making process; 2) the factors considered in authorization decisions; 3) sources of evidence and potential conflicts of interest; and 4) post-market monitoring and review of authorized pesticides.

2.1 Organization of the decision-making process

a) The division of responsibilities between the EU and national level

The EU decision-making process for pesticide authorization is organized following the principles of risk analysis,⁴ on the one hand, and the separation between so called ‘active substances’ and ‘plant protection products’ (PPPs), on the other hand. The first principle is common to all areas of EU risk regulation and requires that regulatory decisions on risk-entailing products or substances are taken following a two-step process.⁵ First, a scientific risk assessment is conducted by specialized expert bodies (at the European level a specialized agency, such as the European Food Safety Authority, EFSA).⁶ The regulatory decision on whether or not to authorize then involves risk management, itself a process of ‘weighing policy alternatives in consultation with interested parties, considering risk assessment and other legitimate factors.’⁷

The distinction between active substances and PPPs means that both have to undergo separate authorization processes (the so-called ‘dual system’). Moreover, responsibilities for each are divided between the EU and the national level. Active substances are authorized at the EU level. An active substance is a chemical such as glyphosate that performs the primary function of a pesticide (e.g. killing a pest). A PPP is the actual pesticide, which apart from an active substance usually also contains other chemicals to enhance its functioning, such as synergists, solvents, and adjuvants. PPPs are authorized at the national level and may only contain active substances previously approved at the EU level.

Concerns have been raised about the functioning of this dual authorization system related to its complexity and redundancy, as well as unclear responsibility and accountability for the safety assessment and authorization of final products. The risk assessment of active substances cannot be fully separated from how those substances will be used as part of final PPP formulations.⁸ In non-EU OECD countries active substances and their formulations are typically assessed together by the same entity. According to the EU Scientific Advice Mechanism (SAM), ‘performing risk assessments distributed over EU and Member State level, as currently practiced, contributes to fragmentation of risk assessment data and methods, as well as sub-optimal use of available expertise,’ which in turn can result in duplication of work, incompatible data, and variations in the quality of scientific assessment, ‘all with the potential to produce conflicting results’ (SAM

⁴ Article 6 of Regulation 178/2002.

⁵ An additional third element of risk analysis is risk communication, see Article 3 (10) of Regulation 178/2002.

⁶ According to Article 3 (11) of Regulation 178/2002 risk assessment means a ‘scientifically based process consisting of four steps: hazard identification, hazard characterisation, exposure assessment and risk characterisation.’ At the national level it is performed by the designated national competent authorities.

⁷ See Article 3 (12) of Regulation 178/2002. At the EU level risk management is the task of the European Commission assisted by Member States following the comitology procedure; and at the national level of the national authorities assigned to this task.

⁸ The assessment of an active substance requires that at least one representative use and formulation is assessed and deemed acceptable, see SAM (2018): 14

2018: 29). Similarly, the division of risk management decisions between active substances at EU level and PPPs at the national level is likely to blur the lines of responsibility for pesticides authorizations leading to ‘confusion and lack of transparency as to where responsibility and accountability ultimately lie.’ (SAM 2018: 31)

The EU’s dual authorization system also makes it more difficult to assess the risks of mixtures of substances and cumulative effects (the so-called ‘cocktail effect’). Pesticide products can contain more than one active substance. Moreover, they typically contain multiple other ingredients, co-formulants, softeners and/or synergists. Different products are often mixed before application or once they are released into the environment (for example, when different products are applied over time). This complexity of interaction of different substances and products can result in cumulative increase of negative effects on health or the environment, in changed toxicity or to exposure via multiple routes (‘aggregate exposure’). The current EU system of authorization and post-market vigilance (on the latter see below) does not provide procedures to address this problem (SAM 2018: 37; Soil Association & Pesticides Action Network UK 2019; European Parliament 2019).

b) Decentralized authorization of PPPs by Member States

As mentioned above, the final products – PPPs – are authorized at the national level. To achieve their free circulation on the EU internal market, a zonal system has been established, within which the principle of mutual recognition is applied. Member States are grouped into three regulatory zones with similar climatic conditions: North, Central, and South. Within each zone, authorization decisions, including risk assessments, adopted by one Member State (so-called zonal Rapporteur Member State) must be accepted by the other Member States in the same zone upon application by the authorization holder.⁹

Originally designed to enhance harmonization and efficiency of pesticides approval, the functioning of the zonal system has been criticized as ineffective (European Commission 2020b; Hamlyn 2018). A lack of cooperation and coordination seems to undermine the mutual recognition of authorizations. Firstly, the uneven distribution of costs and workload within the three zones contributes to significant delays in the approval of PPPs, as some Member States face a high workload. According to the European Parliament, France, the Netherlands, Germany and the UK have dealt with about 80 percent of all dossiers (European Parliament 2019). Secondly, the quality of the assessments seems to differ among Member States, due at least partially to significant differences among the Member States in expertise and personnel (European Parliament 2019). National competent authorities are often understaffed and/or underfunded (European Parliament 2018). There are concerns that such resource limitations could in turn undermine effective safety evaluation of PPPs (SAM 2018; European Parliament

⁹ See Articles 40 and 41 of Regulation 1107/2009 for details of the so-called mutual recognition procedure. Member States from other zones *may* accept the authorization decisions.

2018a).¹⁰ In addition, guidelines for the evaluation of PPPs are not fully harmonized across Member States (Bozzini 2018; European Parliament 2018a). The resulting differences in the assessment of PPPs undermine trust among national regulators, further complicating an effective functioning of the zonal system (Hamlyn, 2018).

Another point of criticism concerns Member States' use of so-called emergency authorizations.¹¹ Envisaged as a last resort measure to address emergency situations of plant protection, the derogation clause allows national authorities to authorize PPPs temporarily outside of the standard authorization procedure. The use of such authorizations has significantly increased over the last decade. According to reports, the derogation clause is often misused to address situations other than emergencies and to address the delays in the authorization process (European Commission 2015; 2017b; Pesticides Action Network 2017; Milieu Ltd 2018; Dedieu 2021).

c) EU-level authorizations of active substances through comitology

EU risk management decisions on the authorization of active substances are taken following the so-called comitology procedure. Formally, when drafting the proposal for an authorization decision the European Commission considers EFSA's risk assessment and 'other legitimate factors' and is guided by the principles of precaution and proportionality.¹² It consults other Commission services and the applicant. It also consults the Standing Committee on Plants, Animals, Food and Feed (PAFF), composed of Member States authorities. In practice, however, comitology decision-making is criticized for being secretive and revealing little about which concerns have actually been considered in what way in reaching the final decision (Bozzini 2017: 50; Pesticides Action Network 2012).

Moreover, in controversial cases, such as glyphosate, the current voting rules allow the Commission to adopt authorization decisions against a majority vote of Member States representatives in the PAFF. In most cases, comitology decisions are taken by consensus, but where Member States oppose a Commission proposal, a vote is required, which recent research shows occurs over 20 percent of the time (Fernández et al. 2020). Member States in the PAFF Committee can either approve or reject the Commission proposal by a qualified majority of its members.¹³ In cases such as glyphosate, Member States have typically failed to produce a qualified majority, resulting in a so-called 'no-opinion' vote (Weimer 2019; Tosun et al. 2019). The Commission is then in principle entitled to adopt its decision even though a majority of

¹⁰ According to SAM (2018: 28): 'concerns have been expressed by experts that some Member States lack up-to-date risk assessment methods and expertise capacity, resulting in over-reliance on EU-level risk assessments of active substances for their decisions on PPPs (Expert Elicitation). It is of concern that actual uses and formulations of authorised PPPs may not have been subjected to the same rigorous risk assessments as the representative uses and formulations proposed in the active substance application.'

¹¹ Article 53 of Regulation 1107/2009.

¹² See Article 13 (2) of Regulation 1107/2009 and Article 7 of Regulation 178/2001.

¹³ Article 5 of Regulation 182/2011.

Member States have either abstained or voted against the authorization. This undermines the accountability of the process and shifts the responsibility from Member State representatives to the Commission (Weimer 2019). Moreover, the voting behaviour of Member States representatives in the PAFF committee is not made public, thus making it difficult for citizens to hold Member States accountable for their votes on controversial issues. In 2017 the Commission has proposed to overhaul the comitology voting rules for such cases, in order to allow for more accountability and voting transparency (European Commission 2017a; Weimer 2017). This proposal is currently proceeding slowly through the ordinary legislative procedure.

2.2 Factors considered in the authorization process

There is an ongoing discussion among regulators, stakeholders and academics about what factors, beyond scientific evidence, should be considered when deciding whether or not to authorize a pesticide. It is widely recognized that risk management decisions involve the weighing of policy alternatives and the consideration of ‘other legitimate factors’ alongside the scientific risk assessment. This is because risk regulation in general and decision making on pesticides in particular touch upon issues that go beyond public health and safety. Instead, pesticides regulation is closely linked to the wider debate about sustainable agriculture and the EU’s pursuit of a sustainable food system (European Commission 2020a, 2020c).

EU pesticides legislation pursues a number of different and sometimes conflicting objectives, namely to ensure a high level of protection of human and animal health and the environment, to improve the functioning of the internal market, and to improve agricultural production.¹⁴ Several past and ongoing regulatory controversies in the agri-food field – e.g. GMOs, glyphosate, neonicotinoids, endocrine disruptors – have demonstrated that tensions often arise in the pursuit of these different goals. They have also demonstrated that the issues which give rise to controversy go beyond the short-term safety of risk-entailing products. Rather, perception of risks is entwined with that of the overall socio-economic costs and benefits of such products, which in turn is influenced by different understandings of issues, such as food security, sustainability, and long-term ecological impact (Weimer 2019; SAM 2018).

There is disagreement, however, to what extent these so-called ‘other legitimate factors’ should influence EU risk management decisions. On the one hand, under the EU Green Deal agenda, and more specifically the Farm to Fork Strategy, the EU aims to reduce the use of chemical pesticides by 50 percent by 2030 in order to “secure a fair, healthy and environmentally friendly food system,” indicating that considerations of fairness should play a role in regulatory decision-making. Moreover, according to the European Parliament, pesticides regulation and its reform should consider a broad set of factors such as ‘quality, safety, availability and affordability of food for consumers, fair income for, and long-term sustainability of, agricultural production, climate change, and the short-term and long-term risks and benefits to human and animal health and the environment.’ (European Parliament 2019).

¹⁴ Article 1 (3) of Regulation 1107/2009.

On the other hand, concerns have been raised that consideration of 'other legitimate factors' is likely to further politicize the process of risk management, undermining its evidence-based nature. Moreover, EU regulators, particularly the European Commission, struggle to integrate such factors systematically into the risk management process (Weimer 2019; Kritikos 2009). A 2018 REFIT evaluation of the General Food Law concluded that 'EU risk managers have considered other legitimate factors in addition to the scientific opinions of EFSA in deciding the appropriate measures to be taken in very few cases.' (European Commission 2018b) On the one hand, the Commission seems to follow a strictly evidence-based approach, which privileges scientific evidence on product safety over broader socio-economic considerations, such as agricultural sustainability. On the other hand, the Commission is sometimes forced to react to politicization. In the case of glyphosate, it justified the reduction of the approval period to 5 years with reference to the need to consider the view of the European Parliament, other legitimate factors and a considerable public debate (European Commission 2017c: 9).

2.3 Sources of evidence and potential conflicts of interest

Under EU law scientific risk assessments used in risk regulation must be independent, objective and transparent.¹⁵ The glyphosate controversy has raised concerns over the independence and transparency of regulatory risk assessments on pesticides, both related to the role in the authorization process of private applicants as well as of industry-generated scientific evidence. A major challenge is to secure the provision of relevant scientific expertise that can keep up with the changing nature of pesticides, the complexity of their interactions as well as the rapid pace of new scientific and technological development. EFSA does not have its own laboratories, research staff or budget to commission research, but relies on expertise and research coming from other sources. Public research (at national scientific authorities or universities) tends to be underfunded (European Commission 2018a: 36). A large body of specialized research on pesticides is generated or funded by the industry itself.

Under EU regulation, the burden of proving the safety of the product to be marketed falls on the applicant requesting authorization. That means that the applicant carries out so-called pre-market assessment studies, which in turn must be performed in Good Laboratory Practice (GLP)-accredited test facilities. Such facilities must follow GLP principles and are audited by local regulators. The scientific evidence generated serves as the main basis for the subsequent risk assessment carried out by public bodies, such as EFSA. This reliance on privately generated evidence has been criticized for being insufficiently transparent and for potentially undermining the independence and objectivity of the risk assessment (Storck et al., 2016). In particular, the fact that the applicant directly funds the research, selects the GLP laboratory, and can request results or other data of the tests to be treated as confidential (such as personal data, commercially sensitive or proprietary data), is considered problematic (SAM 2018: 38). Concerns have also been raised with regard to potential conflicts of interests within the GLP contract

¹⁵ Article 6 (2) of Regulation 178/2002.

laboratories, as cases of fraud and falsification of data have been reported (Robinson et al. 2020: 23).

Transparency and public access to all studies, data and information on which risk assessments of pesticides are based are seen as crucial for securing public trust in EU regulation (European Parliament 2019). In the aftermath of the recent glyphosate re-authorization, several actors have raised concerns over the lack of transparency of the risk assessment process (European Parliament 2019; SAM 2018; European Commission 2017c; European Commission 2020b; Paskalev 2019) and have demanded improvements. In the meantime, the Commission has responded to such demands by proposing an amendment to the General Food Law Regulation, which was adopted by the Council and the European Parliament in June 2019,¹⁶ and which entered into force on 27 March 2021. This amendment creates an obligation to proactively publish all data – except duly justified confidential information¹⁷ – provided by the applicant as part of the authorization application for active substances early in the process. Moreover, an EU register of commissioned GLP studies is to be created, and the Commission is now able to conduct fact-finding missions in Member States to assess testing facilities and their compliance with the relevant GLP standards for studies submitted to EFSA.

Finally, conflicts of interests can also occur within public regulatory agencies responsible for risk assessment undermining their independence. Regulatory agencies at both national and EU level have been criticized for their close ties with the regulated industry, revolving doors as well as inadequate and non-transparent conflict of interest policies. For example, the German Federal Institute for Risk Assessment, which acted as the national risk assessor of glyphosate, has been criticized for conflicts of interest (Clausing et al. 2018) as well as for incorporating industry assessments into its risk assessment without referencing the source (European Parliament 2019). Moreover, EFSA has been criticized because nearly half of all its experts sitting on scientific panels were found to have financial conflicts of interests with agribusiness and the food industry (Robinson et al. 2020). This has led EFSA to adopt a new independence policy prescribing, among other things, a two-year cooling off period for its employees. Nonetheless, there is continuing criticism over conflicts of interests at EFSA, which in 2018 led the European Parliament (2018b) to refuse to discharge the Authority's annual budget.

2.4 Post-market monitoring and vigilance of authorized pesticides

There is a growing concern over the widespread and prophylactic use of pesticides and the effects thereof on health and the environment. Systematic consideration and integration of such effects into the authorization process would require a system of post-market vigilance. Currently, information about exposure to pesticides in the EU, both in terms of effects on health and the

¹⁶ Regulation (EU) 2019/1381 on the transparency and sustainability of the EU risk assessment in the food chain, OJ (2019) L 231/1.

¹⁷ Note that confidentiality does not apply in cases of urgent action to protect health or the environment as well as for information forming part of conclusions of scientific outputs delivered by the EFSA, see new Article 39 of Regulation 178/2002.

environment, is patchy and insufficiently systematic, particularly concerning environmental effects and exposure of agricultural workers (SAM 2018; European Parliament 2019).

Investigations of adverse effects of a pesticide when used at a large scale are mostly limited to the testing of maximum residue levels (MRLs) in food (Milner & Boyd 2017). However, the impact of large-scale pesticide use on the environment falls outside the scope of the regulatory regime. Moreover, while the industry is required to submit information to the European Commission regarding potentially dangerous effects of pesticides discovered after authorization, submission of new information ultimately depends on whether industry actors interpret information to be worthwhile to report. It is also unclear what exactly industry should be measuring (Milner and Boyd 2017).¹⁸ In addition to the collection of data on pesticide use, there are demands to make such data publicly available (Pesticides Action Network 2018).

The collection and public provision of data on the 'real-life' application of pesticides would also help to address the shortcomings of the risk assessment as discussed above as it would allow better assessment of the cumulative and synergetic effects of pesticides use on both health and the environment.

A number of commentators have called for the introduction of an effective post-authorization vigilance system to systematically monitor the real-life impacts of pesticides use (European Parliament 2019; SAM 2018; Pesticides Action Network 2018; Milner & Boyd 2017). SAM considers both an improvement of human biomonitoring (mandatory monitoring of exposure and health directly following the market authorization through cohort studies) and of post-market environmental monitoring as necessary. The latter should include monitoring of the concentration of and exposure to PPPs and their metabolites in soil, water, and target and non-target living organisms. Given the parallels observed between pesticides and pharmaceuticals (particularly antibiotics) in terms of use and unintended side-effects on health and the environment, it has been proposed that the EU's current system of pharmacovigilance could serve as a model for a future system of 'pesticidovigilance' or 'phytopharmacovigilance' (as it is called in France) (Milner and Boyd 2017).¹⁹ Such post-market vigilance systems form part of a broader shift in contemporary regulation under conditions of high uncertainty and rapid technological change from ex-ante authorization or proscription of products and business practices to ex-post monitoring and review in order to detect and remedy possible negative effects, which is also visible in other fields such as offshore oil and gas safety and competition policy (Sabel et al. 2017; Kessler & Sabel 2021; Svetiev 2020).

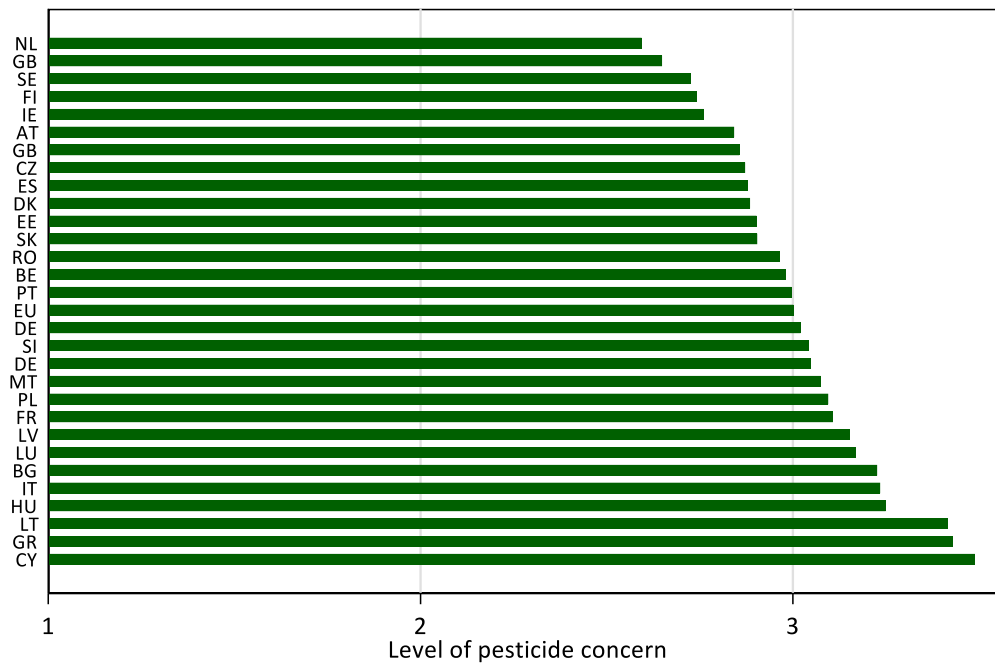
¹⁸ The authors of a White Paper published by the Pesticide Action Network Europe note that even though the current regulation requires the monitoring of 'the volume and type of pesticides used by farmers, the location, and what restrictions were applied; environmental levels of pesticides; exposure levels of farm animals and humans, including bystanders and residents living near sprayed fields', this monitoring is usually not carried out in practice (Pesticide Action Network, 2018: 24).

¹⁹ At national level phytopharmacovigilance programmes of this kind have already been initiated in Denmark and France. On the EU-level system of pharmacovigilance, see Martinsen & Schrama (2021).

3. Public Attitudes towards Pesticides Regulation in Europe: What We Already Know

Before delving into the results of our own study, it is useful to review existing research on public opinion towards pesticides regulation in the European Union. There is a dearth of research on this topic, and to our knowledge only one cross-national survey to date has systematically assessed what people think of pesticides and their regulation in Europe. In 2010, Eurobarometer conducted a survey including a special battery of questions concerned with food risk in 28 countries.²⁰ Respondents were asked to what extent they were worried about pesticide residues in fruit, vegetables and cereals and responded on a 4-point scale, labelled 'not at all worried,' 'not very worried,' 'fairly worried,' and 'very worried'. Figure 1 shows levels of public concern across all countries included in the Eurobarometer survey, as well as the EU average. Across the EU, respondents had an average score of 3.00 ('fairly worried'), with country-averages ranging from 2.59 (Netherlands) to 3.49 (Cyprus). Generally, citizens of southern Member States seem to have been more concerned about pesticide use than their northern counterparts. In addition, this graph shows that already in 2010, public concern about pesticides was fairly high.

Figure 1: Average levels of pesticide concern by country

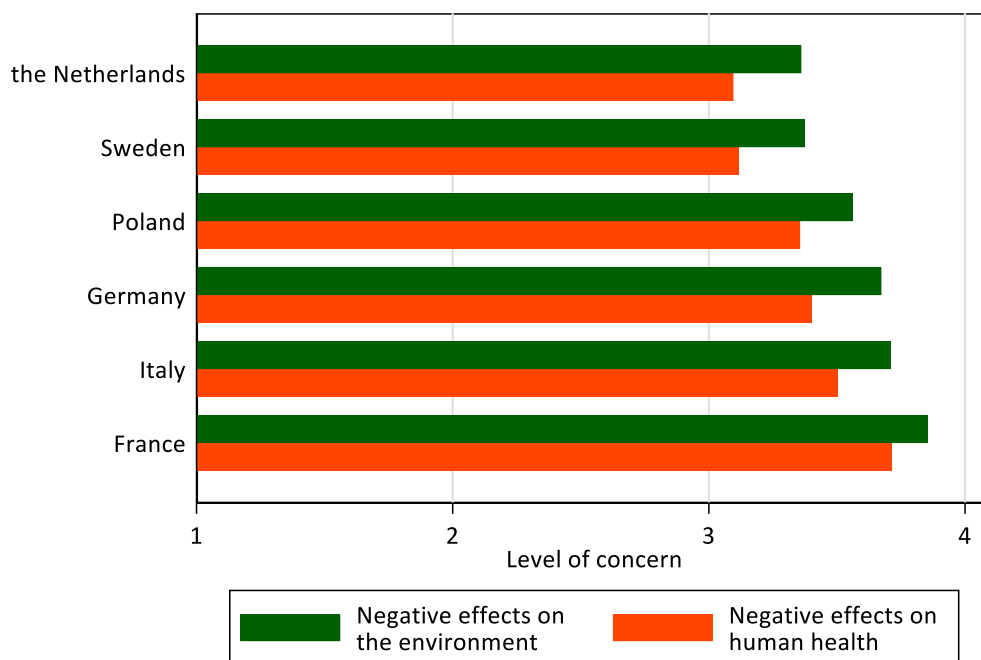


Note: Pesticide concern is measured on a scale from 1 ("not at all worried") to 4 ("very worried").
Data: Eurobarometer 73.5 (2010).

²⁰ The survey can be found at <https://www.gesis.org/en/eurobarometer-data-service/survey-series/standard-special-eb/study-overview/eurobarometer-735-za-5235-jun-2010>.

These results are comparable to our data collected in France, Germany, Italy, the Netherlands, Poland, and Sweden in 2020. In our survey²¹, respondents expressed their concern about the negative effects of pesticides on human health and on the environment in two separate items, on a scale from 1 ('not concerned at all') to 5 ('extremely concerned'). Figure 2 shows that the results from these items are similar to the results of the Eurobarometer survey, both in terms of overall levels and the levels of the particular countries. Similar to the Eurobarometer results, citizens of the Netherlands are the least concerned about pesticide use relative to the other countries in our sample. Also similar to the Eurobarometer results, citizens of France and Italy rank relatively high in terms of pesticide concern. In addition, a comparison between these figures suggests that our sample of countries accurately represents the range within which concern about pesticides varies between EU Member States, as only four countries scored higher in pesticide concern in the Eurobarometer survey than any of the countries included in our sample, and none scored lower. Lastly, our data show that people are more concerned with the negative effects of pesticides on the environment than on human health.

Figure 2: Average levels of concern with different types of pesticide effects

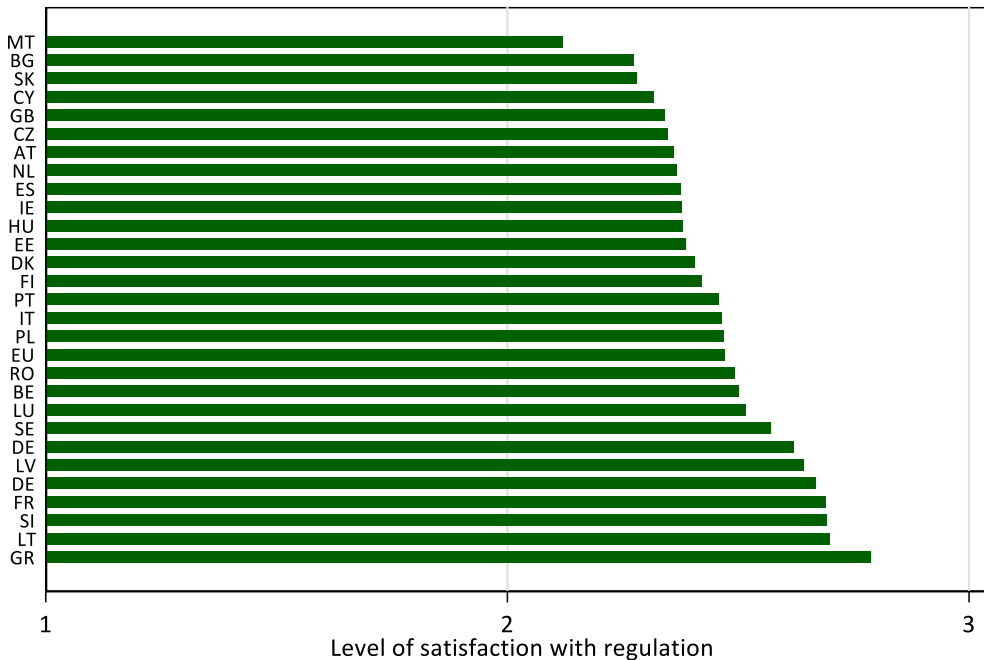


Note: Concern about pesticides is measured on a scale from 1 ("not concerned at all") to 5 ("extremely concerned"). Data: ACES pesticides survey 2020

²¹ For more information on the research design of our survey, including rationale of country selection, sampling, and representativeness, please refer to section 4.1.

In addition, the Eurobarometer survey 2010 asked respondents whether they consider the effort of public authorities in the European Union to protect people from possible risks of chemical contamination of foods to be sufficient. This question referred to risks stemming from pesticide residues in particular, and was answered on a scale from 1 to 4, labelled with 'no, certainly not,' 'no, probably not,' 'yes, probably' and 'yes, definitely.' Figure 3 shows that the EU-27²² average for this question was 2.47, indicating that on average people felt neither particularly protected nor unprotected. In this instance, there is no clear pattern in terms of cross-country differences. For example, neither geographic location nor welfare levels seem to relate to levels of perceived sufficiency of the protection from possible risks of chemical contamination of foods in the EU. However, it can be noted that for the countries that were included in the ACES pesticides survey, the Eurobarometer results show that in 2010 people in the Netherlands were least satisfied, while those in France were most satisfied, which correlates with their respective levels of concern.

Figure 3: Average levels of perceived sufficiency of the regulation of chemical contamination of foods in the European Union



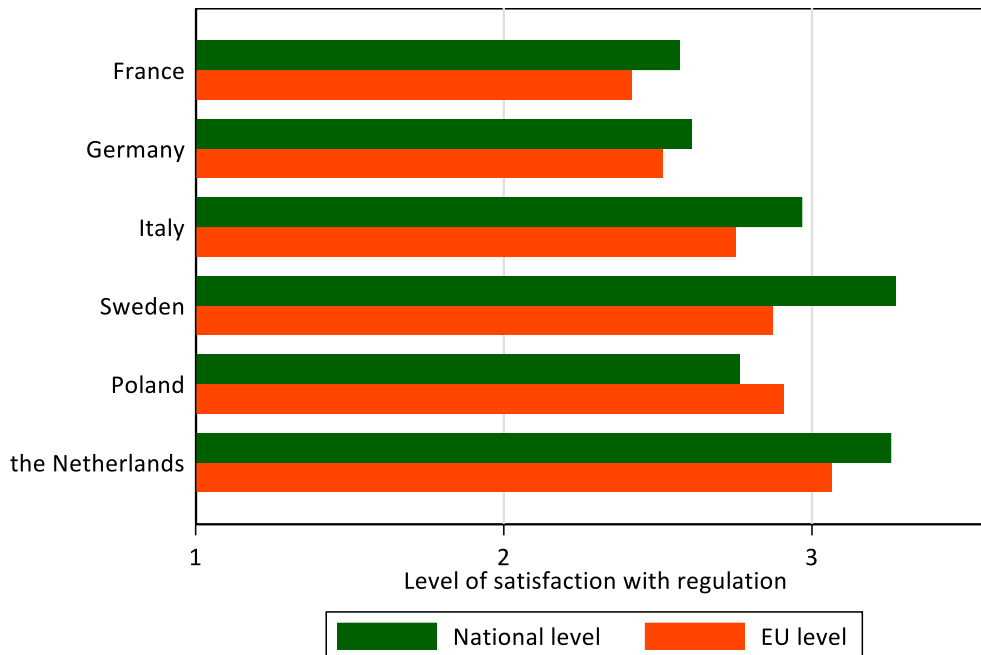
Note: Satisfaction with regulation is measured on a scale from 1 ("No certainly not") to 4 ("Yes definitely"). Data: Eurobarometer 73.5 (2010)

These results can again be compared to our own data collected in 2020. Our survey asked respondents to indicate their satisfaction with pesticide regulation in their country and in the EU by reacting to the following statements: 'The public authorities in [country] are doing enough in order to protect people from food safety and health risks from the use of pesticides' and 'The

²² The 2010 survey included all EU member states at that time, i.e. EU-27 here includes the UK but not Croatia.

public authorities in the European Union are doing enough to protect people from food safety and health risks from the use of pesticides.’ In most countries, the average score was lower than 3 (‘neither agree or disagree’) for both EU and national regulation, indicating (slight) dissatisfaction. Moreover, in most countries in our study people were slightly more satisfied with national than EU regulation, although the opposite is the case for Poland. In comparison to the results of the 2010 Eurobarometer data, the level of satisfaction is somewhat lower in our 2020 data. This suggests that opinion on this issue has slightly shifted between these two surveys.

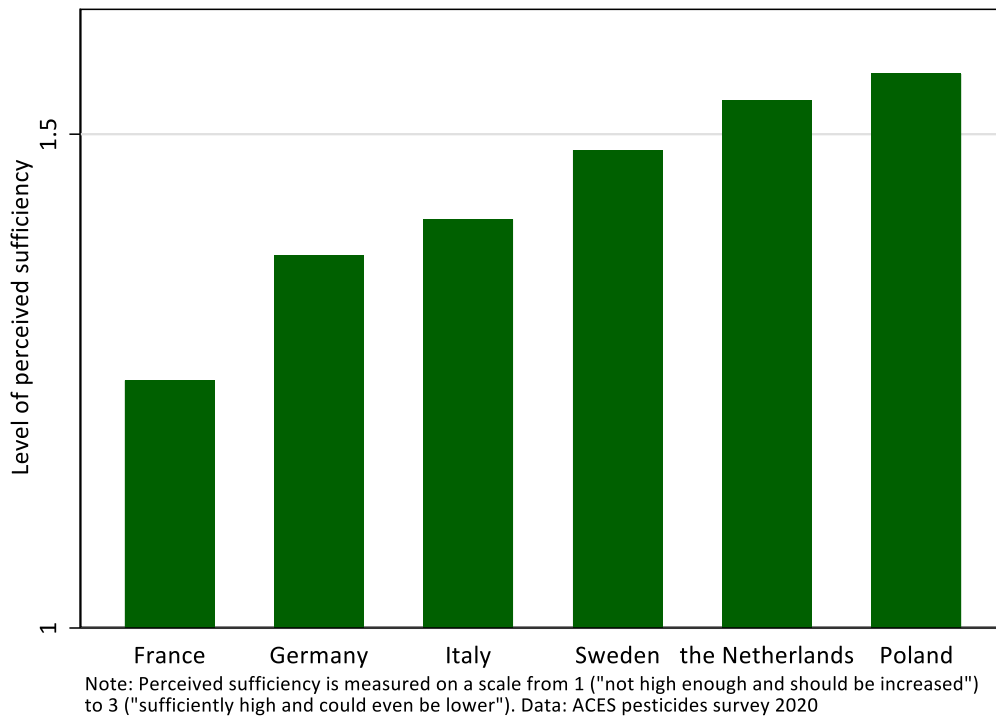
Figure 4: Satisfaction with regulation of pesticide risks for human health at different regulatory levels



Note: Satisfaction with regulation is measured on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). Data: ACES pesticides survey 2020

Respondents in the ACES pesticides survey also indicated the extent to which they considered the regulation of pesticides in the EU to be sufficient or not to protect the environment. The resulting data, presented in figure 5 below, show that in all countries in our sample, respondents on average lean towards the view that the level of regulation should be higher. Compared to the Eurobarometer data, our results again suggest that public opinion has shifted towards a more negative view of the adequacy of the current pesticides regulatory regime over the past decade.

Figure 5: Perceived sufficiency of pesticide regulation in the EU to protect the environment by country



4. Survey Experiment 1: Public Attitudes toward the Reform of EU Pesticides Regulation

The discussion above provided an overview of the main shortcomings of European pesticides regulation exposed by recent developments, including (but not limited to) the glyphosate controversy, as well as the actual and potential reforms proposed by the EU institutions, civil society organizations, academic commentators, and other stakeholders. A central aim of these proposals is to rebuild public support and confidence in EU pesticides regulation. But which of the proposed reforms would European citizens prefer, and how would they impact public support for EU pesticides regulation? To answer this question, we conducted a conjoint survey experiment in which a representative sample of respondents from six Member States were asked to rank and rate randomly assigned policy packages covering five dimensions of proposed reforms to EU pesticides regulation. Section 4.1 explains the design and methodology of the conjoint experiment, including the setup of the survey as a whole, while Section 4.2 analyses its results.

4.1 Survey design and methodology

Survey and sampling procedure

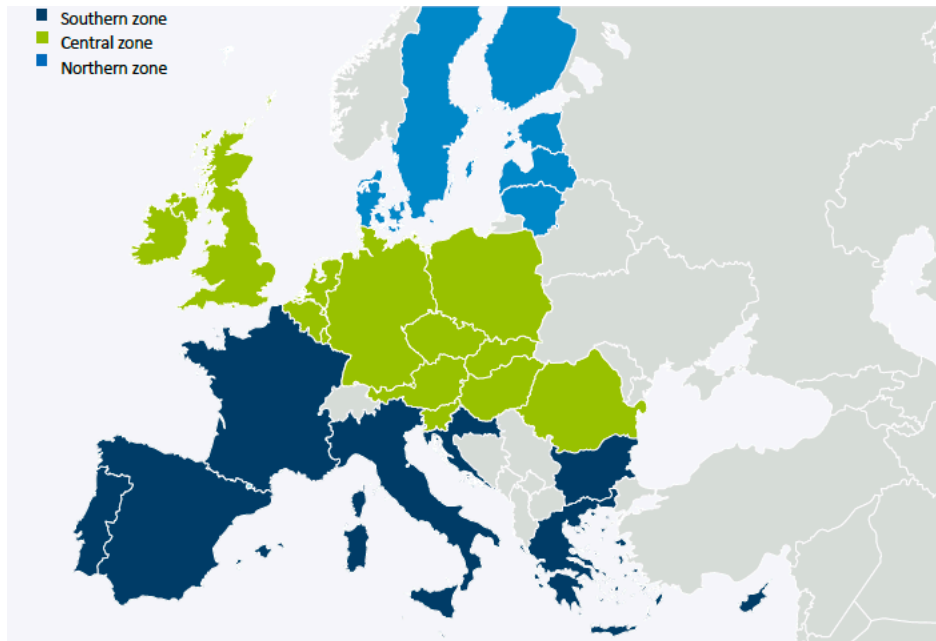
We conducted the survey in June 2020 in six EU Member States: France, Germany, Italy, The Netherlands, Poland, and Sweden, with a sample of 1500 respondents per country, for a total of 9000 respondents. The sample was drawn randomly. However, quotas for demographic categories, derived from Eurostat statistics, were used in order to ensure that each country sample is representative of the adult population across the following categories: age, gender, education and NUTS1 region. The data collection was carried out by means of the online panels of survey company IPSOS. The survey was translated into the countries' main language, and accessed on personal computers and mobile devices. of residence.

Country selection

The countries in our survey were selected to capture as far as possible the variation among EU Member States in terms of the following indicators: GDP, size of the agricultural sector, structure of the agricultural sector (the relative size of organic versus intensive farming), average quantity of pesticides used, membership of different agricultural zones as determined by European regulation (shown in Figure 6 below),²³ voting behavior on the related issue of GMO authorization in the Council of the EU, and the duration of the countries' EU membership. Appendix Table A.1 shows a per-country specification of these characteristics, with the exception of voting behavior on GMOs in the Council of the EU, which can be found in Mühlböck and Tosun (2018). In terms of voting behavior on the re-authorization of glyphosate in 2017 (information about which was not available to us when we designed our survey), two countries in our sample voted no (France and Italy), while four countries voted yes (Germany, The Netherlands, Poland, and Sweden), as shown in Figure 7 below. One country (Germany) changed its vote at the last minute from abstain to positive at the personal insistence of the Minister of Agriculture, provoking a political crisis in the caretaker coalition government (Tosun et al. 2019; Kudsk & Mathiassen 2020). The selected countries thus provide a good cross-section of national positions within the EU on glyphosate re-authorization. In January 2020, the six countries in our survey had a combined population of 255.8 million, comprising 57.2% of that of the EU-27 (own calculations from Eurostat Data Explorer).

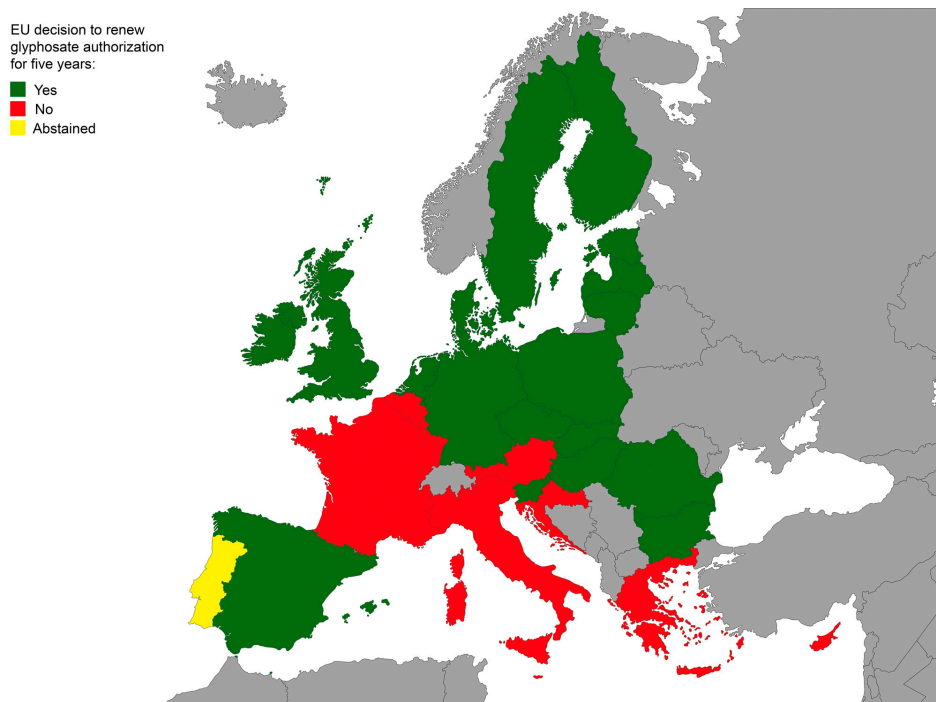
²³ As explained in Section 3, these zones play an important role in the current pesticide regulation regime. Member States are grouped into three zones (northern, central or southern) according to agricultural, plant health and environmental conditions. Member States are expected to collaborate with the others in their zone in pesticides regulation, while the principle of mutual recognition applies for pesticides only to countries within the same zone.

Figure 6: Zonal authorization system



Source: European Commission (2018a: 21)

Figure 7: Voting on glyphosate re-authorization December 2017



Source: Kudsk & Mathiassen (2020: 217)

Conjoint survey experiments: method and rationale

Conjoint survey experiments are an established method for analyzing respondents' stated preferences on complex and multidimensional issues (Bansak et al. 2021, Hainmueller et al. 2014). They have clear advantages compared to conventional survey designs as they provide finer-grained information on preferences than conventional survey questions and they shed light on how the design of a policy (or programme, candidate, or whatever the subject of interest is) influences support. In a nutshell, conjoint experiments ask respondents to rate and rank different hypothetical profiles of policies that randomly vary on a number of crucial dimensions. Conjoint survey experiments thus allow researchers to make causal claims about how the specific design of a policy or programme influences public support (Hainmueller, et al. 2014). Researchers can analyze how public support for a policy correlates with variation on specific dimensions, and they can also elicit how respondents deal with trade-offs between specific dimensions that they face when evaluating different policies.

For these reasons, conjoint experiments have long been a popular method across disciplines such as economics (Hanley et al. 1998), sociology (Jasso & Rossi 1977), and marketing research (Carroll and Green 1995). They have entered the political science mainstream only recently but have since been widely used to study a wide range of topics such as public support for international climate (Bechtel and Scheve 2014) and trade agreements (Hahm et al. 2020), attitudes towards immigrants (Hainmueller & Hopkins 2015), and support for European unemployment insurance (Kuhn et al. 2020). The Amsterdam Centre for European Studies (ACES) has built up substantial expertise in conducting conjoint survey experiments on EU policy issues, including unemployment risk sharing, fiscal capacity, corona bonds, and joint vaccine procurement (Vandenbroucke et al. 2018; Beetsma et al. 2020; de Ruijter et al. 2020; Bremer et al. 2021).

A common concern is that conjoint experiments overload respondents with too much and too complex information and hence make it difficult for ordinary people to make an informed choice. However, research suggests that this concern is not warranted as respondents have been shown to give valid and robust answers even in conjoint experiments with unusually high numbers of dimensions and attributes (Bansak et al. 2018).

Our conjoint survey experiment

In our case, the conjoint survey experiment asked respondents to choose between, and rate their preference for, two proposals for the reform of the EU pesticide regulation regime. The experiment was introduced by a frame, which was composed to be as neutral as possible. The text of this frame is as follows:

'Pesticides are chemicals used to prevent pests from damaging food crops and other plants. Many farmers rely on pesticides to grow crops in large quantities at low costs. But pesticides can also have negative effects, for example on human health and the environment.

The European Union and national authorities therefore regulate the use of pesticides. Recently, the procedures for European pesticide regulation have become controversial, and multiple options for their reform are under discussion.

We would like to hear your opinion about different ways to regulate the use of pesticides. In a moment you will be shown alternative procedures for pesticides regulation. You will be asked to indicate which procedures you prefer (or dislike the least), and how much you support or oppose them. People have different opinions about this issue, and there are no right or wrong answers.’ Subsequently, respondents moved on to the first iteration of the experiment. Each iteration of the experiment was headed by the text ‘A manufacturer submits a new pesticide for approval. How should the decision be taken? Please consider the following two options.’ Respondents were shown two randomly drawn profiles of decision-making procedures and were subsequently asked to rate and rank the profiles.

The profiles of the conjoint experiment itself varied on five dimensions, with two or three distinct options each. The options shown for each dimension in each proposal were randomly drawn from a prepared set. An overview of the dimensions and options is shown in Table 1 below. The first four dimensions in the conjoint experiment were designed to cover the key challenges and proposed reforms of EU pesticides regulation identified in Section 3 above, while also being readily understandable to respondents. Thus D1 on the level of decision-making takes up a central issue concerning the organization of the decision-making process, D2 addresses the debate on which factors should be considered in authorization decisions, D3 deals with the sources of evidence to be considered in risk assessments, and D4 takes up the question of post-market monitoring and vigilance of authorized pesticides. D5 on the possible effects on food prices is included in the conjoint experiment as a discipline on respondents’ support for proposed reforms to EU pesticide regulation, encouraging them to reflect on possible trade-offs between the costs and benefits of a given policy package. The numerical amounts of the increase in food prices (1 percent and 3 percent) are purely hypothetical, as it is extremely difficult to predict with any degree of accuracy the likely economic impact of regulatory reforms, especially in the longer term, as farmers and manufacturers develop alternatives to existing chemical pesticides.

Table 1. Overview of conjoint experiment dimensions and options

		The European Union level only.
D1	At what level is the decision taken?	The national level only.
		A combination of the EU and national levels.
D2	What other factors are considered in the decision, in addition to the effects on human health and the environment?	The effects on small and organic farmers. The effects on the international competitiveness of European farmers. No additional factors.
D3	What sources of scientific evidence are considered in the decision?	Only scientific studies conducted on behalf of the manufacturer.

All relevant scientific studies.

Only scientific studies conducted by an independent public body.

D4	If the pesticide is approved, are its effects systematically monitored?	No systematic monitoring after the approval decision. Yes, there is systematic monitoring, with the possibility of removing the pesticide from the market in the case of unexpected negative effects.
D5	How will this decision-making procedure affect food prices?	Food prices will stay the same. Food prices will rise by 1%. Food prices will rise by 3%.

After each iteration of the experiment, respondents were asked three questions. First, they were asked which of the two proposals they preferred, resulting in a proposal choice variable. Second, they were asked for the first proposal how much they support it, with 5 answer categories ranging from 'strongly oppose' to 'strongly support,' resulting in a proposal rating variable. Third, they were asked for the second proposal how much they support it.

Figure 8 shows a concrete example of what the experiment looked like for respondents.

Figure 8: Experiment sample

Current question: Block_Conjoint, questiontype: info

A manufacturer submits a new pesticide for approval. How should the decision be taken? Please consider the following two options.

	Option 1	Option 2
What other factors are considered in the decision, in addition to the effects on human health and the environment?	The effects on the international competitiveness of European farmers	The effects on the international competitiveness of European farmers
If the pesticide is approved, are its effects systematically monitored?	Yes, there is systematic monitoring, with the possibility of removing the pesticide from the market in the case of unexpected negative effects	No systematic monitoring after the approval decision
What sources of scientific evidence are considered in the decision?	All relevant scientific studies	Only scientific studies conducted on behalf of the manufacturer
At what level is the decision taken?	The European Union level only	The national level only
How will this decision-making procedure affect food prices?	Food prices will rise by 1%	Food prices will stay the same

Which one of the two options do you prefer (or dislike the least)?

Option 1
 Option 2

How much do you support or oppose option 1?

Strongly support
 Somewhat support
 Neither support nor oppose
 Somewhat oppose
 Strongly oppose

How much do you support or oppose option 2?

Strongly support
 Somewhat support
 Neither support nor oppose
 Somewhat oppose
 Strongly oppose

14%

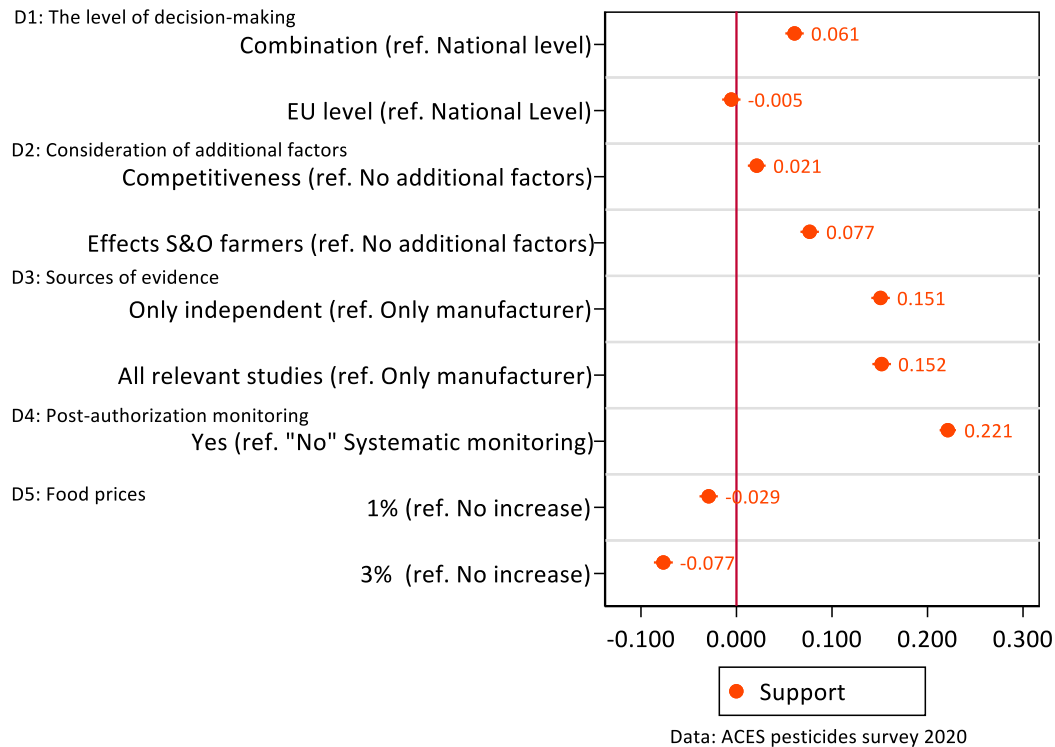
The exercise was repeated three times, and thus each respondent ranked three profile pairings and rated six profiles in total. In addition to the options for the dimensions, the order in which the dimensions appeared was also randomized, with the single exception of the ‘food price’ dimension (D5), which always appeared last, in order to avoid priming respondents’ reactions to the other dimensions. At the same time, however, the order in which the dimensions were shown to each respondent remained fixed, and did not change across successive iterations of the experiment.

The survey also included questions concerning demographic characteristics, attitudes toward pesticides, attitudes toward the current pesticide regulation regime, pesticide knowledge, political ideology, trust in governmental and private actors and identity. The complete questionnaire can be found in the Appendix.

4.2 Results

In what follows, we analyse proposal support, which equals 1 if the proposal rating variable is 4 ('somewhat support') or 5 ('strongly support')²⁴, and 0 otherwise. Figure 9 tells us how each particular characteristic of the reform proposals individually influences support for the reform. Following established standards in conjoint analysis, Figure 9 shows 'average marginal component effects' (AMCEs) for each dimension in the full sample of 9000 respondents across the six countries. 'The AMCE measures the average causal effect of changing the treatment for a given dimension on the likelihood that a package will be supported or chosen, holding the treatments for all other dimensions the same' (Beetsma et al. 2020: 19). A positive AMCE means that a particular characteristic increases support, while a negative effect refers to decreasing support. The statistical analysis underlying this figure can be found in Appendix Table A.2, including information on the (mostly negligible) effects of the individual control variables. Robustness checks are discussed in the Appendix.

Figure 9: Proposal support: Average marginal component effects



²⁴ As the levels of the dimensions are completely randomized across iterations of the experiment, the models can be estimated using OLS regression (Hainmueller et al., 2014). In addition, all models presented below control for age, gender, education (8-level ISCED classification), income (subjectively rated on a 5-point scale) and country-level fixed effects.

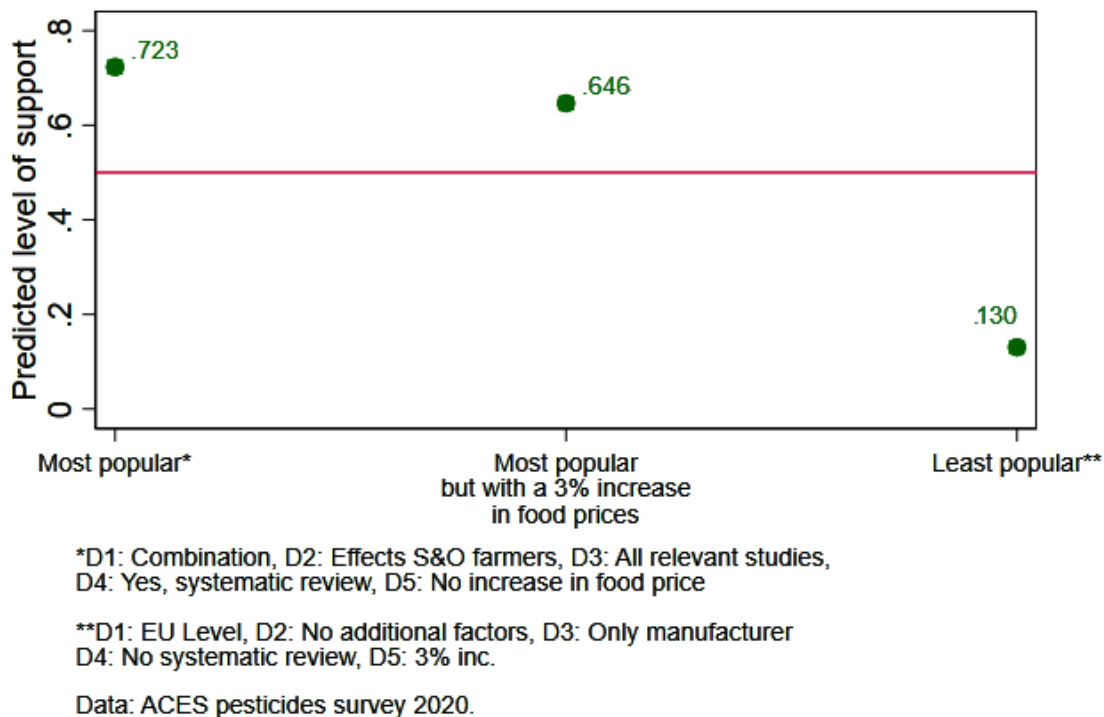
Figure 9 shows that citizen support for pesticide regulation strongly depends on how regulation is organized. The strongest effect (holding all else constant) concerns post-authorization monitoring and review, whose inclusion in a proposed reform package increases the probability of support by 22.1 percent. The second strongest effect concerns the sources of evidence to be considered in authorization decisions: inclusion of all relevant scientific studies or only studies conducted by an independent public body, as opposed to only studies conducted on behalf of the manufacturer, increases the likelihood of proposal support by 15.2 and 15.1 percent respectively. Consideration of the effects on small and organic farmers (in addition to the effects on human health and the environment) in pesticides authorization decisions increases the probability of support by 7.7 percent, while inclusion of the effects on the international competitiveness of European agriculture increases the likelihood of support by 2.1 percent. Perhaps surprisingly, taking authorization decisions at a combination of the EU and national levels (the current status quo) increases the probability of support for a proposed policy package by 6.1 percent relative to decision-making at the national level alone. In contrast, moving the decision to the EU level decreases the likelihood of support by 0.5 percent, but this effect is not statistically significant. Conversely, a projected 3 percent increase in food prices decreases the probability of support for a reform proposal by 7.7 percent, while a projected price increase of 1 percent decreases the likelihood of support by 2.9 percent. All of these effects are even stronger for proposal ranking (indicating which proposal within each pair respondents preferred) than for proposal support (the rating respondents gave to each proposal).

Figure 9 shows results for all countries in our study. In addition to the pooled sample, we calculated AMCEs for each dimension separately for each of the six countries in our sample. The results (not shown) diverged remarkably little from those for the sample as a whole, with slightly weaker support (-2.5 percent) in Sweden for decision making at the EU level only and stronger support (+6.7 percent) in the Netherlands for consideration only of scientific studies conducted by an independent public body as the biggest outliers.²⁵

While Figure 9 showed how support depends on particular characteristics of the reform proposals, we can also estimate the level of support for specific policy packages, i.e. combinations of characteristics. When using this method, the analysis also yields clear results. As Figure 10 shows, the most popular reform package, comprising authorization decisions taken jointly at EU and national levels, consideration of effects on small and organic farmers, inclusion of all relevant scientific studies in risk assessments, and systematic post-authorization monitoring and review, with the possibility of removing pesticides from the market in the case of unexpected negative effects, would command the support of 72.3 percent of respondents in our survey. Moreover, even if this reform package were expected to lead to a 3 percent increase in food prices, it would still be supported by 64.7 percent of all respondents.

²⁵ The between-country variance for the main effects, using a random-intercept OLS model, is only 0.0008.

Figure 10: Predicted support for three proposals



5. Survey Experiment 2: Regulatory Governance Reforms and Public Acceptance of Pesticide Authorization Decisions

The results of our first survey experiment show that citizens in six EU member states have clear and strong preferences about how pesticides should be authorized and regulated. But are citizens prepared to accept authorization decisions taken under a regulatory governance procedure they support, even when such decisions go against their prior expressed preferences on policy outcomes? In other words, can the ‘right’ regulatory governance procedure convince citizens to accept decision outcomes? To tackle this question, we conducted a second linked survey experiment on acceptance of pesticide authorization decisions. This section of the report first explains the design and methodology of the experiment, and then analyses its results.

5.1 Design and methodology

Following the first conjoint survey experiment on public attitudes towards reform of EU pesticides regulation, respondents were asked a set of three questions which together lead to the core dependent variable for the analysis of the decision acceptance investigation. First, respondents were asked whether they had previously heard about glyphosate, to which they could answer ‘yes,’ ‘no,’ or ‘don’t know.’ Subsequently, respondents were asked whether they think farmers should be allowed to use pesticides containing glyphosate, to which they could respond with the same set of answers. These two questions were followed by the second

experiment, in which respondents were first asked to review one of the proposals that they had supported most during the conjoint experiment, which is shown to them at the top of the page for this experiment.²⁶ Depending on their answer to the previous question (whether they support the use of pesticides containing glyphosate by farmers or not), respondents were assigned to one of two versions of this experiment. If they answered 'yes' to the previous question (i.e. they support the use of pesticides containing glyphosate by farmers), they were assigned to version A. If they answered 'no' to the previous question (i.e. they oppose the use of pesticides containing glyphosate by farmers), they were assigned to version B. Respondents who answered 'don't know' to this question (referred to in our subsequent analysis as 'ex-ante don't knows') were randomly assigned to either version A or B.

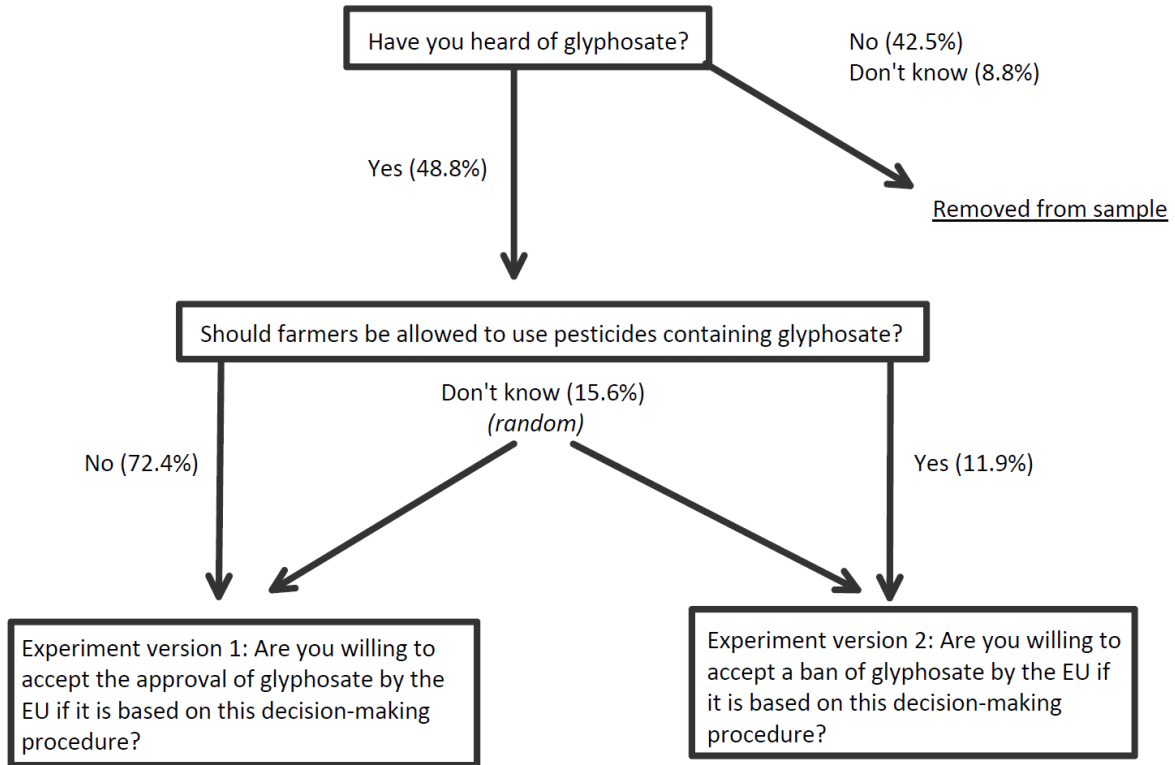
Version A of the experiment asked respondents the following question: 'Above you can see one of the decision-making procedures you rated most highly. Would you be willing to accept a ban on glyphosate if the decision was based on this procedure?' Version B conversely asked respondents the following question: 'Above you can see one of the decision-making procedures you rated most highly. Would you be willing to accept the approval of glyphosate if the decision was based on this procedure?' In both versions, respondents could respond 'yes,' 'no,' or 'don't know.' The answer to this question forms the main dependent variable of the decision acceptance investigation. Respondents who said that they did not know whether they would be prepared to accept the outcome of an authorization decision taken under one of their most highly rated decision-making procedure are referred to as 'ex-post don't knows' in our subsequent analysis.²⁷

The decision tree in figure 11 below shows the assignment of respondents to the different versions of the experiment and the stages at which exclusions of respondents occurred.

²⁶ If respondents rated multiple packages equally highly, one of these most highly rated packages was chosen at random for this experiment.

²⁷ It should be noted that some respondents are excluded from the baseline models presented below. First, these models exclude respondents who reported that they had not heard or did not know whether they had heard about glyphosate. This reduces the sample size by 51.3 percent, or 4622 respondents. In addition, respondents who reported that they did not know whether they support the use of glyphosate by farmers ('ex-ante don't knows') are excluded from the main analysis, since strictly speaking these were not presented with an authorization decision that was opposed to their prior preferences, removing 688 additional respondents (15.6 percent of the remaining sample) from the sample, for a total of 58.9 percent. However, additional analyses presented below will discuss the attitudes of these two groups of respondents as well.

Figure 11: Decision tree for experiment versions



Below is a screenshot taken from a test environment that shows what this experiment looked like for respondents:

Figure 12: Screenshot of decision acceptance experiment

Current question: Q17b, questiontype: categorical_sr

	Option
What other factors are considered in the decision, in addition to the effects on human health and the environment?	The effects on small and organic farmers
If the pesticide is approved, are its effects systematically monitored?	Yes, there is systematic monitoring, with the possibility of removing the pesticide from the market in the case of unexpected negative effects
What sources of scientific evidence are considered in the decision?	All relevant scientific studies
At what level is the decision taken?	The national level only
How will this decision-making procedure affect food prices?	Food prices will stay the same

Above you can see one of the decision-making procedures you rated most highly. Would you be willing to accept the approval of glyphosate if the decision was based on this procedure?

Yes
 No
 I don't know

Previous Next

38%

5.2 Results

Using ordinal logistic regression, we tested two main hypotheses about the relationship between respondents' attitudes towards regulatory governance reform and pesticide decision acceptance:

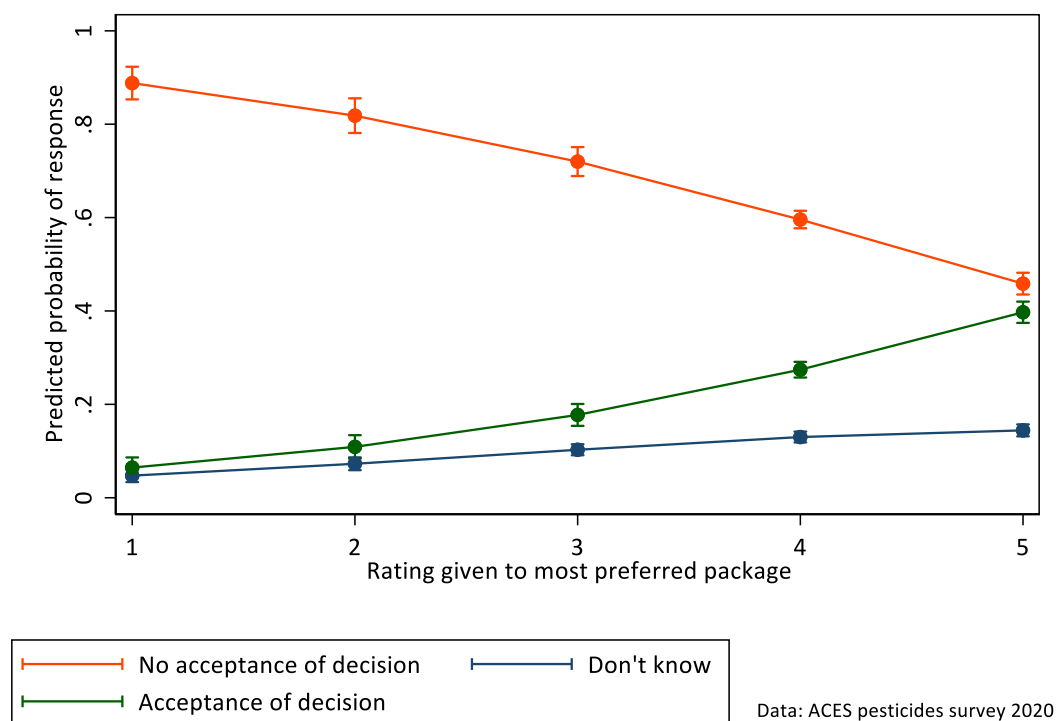
H1: If the hypothetical glyphosate authorization decision opposed to respondents' prior expressed preference is based on a decision-making procedure proposal that they support, respondents are more likely to accept this decision than they are to refuse the decision.

H2: The stronger the support for the decision-making procedure on which the hypothetical glyphosate authorization decision opposed to respondents' prior expressed preference is based, the more likely they are to accept this decision.

As Appendix Table A.3 shows, both hypotheses are confirmed. The odds of accepting the decision are 2.43 times higher when the authorization decision opposed to respondents' prior preferences is based on a decision-making procedure proposal that they support compared to when this is not the case, holding all other variables constant (H1 and Model 1). Moreover, as the rating given to the most preferred proposal package increases, respondents' predicted decision acceptance probability increases, while their non-acceptance probability decreases; the probability of an ex-post don't know answer also increases slightly, indicating a weakening of opposition to decision acceptance (H2 and Model 2). Robustness checks are discussed in the Appendix.

Figure 13 represents the results of the analysis for H2 graphically, showing how respondents' probability of decision acceptance increases while the probability of rejection declines as their level of support for the most preferred package rises. It also shows how the probability of ex-post don't know answers increases with support for the preferred package, indicating a movement from rejection to a neutral position on decision acceptance among some respondents.

Figure 13: Predicted level of decision acceptance, no acceptance and uncertainty over preferred proposal rating



While respondents are generally more likely to accept than to reject the result of a hypothetical authorization decision opposed to their prior expressed preference if it is taken under a procedure they support, this is less true of those who believe that farmers should not be allowed to use pesticides containing glyphosate than of those who support its use. The effects of regulatory governance reforms on respondents' acceptance of pesticide authorization decisions are thus asymmetrical between ex-ante supporters and opponents of glyphosate. But even for ex-ante opponents of glyphosate (who comprised 72.4 percent of respondents included in the analysis) an authorization decision taken under a procedure they support reduces the probability of opposition to 60 percent.

What explains the asymmetry of decision acceptance among ex ante supporters and opponents of glyphosate? Further analyses of our results show that the most important predictors of respondents' unwillingness to accept a hypothetical approval of glyphosate taken under a regulatory decision-making procedure they support are their expressed level of concern about pesticides and the degree to which they think that EU pesticides regulation should be

precautionary. We operationalized pesticide concern as an index formed from two items in our survey questionnaire, the first measuring concern with the possible negative effects of pesticides on human health, and the second measuring concern with the possible negative effects of pesticides on the environment. Both are measured on a 5-point scale anchored with different degrees of concern. We operationalized precautionary preference as the extent to which respondents believe that ‘The public authorities should approve a pesticide if there is a small but unproven chance that it might have harmful effects’, ranging from 1 (‘strongly agree’) to 5 (‘strongly disagree’).

Figures 14 and 15 represent these results graphically, based on Models 4 and 5 in Appendix Table A.3. They show how respondents’ predicted level of decision acceptance declines as their level of concern about pesticides and the intensity of their precautionary preference increase respectively. Note that these analyses were conducted only on those respondents who encountered the scenario of the decision acceptance experiment in which the use of pesticides containing glyphosate is approved.

Figure 14: Predicted level of decision acceptance, no acceptance, and uncertainty at levels of concern about pesticides

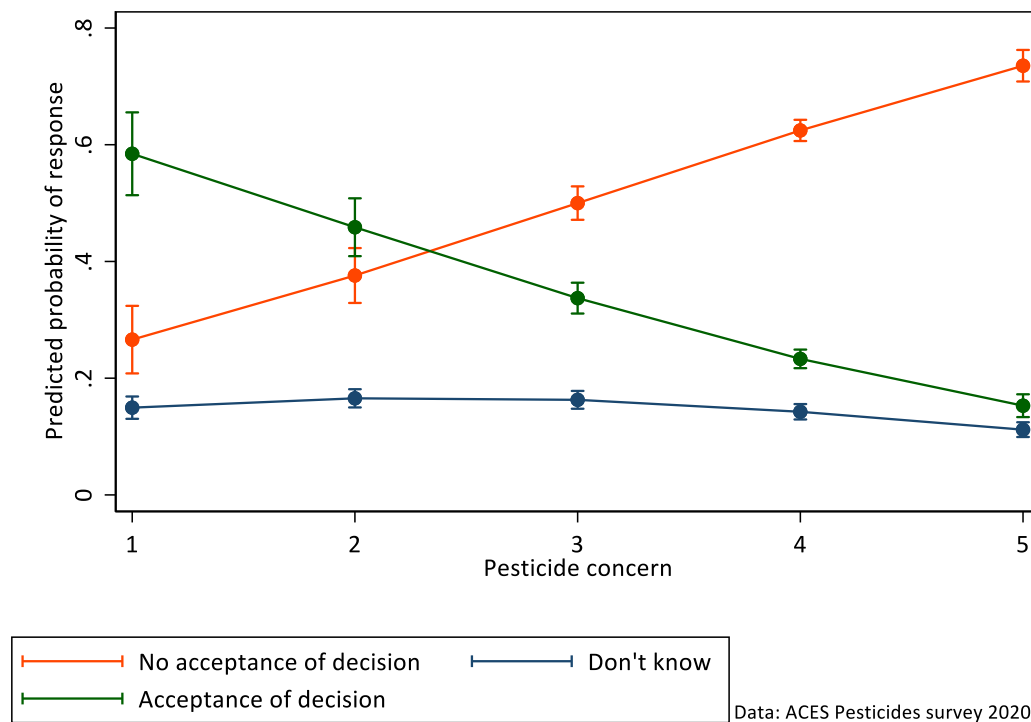
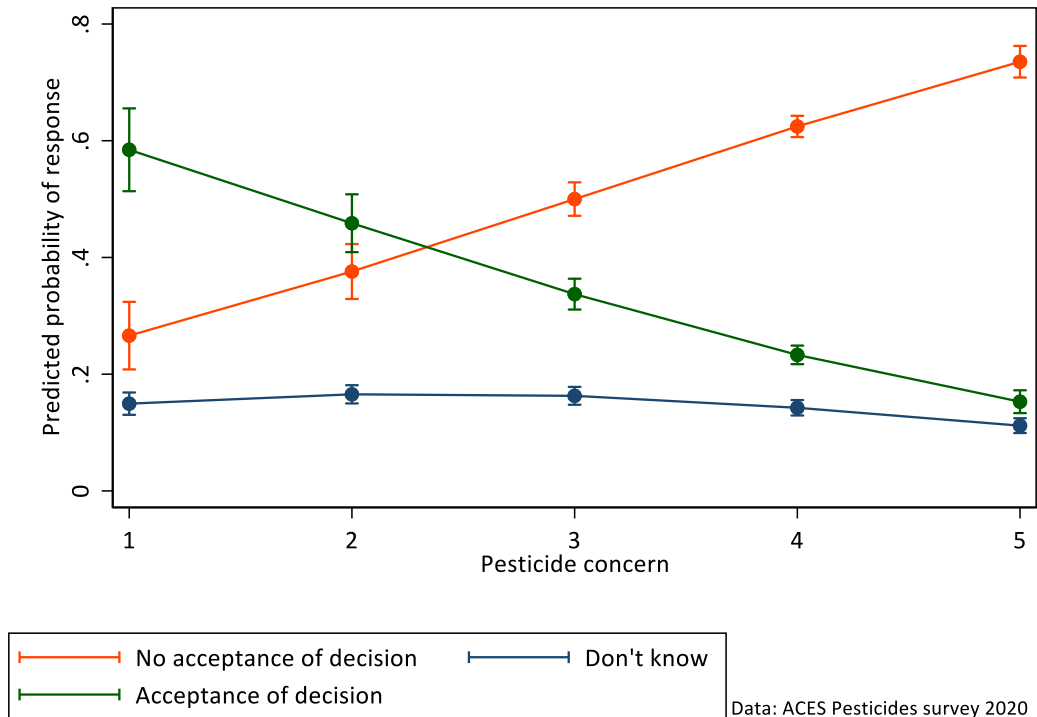


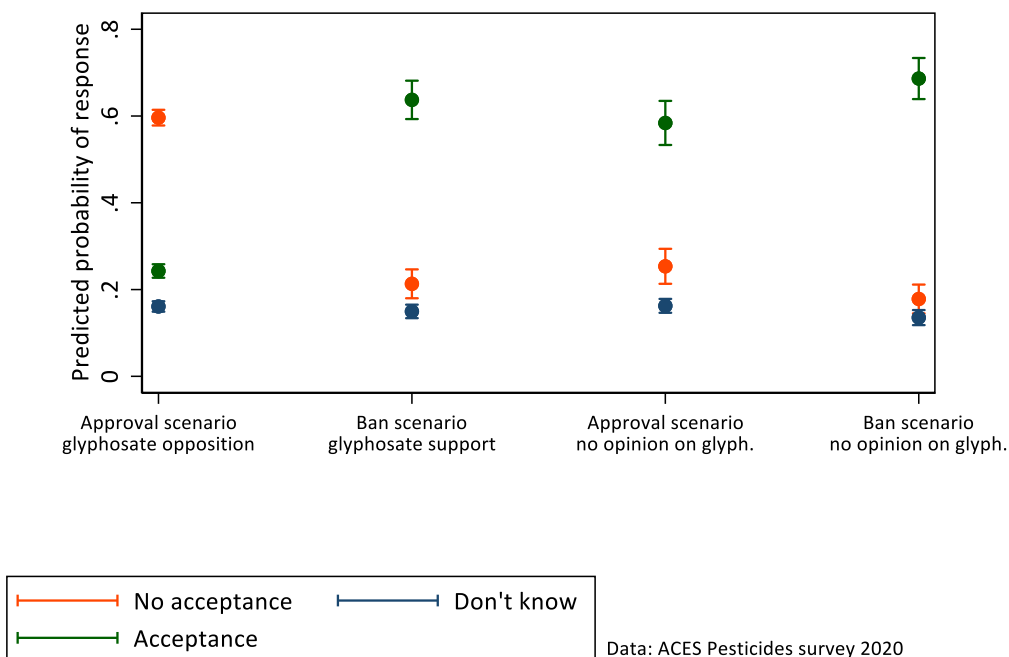
Figure 15: Predicted level of decision acceptance, no acceptance, and uncertainty at levels of precautionary preference



Only respondents who had a clear opinion on glyphosate usage by farmers were included in this analysis. However, as explained above, those who did not know whether they support glyphosate were also asked to complete the experiment, having been allocated randomly to one of the two scenarios. These respondents ('ex-ante don't knows') had a 59 percent probability of decision acceptance for a positive authorization decision (approval) and a 70 percent probability of acceptance for a negative authorization decision (ban). The extent to which they can be swayed by a decision-making procedure that they support is thus more similar to that of the ex-ante supporters of glyphosate than that of the ex-ante opponents.

Figure 16 represents these results graphically, based on Appendix Table A.4.

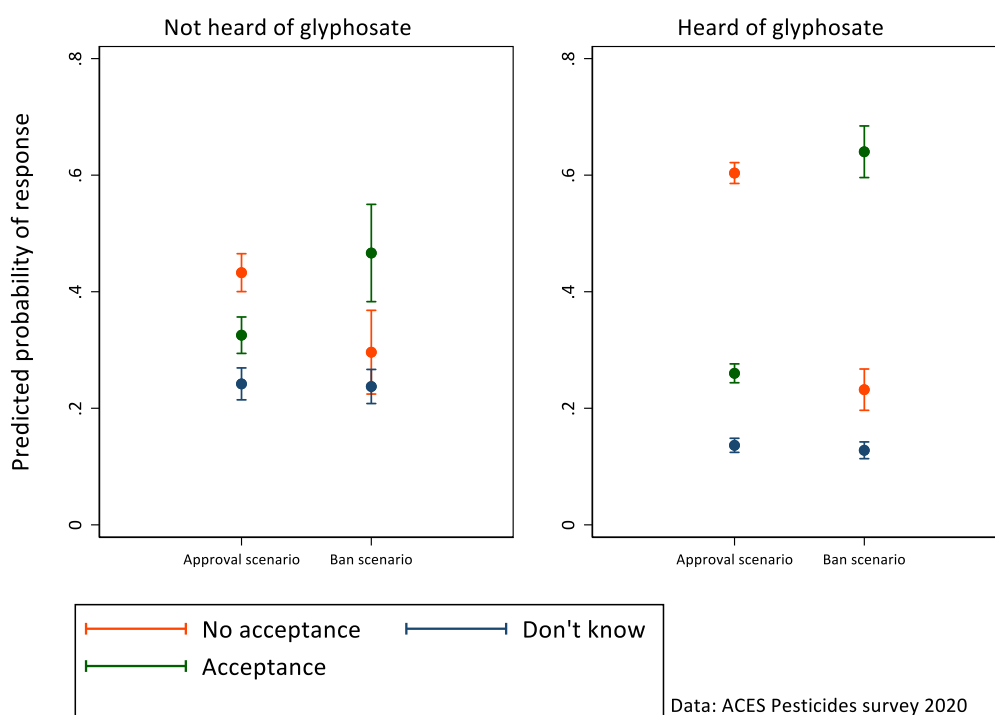
Figure 16: Predicted level of decision acceptance, no acceptance, and uncertainty over different decision acceptance experiment scenarios



Another limitation to the main analysis presented above was that respondents who had not heard of glyphosate, comprising 51.3 percent of the sample, were also excluded. Most of these excluded respondents nonetheless expressed an opinion on glyphosate usage: 28.4 percent who had not heard of glyphosate (or were not sure whether they had) believed that farmers should not be allowed to use it, compared to 3.9 percent who believed that they should be allowed to do so, and 67.8 percent who did not know. These respondents also then participated in the decision acceptance experiment on the same basis as those who had previously heard of glyphosate. Depending on whether they supported the use of pesticides containing glyphosate by farmers or not, these respondents were assigned to one of two versions of the experiment in a similar way as respondents who did have an ex-ante opinion on glyphosate use. 38.9 percent of this group were prepared to accept the hypothetical glyphosate decision with which they were presented in the experiment, compared to 21.4 percent who would reject the decision, and 39.7 percent who did not know. As with the main experimental sample, moreover, responses to the decision acceptance experiment varied depending on respondents' prior preferences towards glyphosate use. Figure 17 below shows this pattern (based on model 1 in table A.4), and compares it to respondents who had heard of glyphosate before the survey (based on model 2 in table A.4). Note that respondents who did not have an opinion on glyphosate usage are again not included in this analysis, as these were strictly speaking not presented with a decision opposed to their prior preferences.

From this figure we can see that as among respondents who had heard of glyphosate, the predicted probability of 'no acceptance' is higher than the predicted probability of 'acceptance' among those who opposed glyphosate use and were thus assigned to the 'approval scenario', while the reverse pattern occurs among people who support glyphosate use and were thus assigned to the ban scenario. However, in comparison to respondents who had previously heard of glyphosate, those who had not heard²⁸ of it have a substantively higher probability to respond 'don't know' to the hypothetical authorization decision, which makes the relative difference in size between the 'acceptance' and 'no acceptance' outcomes smaller. Nonetheless, the predicted probability of acceptance is substantial among both groups of respondents.

Figure 17: Comparison of patterns of acceptance, non-acceptance and uncertainty towards a hypothetical glyphosate decision between people who had and people who had not heard of glyphosate



In sum, we can conclude that the adoption of a regulatory governance procedure that respondents support has a significant positive effect on their willingness to accept pesticide authorization decisions also among the majority of respondents in our sample who had not heard or were unsure whether they had heard of glyphosate.

²⁸ Note that this analysis combines respondents who were unsure whether they had heard of glyphosate prior to the experiment with those who stated that they had not previously heard of it.

6. Conclusions

Concerns about the negative effects of pesticides, as our survey shows, are rising among EU citizens. So too is their dissatisfaction with the adequacy of the current regulatory regime at EU and national levels to protect human health and the environment from pesticides risks. At the same time, moreover, EU citizens, as our first experiment demonstrates, also have strong views about which reforms to decision-making procedures should be adopted to improve EU pesticides regulation.

Foremost among these reforms is the introduction of systematic post-authorization monitoring and review, with the possibility of removing the pesticide from the market in the case of unexpected negative effects, which increases respondents' probability of support for a proposed reform package by 22.1 percent. Introducing such a system of post-authorization monitoring and review, which forms part of a broader shift in contemporary approaches to regulation under conditions of high uncertainty, would make authorization decisions less fateful, by allowing them to be reconsidered on the basis of ongoing surveillance of the cumulative effects of pesticides use under real-life conditions, rather than depending on clinical trials conducted under artificial laboratory conditions alone.

The second most strongly supported reform would be the inclusion in authorization decisions of all relevant scientific studies or only studies conducted by an independent public body, each of which increases citizens' support for a proposed decision-making procedure by more than 15 percent relative to reliance only on private studies conducted on behalf of the manufacturer. The intensity of support for the inclusion of independent scientific studies in the authorization process clearly reflects the widespread public distrust of manufacturers' predominant influence on the sources of evidence used in regulatory risk assessments, which was highlighted by the glyphosate controversy.

A third reform proposal that attracts substantial public support is consideration in pesticide authorization decisions of effects on small and organic farmers (in addition to those on human health and the environment), which increases the likelihood of support among respondents by 7.7 percent. Consideration of these 'other legitimate factors' in authorization decisions is closely bound up with the broader debate about the EU's pursuit of a sustainable agri-food system, which includes a reduction in pesticide use and risks by 50 percent over the next decade.

By contrast, our respondents were less concerned about the level at which pesticide authorization takes place. Support is strongest for taking authorization decisions at a combination of EU and national levels – the current status quo – which increases the likelihood of approval of a proposed policy package by 6.1 percent relative to decision making at the national level alone and 6.6 percent relative to the EU level only.²⁹ At least in this policy field, EU

²⁹ We did not inform respondents that this is the current status quo. The risk of a status-quo bias is therefore rather limited.

citizens appear to care more about how decisions are taken than the level at which they are taken: about the substance of the regulatory governance process itself rather than the issue of more Europe or less Europe. And even a hypothetical increase in food prices of 3 percent diminishes respondents' probability of support for a proposed reform package by only 7.7 percent.

The most popular combination of reforms (comprising systematic post-authorization monitoring and review, inclusion of all relevant scientific studies, consideration of effects on small and organic farmers, and decisions taken jointly at EU and national levels) attracts broad public support among respondents to our survey of 72.3 percent (falling to 64.7 percent if it led to an increase of 3 percent in food prices). But if the EU adopted these proposed regulatory governance reforms, would citizens be more prepared to accept pesticide authorization decisions even when they run counter to their substantive preferences, for example in cases such as glyphosate? The results of our second experiment clearly demonstrate that the answer is Yes. Respondents' odds of accepting a hypothetical glyphosate authorization decision opposed to their prior expressed preferences are more than twice as high when it is taken under a decision-making procedure they support, a probability that increases along with the strength of their support for the proposed procedure. Even for ex-ante opponents of glyphosate, who are less likely to accept a hypothetical outcome counter to their prior expressed preferences, an authorization decision taken under a procedure they support reduces the probability of opposition by 40 percent. Our study therefore provides robust evidence that the adoption of proposed reforms preferred by citizens could not only help to rebuild public support for EU pesticides regulation in general, but also enhance acceptance of controversial authorization decisions.

The EU re-authorization process for glyphosate, on which a decision must be taken in 2022, has already begun. This decision will be taken under the same unreformed procedures as the previous controversial 2017 re-authorization. These existing procedures, as our survey shows, do not command the confidence of EU citizens. Should the outcome of this process be a renewed approval of glyphosate, there is thus a high risk that its legitimacy will be rejected by a large proportion of the European public.

Acronyms

AMCE	average marginal component effect
ECI	European Citizens' Initiative
EFSA	European Food Safety Authority
EU	European Union
GLP	Good Laboratory Practice
GMO	genetically modified organism
IARC	International Agency for Research on Cancer
MRL	Maximum Residue Level
OECD	Organization for Economic Cooperation and Development
PAFF	Standing Committee on Plants, Animals, Food and Feed
PAN	Pesticides Action Network
PPP	plant protection product
SAM	Scientific Advice Mechanism

References

Bansak K, Hainmueller J, Hopkins DJ, Yamamoto T (2021) Beyond the breaking point? Survey satisficing in conjoint experiments. *Political Science Research and Methods* 9 (1), 53-71.

Bansak K, Hainmueller J, Hopkins DJ, Yamamoto T (2018) The number of choice tasks and survey satisficing in conjoint experiments. *Political Analysis* 26(1), 112-119.

Benbrook C (2020) Shining a light on glyphosate-based herbicide hazard, exposures and risk: The role of Non-Hodgkin Lymphoma litigation in the USA. *European Journal of Risk Regulation* 11(3), 498-519.

Beetsma RM, Burgoon B, Nicoli F, de Ruijter A, Vandenbroucke F (2020) What kind of EU fiscal capacity? Evidence from a randomized survey experiment in five European countries in times of corona. *Amsterdam Centre for European Studies*.

Bozzini E (2018) Assessing criteria and capacity for reliable and harmonised 'hazard identification' of active substances. *European Parliamentary Research Service*. Brussels.

Bozzini E (2017) *Pesticide Policy and Politics in the European Union: Regulatory Assessment, Implementation and Enforcement*. Springer Nature, Switzerland.

Bremer B, Kuhn T, Meijers M, Nicoli F (2021) Viral Solidarity? EU Solidarity and Risk-Sharing in the COVID-19 Crisis. *SocArXiv*. doi:10.31235/osf.io/82cyw

Carroll JD, Green PE (1995) Psychometric methods in marketing research: Part I, conjoint analysis. *Journal of marketing Research* 32(4), 385-391.

Clausing P, Robinson C, Burtscher-Schaden H (2018) Pesticides and public health: an analysis of the regulatory approach to assessing the carcinogenicity of glyphosate in the European Union. *J Epidemiol Community Health* 72(8), 668-672.

Dedieu F (2021) Organized denial at work: The difficult search for consistencies in French pesticide regulation. *Regulation & Governance*. Available from: doi:10.1111/rego.12381

European Commission (2015) *Overview Report on a Series of Audits Carried out in Member States From 2012 to 2014 in Order to Evaluate Controls of Plant Protection Products*, Food and Veterinary Office, Available from URL: https://ec.europa.eu/food/audits-analysis/overview_reports/act_getPDF.cfm?PDF_ID=332

European Commission (2017a) *Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) No 182/2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers*, 14 February, COM(2017) 085 final, Strasbourg. Available from URL: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2017:85:FIN>

European Commission (2017b) *Overview Report on a Series of Audits Carried out in EU Member States in 2016 and 2017 in Order to Evaluate the Systems in Place for Authorisations of Plant Protection Products*, Food and Veterinary Office, Available from URL: https://ec.europa.eu/food/audits-analysis/overview_reports/details.cfm?rep_id=108

European Commission (2017c) *Communication: on the European Citizens' Initiative "Ban glyphosate and protect people and the environment from toxic pesticides"*, 12 December, COM(2017) 8414 final, Strasbourg. Available from URL: https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides_glyphosate_eci_final.pdf

European Commission (2018a) *Study supporting the REFIT Evaluation of the EU legislation on plant protection products and pesticides residues (Regulation (EC) No 1107/2009 and Regulation (EC) No 396/2005)* Brussels. Available from URL: <https://op.europa.eu/en/publication-detail/-/publication/7244480c-d34d-11e8-9424-01aa75ed71a1>

European Commission (2018b) *Staff working document: The REFIT evaluation of the General Food Law (Regulation (EC) No 178/2002)*. 15 January. SWD(2018) 38 final. Brussels. Available from URL: https://ec.europa.eu/food/sites/food/files/gfl_fitc_comm_staff_work_doc_2018_part2_en.pdf

European Commission (2020a) *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the regions: A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system*, 20th May, COM(2020) 381 final, Brussels. Available from URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590404602495&uri=CELEX%3A52020DC0381>

European Commission (2020b) *Report from the Commission to the European Parliament and the Council: evaluation of Regulation (EC) No 1107/2009 on the placing of plant protection products on the market and of Regulation (EC) No 396/2005 on maximum residue levels of pesticides*, 20th May, COM(2020) 208 final, Brussels. Available from URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0208>

European Commission (2020c) *Communication: EU Biodiversity Strategy for 2030 – Bringing Nature Back into our Lives*, 20 May, COM(2020) 380 final, Brussels. Available from URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0380>

European Parliament (2018a). Regulation (EC) 1107/2009 on the Placing of Plant Protection Products on the Market. *European Implementation Assessment*. 24 April. Available from URL: [https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615668/EPRS_STU\(2018\)615668_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615668/EPRS_STU(2018)615668_EN.pdf)

European Parliament (2018b) Decision of 18 April 2018 on Discharge in Respect of the Implementation of the Budget of the European Food Safety Authority for the Financial Year 2016. 18 April. DEC(2017) 2159. Strasbourg. Available from URL: http://www.europarl.europa.eu/doceo/document/TA-8-2018-0146_EN.html

European Parliament (2019) on the Union's authorisation procedure for pesticides. Special Committee on the Union's authorisation procedure for pesticides (EU) No 2018/2153, 16 January, Brussels. Available from URL: https://www.europarl.europa.eu/doceo/document/TA-8-2019-0023_EN.html

Hanley N, Wright RE, Adamowicz V (1998) Using choice experiments to value the environment. *Environmental and resource economics* 11(3), 413-428.

Hahm H, Hilpert D, König T (2020) Institutional reform and public attitudes toward EU decision making. *European Journal of Political Research*, 59(3), 599-623.

Hainmueller J, Hopkins DJ, Yamamoto T (2014) Causal Inference in Conjoint Analysis: Understanding Multi-Dimensional Choices via Stated Preference Experiments. *Political Analysis* 22: 1.

Hainmueller J, Hopkins DJ (2015) The Hidden American Immigration Consensus: A Conjoint Analysis of Attitudes toward Immigrants. *American Journal of Political Science*.

Hamlyn O (2018) Assessing Member States' capacity for reliable 'authorisation of PPPs', and its uniformity. *European Parliamentary Research Service*. Brussels.

Hendlin YH, Arcuri A, Lepenies R, Hüesker F (2020) Like Oil and Water: The Politics of (Not) Assessing Glyphosate Concentrations in Aquatic Ecosystems. *European Journal of Risk Regulation* 11(3), 539-564.

Jasso G, Rossi PH (1977) Distributive justice and earned income. *American Sociological Review* 42(4). 639–651.

Kessler J, Sabel C (2021) The Uncertain Future of Administrative Law. *Forthcoming in Mark Tushnet, ed., The Modern Administrative State: Reconstruction or Deconstruction*. Available from URL: <https://dx.doi.org/10.2139/ssrn.3780796>.

Kritikos M. (2009) Traditional risk analysis and releases of GMOs into the European Union: space for non-scientific factors? *European law review* 34(3), 405-432.

Kudsk P, Mathiassen SK (2020) Pesticide regulation in the European Union and the glyphosate controversy. *Weed Science* 68(3), 214-222.

Kuhn T, Nicoli F, Vandenbroucke F (2020) Preferences for European unemployment insurance: a question of economic ideology or EU support? *Journal of European Public Policy* 27(2), 208-226.

Leonelli GC (2018) The glyphosate saga and the fading democratic legitimacy of European Union risk regulation. *Maastricht Journal of European and Comparative Law* 25(5), 582-606.

Martinsen DS, Schrama R (2021) Networked health governance in the European Union. *Journal of Health Policy, Law and Politics* 46(1): 93-116.

Milieu Ltd (2018) *Annex I. Evaluation of the Implementation of Regulation (EC) No 1107/2009 and its impact. Mapping the usage made by Member States of the derogations laid down by Article*

53 of the Regulation, in European Parliament (2018) Regulation (EC) 1107/2009 on the Placing of Plant Protection Products on the Market, European Implementation Assessment. 24 April. Available from URL: [https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615668/EPRS_STU\(2018\)615668_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615668/EPRS_STU(2018)615668_EN.pdf)

Milner AM, Boyd IL (2017) Toward pesticidovigilance. *Science* 357(6357), 1232-1234.

Mühlböck M, Tosun J (2018) Responsiveness to different national interests: Voting behaviour on genetically modified organisms in the council of the European Union. *Journal of Common Market Studies* 56(2), 385-402.

Paskalev V (2019) On giving account and taking things into account – The case of Glyphosate. *ARENA Centre for European Studies*. Oslo. TARN working paper series 1/2019. Available from URL: <https://dx.doi.org/10.2139/ssrn.3316949>

Pesticide Action Network (2012) *Part 3: Twisting and bending the rules: In 'resubmission all efforts are aimed to get pesticides*. Available from URL: <https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/other/resubmission-2012-sneaky-part-3.pdf>

Pesticide Action Network (2017) *Bee Emergency Call. How some Member States are threatening bees by allowing the use of prohibited pesticides and how the Commission does nothing to stop them*. Available from URL: [https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/reports/201702%20Bee%20emergency%20call%20\(neonics%20derogations%20report\)/bee_emergency_call_FINAL.pdf](https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/reports/201702%20Bee%20emergency%20call%20(neonics%20derogations%20report)/bee_emergency_call_FINAL.pdf)

Pesticides Action Network (2018) *A White Paper: Ensuring a Higher Level of Protection from Pesticides in Europe. Citizens for Science in Pesticide Regulation A European Coalition – 2018*. Available from URL: https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/reports/White%20Paper_Dec2018.pdf

Robinson C, Portier CJ, Čavoški A, Mesnage R, Roger A, Clausen P, Whaley P, Muilerman H, Lyssimachou A (2020) Achieving a high level of protection from pesticides in Europe: problems with the current risk assessment procedure and solutions. *European Journal of Risk Regulation* 11(3), 450-480.

de Ruijter A, Beetsma R, Burgoon B, Nicoli F, Vandenbroucke F (2020) EU solidarity and policy in fighting infectious diseases: State of play, obstacles, citizen preferences and ways forward. CESifo working papers 8222.

Sabel CF, Victor DG (2017) Governing global problems under uncertainty: making bottom-up climate policy work. *Climatic Change* 144: 15-27.

SAM (2018) EU Authorisation Processes of Plant Protection Products – From a Scientific Point of View. Group of Chief Scientific Advisors, *Scientific Opinion* 5/2018. Brussels.

Soil Association & Pesticides Action Network UK (2019) The Cocktail Effect – How Pesticides Mixtures May be Harming Human Health and the Environment. October 2019. Bristol.

Storck V, Karpouzas DG, Martin-Laurent F (2016) Towards a better pesticide policy for the European Union. *Science of the Total Environment* 575, 1027-1033.

Svetiev Y (2020) *Experimentalist competition law and the regulation of markets*. Oxford: Hart Publishing.

Tosun J, Lelieveldt H, Wing T (2019) A Case of Muddling Through? The Politics of Renewing Glyphosate Authorisation in the European Union. *Sustainability* 11, 440.

Vandenbroucke F, Burgoon BM, Kuhn T, Nicoli F, Sacchi S, van der Duin D, Hegewald, S (2018). Risk sharing when unemployment hits: How policy design influences citizen support for European Unemployment Risk Sharing (EURS). *Amsterdam Institute for Social Science Research (AISSR)*.

Weimer M (2019) *Risk Regulation in the Internal Market – Lessons from Agricultural Biotechnology*. Oxford University Press, Oxford.

Weimer M (2017) No More Blame Game: Back to the Future of Comitology. *Verfassungsblog*. Available from URL: <https://verfassungsblog.de/no-more-blame-game-back-to-the-future-of-comitology/>

Laws cited

Commission Regulation (EC) No 178/2001 of 29 January 2001 establishing the standard import values for determining the entry price of certain fruit and vegetables

Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market.

Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers

Regulation (EU) 2019/1381 of the European Parliament and of the Council of 20 June 2019 on the transparency and sustainability of the EU risk assessment in the food chain.

Appendix

A: Tables

Table A.1: Country characteristics

Country	GDP million Euro	Real GDP per capita Euro (2020)	Size of Agricultural sector	Organic farming %	Annual pesticide use per hectare of farmland	Agricultural zone *	EU member since
Netherlands	774,039.0	40080	3.53	3.13	10.0	Central	1958
Germany	3,344,370.0	34060	1.55	7.31	5.6	Central	1958
France	2,353,090.0	30480	3.17	6.27	5.1	Southern	1958
Sweden	471,207.9	42370	1.19	19.15	0.8	Northern	1995
Italy	1,765,421.4	26640	2.96	15.54	8.0	Southern	1958
Poland	496,360.9	12660	5.03	3.44	3.2	Central	2004

Source: Eurostat, own calculations, except for agricultural zone membership, which is drawn from Hamlyn, 2018.

Table A.2: The effect of regulatory design on support for the pesticide regulation regime

	Proposal support		Package ranking	
<i>Dimension 1: Level of decision-making</i>				
Combination	0.061***	(0.005)	0.084***	(0.006)
EU level	-0.005	(0.005)	-0.007	(0.006)
Ref.: National level				
<i>Dimension 2: Consideration of additional factors</i>				
Competitiveness	0.021***	(0.005)	0.033***	(0.006)
Effects S&O farmers	0.077***	(0.005)	0.099***	(0.006)
Ref.: No additional factors				
<i>Dimension 3: Sources of evidence</i>				
Only independent	0.151***	(0.005)	0.177***	(0.006)
All relevant studies	0.152***	(0.005)	0.183***	(0.006)
Ref.: Only manufacturer				
<i>Dimension 4: Post-authorization monitoring</i>				
Yes	0.221***	(0.004)	0.253***	(0.005)
Ref.: No				
<i>Dimension 5: Food prices</i>				
1%	-0.029***	(0.005)	-0.040***	(0.006)
3%	-0.077***	(0.005)	-0.109***	(0.006)
Ref.: No increase				
Age	0.000*	(0.000)	0.000	(0.000)
Gender ref. male	-0.018**	(0.006)	-0.000	(0.000)
Education level	0.006***	(0.002)	0.000	(0.000)
Subjective income	0.001	(0.002)	0.000	(0.000)
Constant	0.193***	(0.016)	0.232***	(0.007)
Observations	51804		51804	
Respondents	9022		9022	
Adjusted R-squared	0.088		0.116	

Figures are coefficients of OLS regressions; standard errors in parentheses

* p<0.05 ** p<0.01 *** p<0.001 (two-tailed).

Table A.3: Regression of acceptance of a hypothetical glyphosate authorization decision

	Model 1		Model 2		Model 3		Model 4		Model 5	
Support for preferred package	2.432***	(0.318)								
Rating given to package			1.790***	(0.096)	1.796***	(0.111)	1.731***	(0.108)	1.820***	(0.092)
Pesticide concern					0.582***	(0.031)				
Precaution preference							0.685***	(0.024)		
<i>Experiment scenario</i>										
Ban scenario									6.110***	(0.688)
Don't know assigned to approval scenario									4.807***	(0.584)
Don't know assigned to ban scenario									7.728***	(0.988)
Ref.: Approval scenario										
Age	0.984***	(0.002)	0.984***	(0.002)	0.988***	(0.003)	0.986***	(0.003)	0.987***	(0.002)
Gender ref. male	0.639***	(0.046)	0.650***	(0.047)	0.772**	(0.062)	0.695***	(0.057)	0.735***	(0.050)
Education level	1.036	(0.021)	1.036	(0.021)	1.009	(0.023)	1.011	(0.023)	1.009	(0.019)
Subjective income	1.052	(0.032)	1.054	(0.032)	1.075*	(0.037)	1.098**	(0.039)	1.104***	(0.032)
Political ideology (left-right)	1.070***	(0.016)	1.069***	(0.016)	1.038*	(0.018)	1.030	(0.018)	1.018	(0.015)
Attentiveness	0.702***	(0.056)	0.717***	(0.058)	0.996	(0.093)	0.984	(0.094)	0.858*	(0.067)
Observations	3214		3214		2732		2657		3785	
Pseudo R-squared	0.037		0.050		0.058		0.063		0.120	

Exponentiated coefficients; standard errors in parentheses

Note: Own calculations

* p<0.05 ** p<0.01 *** p<0.001

Definition of explanatory variables: *Proposal support* indicates whether the proposal shown was supported by the respondent or not (similar to the main dependent variable used for the analysis of the conjoint experiment). *Preferred proposal rating* is the rating that respondents gave to the proposal shown during the experiment. *Glyphosate opposition* indicates that respondents encountered version B of the experiment, and thus previously expressed opposition to the use of glyphosate by farmers.

Table A.4: Comparison of acceptance between people who had and had not heard of glyphosate

	Model 1, not heard of glyphosate		Model 2, heard of glyphosate	
Rating given to most preferred package	1.602***	(0.148)	1.775***	(0.097)
Ban scenario	1.950***	(0.362)	5.632***	(0.635)
Ref.: Approval scenario			Ref.: Approval scenario	
Age	0.990**	(0.004)	0.987***	(0.002)
Gender ref. male	0.873	(0.108)	0.727***	(0.054)
Education level	0.964	(0.036)	1.022	(0.021)
Subjective income	1.074	(0.056)	1.081*	(0.034)
Political ideology (left-right)	1.089***	(0.027)	1.025	(0.016)
Attentiveness	1.144	(0.154)	0.830*	(0.070)
Observations	1117		3214	
Pseudo R-squared	0.038		0.092	

Exponentiated coefficients; standard errors in parentheses

Note: Own calculations. 'Not heard of glyphosate' includes those who answered 'don't know' to whether they had heard of glyphosate.

* p<0.05 ** p<0.01 *** p<0.001

B: Robustness checks

Experiment 1:

The robustness of the results presented in section 3.2 above has been tested across a number of alternative specifications of the models. First, we tested whether the results change in any meaningful way if respondents who were inattentive during the survey are excluded. The data allow two ways to check for attentiveness. First, the survey included a dedicated attention check which occurred toward the end of the survey. Excluding respondents who failed this check slightly increases the strength of the dimension effects, which is in line with the expectation that excluding inattentive respondents reduces noise in the analysis. However, the difference in the results is negligible. Second, it was possible for respondents to provide inconsistent answers during the conjoint experiment by choosing one of the two packages but expressing higher support for the non-chosen package. When they did so, they were prompted to revise their answer so that the ranking of policy proposals would be aligned with their ratings. However, we kept track of the number of times that respondents were prompted on their inconsistency. As such inconsistent answers can also be considered to be a sign of

inattentiveness, we repeated the analyses after exclusion of respondents who provided one or more inconsistent answers. However, such exclusion does not change the results in any meaningful way.

In addition, we tested robustness across estimation techniques. We investigated whether our results change when the proposal rank variable is used as the dependent variable instead of the proposal support variable; when a random effects model that allows for random intercepts at the levels of the country and the individual is used; when the results are estimated using logistic regression (using the proposal support or the proposal rank variables) or ordinal logistic regression (using the proposal rating variable); and when the control variables are left out of the model. However, none of these specifications gave results that were meaningfully different from the models presented here in any way.

Experiment 2:

We used ordinal logistical regression for ease of interpretation of the results presented in section 4.2 across the three categories of accept, oppose, and don't know. A Wald test indicates that combining the oppose and don't know categories is not appropriate, meaning that the variables in the model have a different effect on the odds of being in these two categories. Throughout the analyses, the proportional odds assumption of the ordinal logistic regression models was violated for the independent variable and some of the control variables, but the results did not change significantly when this assumption was relaxed, according to a Brant test. We also conducted the same analyses using multinomial logistic regression, which does not require the proportional odds assumption. This did not change the results in any meaningful way.

C: Questionnaire Survey

Introduction

Thank you for taking this survey. This survey by the University of Amsterdam explores public opinion on European pesticide regulation. Please provide answers that reflect your genuine opinion on the matter.

The survey includes, amongst others, questions on your political opinions. You can always decide not to answer sensitive questions. Your answers will be processed and stored anonymously and on an aggregated level only. We will not share your personal data with third parties. Ipsos hereby guarantees complete confidentiality and deletion of the data after completion of the project. In our privacy statement (add link) you can read how we respect and protect your personal information. Please be aware that you are free to stop at any later moment.

Answers:

- I have read the Privacy statement and I understand that by clicking this box, I consent to the processing of my data for this research
- I do not want to participate

Quotas

- Q25** **Please tell us the month and year of your birth.**
[Scroll-down, month & year]
- Q26** **Are you:**
[Male / Female / Other / I prefer not to say]
- Q27** **What is your highest completed level of education? If you are unsure about your degree or if you completed your education abroad, please choose the level you think is closest.**
[Scroll-down, country-specific education list]
- Q29** **Please tell us in which {#region_denomination} you currently live. If you currently live abroad, please indicate the last region you lived in.**
[Scroll-down, NUTS 2 list]

Conjoint experiment

Pesticides are chemicals used to prevent pests from damaging food crops and other plants. Many farmers rely on pesticides to grow crops in large quantities at low costs. But pesticides can also have negative effects, for example on human health and the environment.

The European Union and national authorities therefore regulate the use of pesticides. Recently, the procedures for European pesticide regulation have become controversial, and multiple options for their reform are under discussion.

We would like to hear your opinion about different ways to regulate the use of pesticides. In a moment you will be shown alternative procedures for pesticides regulation. You will be asked to indicate which procedures you prefer (or dislike the least), and how much you support or oppose them. People have different opinions about this issue, and there are no right or wrong answers.

A manufacturer submits a new pesticide for approval. How should the decision be taken? Please consider the following two options.

Note: This header is shown above the conjoint box during every iteration of the experiment.

D1	At what level is the decision taken?	<ul style="list-style-type: none">- The European Union level only.- The national level only.- A combination of the EU and national levels.
D2	What other factors are considered in the decision, in addition to the effects on human health and the environment?	<ul style="list-style-type: none">- The effects on small and organic farmers.- The effects on the international competitiveness of European farmers.- No additional factors.
D3	What sources of scientific evidence are considered in the decision?	<ul style="list-style-type: none">- Only scientific studies conducted on behalf of the manufacturer.- All relevant scientific studies.- Only scientific studies conducted by an independent public body.
D4	If the pesticide is approved, are its effects systematically monitored?	<ul style="list-style-type: none">- No systematic monitoring after the approval decision.

		<ul style="list-style-type: none"> - Yes, there is systematic monitoring, with the possibility of removing the pesticide from the market in the case of unexpected negative effects.
D5	How will this decision-making procedure affect food prices?	<ul style="list-style-type: none"> - Food prices will stay the same. - Food prices will rise by 1%. - Food prices will rise by 3%.

Q1 Which one of the two options do you prefer (or dislike the least)?

[Option 1 / Option 2]

Q2 How much do you support or oppose option 1?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Q3 How much do you support or oppose option 2?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Thank you. Please now consider two more options.

Q4 Which one of the two options do you prefer (or dislike the least)?

[Option 1 / Option 2]

Q5 How much do you support or oppose option 1?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Q6 How much do you support or oppose option 2?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Again, thank you. Please now choose one last time.

Q7 Which one of the two options do you prefer (or dislike the least)?

[Option 1 / Option 2]

Q8 How much do you support or oppose option 1?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Q9 How much do you support or oppose option 2?

[Strongly support / Somewhat support / Neither support nor oppose / Somewhat oppose / Strongly oppose]

Q10 Think about the differences between the options we showed you. Overall, could you tell us to what extent each of the following features were important in making your decisions?

- The level at which the decision is taken.
- The factors that are considered in the decision.
- The sources of scientific evidence considered in the decision.
- Whether the pesticide's effects are systematically monitored after it is approved.
- The effect on food prices.

[Likert-scale rating from 0 to 10, anchored by "Not important at all" (0) and "Very important" (10)]

Attitudes toward pesticides

Q11 Have you used pesticides before? This includes for example garden weed killer and insect, snail or slug repellents.

[Yes / No / I don't know]

Q12 To what extent are you concerned about possible negative effects of pesticides on human health?

[Not concerned at all (1) / Hardly concerned (2) / Somewhat concerned (3) / Very concerned (4) / Extremely concerned (5)]

Q13 To what extent you are concerned about possible negative effects of pesticides on the environment?

[Not concerned at all (1) / Hardly concerned (2) / Somewhat concerned (3) / Very concerned (4) / Extremely concerned (5)]

Q14 Do you personally support or oppose the use of pesticides on farm crops?

[Strongly support (1) / Somewhat support (2) / Neither support nor oppose (3) / Somewhat oppose (4) / Strongly oppose (5)]

Q15 There has been a lot of controversy recently about glyphosate, a substance widely used in pesticides. Have you heard of glyphosate?

[Yes / No / Don't know]

Q16 Do you think that farmers should be allowed to use pesticides containing glyphosate?

[Yes / No / Don't know]

Note for Here, people will review (one of) the regulation procedure(s) that they Q17a/Q17b: supported most during the conjoint. So show this above Q17a or Q17b depending on the routing

If Q16 = Yes, Ask Q17A, then skip to Q18

If Q16 = No, Ask Q17B, then skip to Q18

If Q16 = Don't know randomly ask Q17a or Q17b then skip to Q18

- Q17a** Above you can see one of the decision-making procedures you rated most highly. Would you be willing to accept a ban on glyphosate if the decision was based on this procedure?
[Yes / No / Don't know]
- Q17b** Above you can see one of the decision-making procedures you rated most highly. Would you be willing to accept the approval of glyphosate if the decision was based on this procedure?
[Yes / No / Don't know]
- Q18** To what extent are you concerned about food safety?
[Not concerned at all (1) / Hardly concerned (2) / Somewhat concerned (3) / Very concerned (4) / Extremely concerned (5)]
- Q19** When you buy food, how often do you buy food that is organically [biologically] grown?
[Always when I buy food (1) / At least every week (2) / At least once a month (3) / Rarely, less than once a month (4) / Never (5)]
- Q20** To what extent do you agree or disagree with the following statements:
- Fruits and vegetables produced without pesticides are healthier.
 - Food would be more expensive without pesticides.
 - Without the use of pesticides more people would suffer from hunger.
 - There are risks for illness or injury for people working with pesticides.
 - Pesticides are harmful for wildlife and the environment.
 - Without pesticides food would be less safe.
- [Strongly disagree (1) / Somewhat disagree (2) / Neither disagree or agree (3) / Somewhat agree (4) / Strongly agree (5) / Don't know (99)]

Attitudes toward current pesticide regulation regime

- Q21** Please say to what extent you agree or disagree with the following statements:
- The public authorities in {#country} are doing enough in order to protect people from food safety and health risks from the use of pesticides.
 - The public authorities in the European Union are doing enough to protect people from food safety and health risks from the use of pesticides.

[Strongly disagree (1) / Somewhat disagree (2) / Neither agree or disagree (3) / Somewhat agree (4) / Strongly agree (5) / Don't know (99)]

Q22 **In order to protect the environment from possible risks of pesticide use, do you think that the current level of regulation in the EU is...**

[Sufficiently high and could even be lower (1) / At the right level and should not be lowered or increased (2) / Not high enough and should be increased (3) / Don't know (99)]

Q23 **Please say to what extent you agree or disagree with the following statement: "The public authorities should approve a pesticide if there is a small but unproven chance that it might have harmful effects."**

[Strongly disagree (1) / Somewhat disagree (2) / Neither agree nor disagree (3) / Somewhat agree (4) / Strongly agree (5) / Don't know (99)]

Objective pesticide knowledge

Q24 **We are interested in understanding your level of knowledge about pesticides. Please indicate whether the following statements are true, false, or whether you don't know the answer. The correct answers will be provided at the end of the questionnaire.**

- **The majority of pesticides do not break down in nature over time.**
- **People who face the greatest health risks from exposure to pesticides are those who eat products containing pesticide residues.**
- **By using pesticides, crops can be grown on the same land a larger number of times per year than would otherwise be possible**
- **Washing or peeling food cannot reduce the amount of pesticide residues.**
- **Exposure to certain pesticides can cause infertility for humans.**
- **Certain types of pesticides are also authorized in organic farming.**

[True (1) / False (2) / Don't know (99)]

Demographics

Q30 **Which of the following best describes the area where you currently live?**

[A big city / The suburbs or outskirts of a big city / A town or a small city / A country village / A farm or home in the countryside]

Q31 Do you currently live in a farming area?

[Yes / No]

Q32 Which of these descriptions best applies to what you have been doing for the last month?

[Paid work / Education or training / Unemployment / Long-term sick or disabled / Retired / Community or military service / Housework, looking after children and/or other persons / Other/ I prefer not to answer / I don't know]

Q33 Which of these descriptions comes closest to how you feel about your household's income nowadays?

[Very difficult on present income and insufficient to cover all the expenses / Difficult on present income / Coping on present income / Living comfortably on present income, but unable to save / Living comfortably on present income and able to save / I prefer not to answer]

Q34 Do you or any of your close family members work in the agricultural sector, for example as a farmer?

[Yes, full-time / Yes, part-time / No]

Trust

Q36 Please say to what extent you disagree or agree with each of the following statements:

- I have very little confidence in the government.
- The government has too much power and influence.
- The government usually tells the public the truth.
- I trust the government to do what is right.

[Strongly disagree (1) / Somewhat disagree (2) / Neither agree nor disagree (3) / Somewhat agree (4) / Strongly agree (5)]

Q37 Please say to what extent you disagree or agree with each of the following statements:

- I have very little confidence in businesses.
- Businesses have too much power and influence.
- Businesses usually tell the public the truth.

- **I trust businesses to do what is right.**

[Strongly disagree (1) / Somewhat disagree (2) / Neither agree nor disagree (3) / Somewhat agree (4) / Strongly agree (5)]

Q38 Please say to what extent you disagree or agree with each of the following statements:

- **I have very little confidence in the European Union.**
- **The European Union has too much power and influence.**
- **The European Union usually tells the public the truth.**
- **I trust the European Union to do what is right.**

[Strongly disagree (1) / Somewhat disagree (2) / Neither agree nor disagree (3) / Somewhat agree (4) / Strongly agree (5)]

Q39 Please say how much you disagree or agree with the following statements:

- **Scientists can be trusted to produce true and reliable results.**
- **Science has led to many discoveries which are of practical benefit to society.**
- **Science is too influenced by funding sources to be of value for society.**

[Strongly disagree (1) / Somewhat disagree (2) / Neither disagree nor agree (3) / Somewhat agree (4) / Strongly agree (5)]

Q35 From the following list, how much do you trust each of the following when it comes to providing reliable information about pesticides?

- **The European Union**
- **Your national government**
- **Scientists**
- **Businesses**
- **The media (for example, newspapers, television)**

[Very much trust / Somewhat trust / Neither trust nor distrust / Somewhat distrust / Very much distrust]

Ideology & politics

Q40a What is your most important source for information about politics and current affairs?

[**News outlets (physical or online) / Television / Social media / Websites other than news outlets or social media / Other / None**]

Note: only if Q40a was not 'other':

- Q40b** Please fill in the name of your favourite information source.
- Q53** In terms of politics, where would you put yourself on a scale from “left” to “right”?
[Scale from 0 to 10, anchored by ‘left’ (0) and ‘right’ (10) / Don’t know (99)]
- Q41** To what extent do you support or oppose the following?
- State regulation of businesses.
 - Redistribution of wealth by the government.
 - Same-sex marriage.
 - A restrictive immigration policy.
- [1 Strongly support / 2 Somewhat support / 3 Neither support nor oppose / 4 Somewhat oppose / 5 Strongly oppose]
- Q42** How urgent do you think that action is to combat climate change?
[0 Not urgent at all / 1 Somewhat urgent / 2 Very urgent / 3 Extremely urgent / 4 I don’t think climate change is happening]
- Q43** How important do you think environmental protection is compared to economic growth?
[1 Environmental protection should take priority even at the cost of economic growth / 2 Environmental protection and economic growth are equally important / 3 Economic growth should take priority even at the cost of environmental protection]
- Q44** Did you vote during the previous {#country_adjective} election on {electiondate}?
[Yes / No / I prefer not to answer]
- Note: If Q44=yes:*
- Q45** Which party did you vote for in that election?
[Scroll-down list, national parties / Other, please specify / Blank / I prefer not to answer]
- Q46** If there was a general election tomorrow, which party would you vote for? If you are not sure, please choose the most likely candidate.
[Scroll-down list, national parties / other, please specify / I prefer not to answer]

Identity

- Q47** Do you see yourself as ...?

{#country2} only / {#country2} and European / European and {#country2} / European only / None of the above]

Q48 On a scale of 0 to 10 (where 0 means totally unattached, and 10 means very attached), how attached do you feel with respect to...

- 1) Your local community.
- 2) Your region {#region_denomination}.
- 3) {#country}.
- 4) Europe.

[0-10 points scale / I don't know]

Q49 Generally speaking, do you think that the {#country_adjective} membership of the EU is...?

[A good thing / A bad thing / Neither a good nor a bad thing / I prefer not to answer]

Q53 Many countries are currently experiencing a major outbreak of the “corona virus” (COVID-19). On a scale of 1 to 10, 1 being not at all worried and 10 being extremely worried, how worried are you about the economic and health implications of this outbreak for your country?

[Likert-scale rating from 0 to 10, anchored with “Not at all worried” and “Extremely worried.” / I don't know / I prefer not to answer]

Q50 How important are these issues for you? To ensure that you are still paying attention, we ask that you choose the value 7 for “Focus”.

- Organized crime
- Gay rights
- Taxation
- National sovereignty
- Focus

[Likert-scale rating from 0 to 10, anchored with “Not important at all” and “Very important”]

Q51 Could you please indicate how difficult this survey was for you to complete?

[Likert-scale rating from 0 to 10, anchored with “Not difficult at all” and “Very difficult.”]

Q52 And could you please indicate how interesting you found this survey?

[Likert-scale rating from 0 to 10, anchored with “Not interesting at all” and “Very interesting.”]

Thank you kindly for participating in the survey. The correct answers to the pesticides quiz are as follows:

- The majority of pesticides do not break down in nature over time: *False*

- People who face the greatest health risks from exposure to pesticides are those who eat products containing pesticide residues: *False*
- By using pesticides, crops can be grown on the same land a larger number of times per year than would otherwise be possible: *True*
- Washing or peeling food cannot reduce the amount of pesticide residues: *False*
- Exposure to certain pesticides can cause infertility for humans: *True*
- Certain types of pesticides are also authorized in organic farming: *True*