

Assessing the Potential Effects of the European Union Multilevel Approach to the Coexistence Policy

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European Union (EU) coexistence policy is based on the principle of subsidiarity, which implies a multilevel governance framework. Different legislative approaches have been developed in EU Member States. These legal rules are oriented to both preventing on-farm adventitious admixture (ex-ante regulations) and reducing potential economic consequences (ex-post liability). So coexistence deals with a subject of negative externalities involving an issue of property-right allocation between farmers. Considering the impacts that coexistence policy has on GM (genetically modified) crop adoption rates and the generation of trade distortions, potential effects of the EU coexistence framework are reviewed from a theoretical property-right allocation view. Derived from the analysis, property-right allocation is focused on non-GM farmers according to EU regulation enforcement, which tends to rigid coexistence measures. Nonetheless, the multilevel EU framework has led Member States to pursue their aims: trade interests and social legitimation.

1. Introduction: Concepts and Basis of Coexistence

The European Union (EU) coexistence policy is largely formed of soft regulations, mainly recommendations and guidelines, based on the principle of subsidiarity. These rules define ‘coexistence’ as the farmers’ capacity and right to opt for genetically modified (GM), conventional or organic agricultural production, in compliance with the legal requirements of purity, traceability and labelling.¹ Therefore, the core intention of coexistence is to keep the agricultural diversity by means of maintaining the three production alternatives – GM, conventional or organic.

The former definition involved only economic and normative aspects related to the accidental or adventitious admixture of GM crops in non-GM crops (ex-ante regulations and ex-post liability). As a result, it focused on the implementation of technical and economic efficiency measures. Those measures were oriented to both preventing genetic pollution, which is distance-dependent (ex-ante regulations), and reducing the potential consequences of inadvertent GM admixture for non-GM farmers (ex-post liability). The orientation of crop coexistence acquires significance in European markets given that non-GM productions can opt for a market price premium. In this regard, coexistence deals with a problem of negative external consequences – externalities in the sense of Baumol² – from producer to producer, i.e. from GM crop farmers to non-GM crop farmers, due to crop admixture because of product differentiation and market price premium losses. Thus, the most conflictive issue is the accidental or technically inevitable presence of GMO (Genetically Modified Organisms) in conventional or organic crops over the maximum tolerance level (0.9%) prescribed by EU regulations.³ Surpassing the tolerance level, non-GM crop farmers have to label products as ‘genetically modified’. In addition, coexistence becomes a problem of social costs⁴ considering that GM crops may jeopardize the existence of non-GM crops and the consumers’ right to choose is not assured due to the lack of access to GM-free food.

According to the principle of subsidiarity, the Member States have developed and implemented their own coexistence measures. Thus, the EU acts in a multi-level approach based on the heterogeneity of European agriculture. In this regard, national political decision-makers can design either lenient coexistence measures that transfer the costs from accidental admixture to non-GM crop farmers, or rigid coexistence measures which means that the costs are supported by GM crop farmers. The implementation of any type of coexistence measure involves property rights allocation between GM and non-GM crop farmers. Property rights are frequently characterized by a group of rights that define the ownership, the named incidents of ownership⁵ (e.g. right to use, manage, receive income, etc.), and the protection of these rights by law. Coexistence measures, as statutory regulations, can modify the ownership of those rights, including land management and liability in incidents and, consequently, entail costs for farmers. Costs in terms of the coexistence policy are composed mainly of admixture prevention costs derived from fulfilling administrative registration and information procedures as well as technical segregation measures; transaction costs induced by information and agreement with farming neighbours; and costs of damages that materialize only when there has actually been GM admixture. Another economic concept that may be considered is the opportunity cost that embodies the trade-off between the risk and return associated with GM and non-GM crops. This is considered a global cost because it involves both coexistence costs and the profitability gap due to growing GM crops instead of non-GM crops.

Considering the profound impacts that Member States’ coexistence policies can have on both GM crop adoption rates⁶ and the generation of foreseeable trade distortions, this paper aims to assess potential effects derived from the EU coexistence multilevel system by considering a property right allocation criterion – i.e. identifying

the potential effects of property right allocation due to the framework of the EU coexistence policy. We are basing this on the active link involving property right allocation and coexistence measures, drawing on the efficiency and social legitimacy sought by political interventions. Analysing the coexistence multilevel system planned by the EU by using the potential consequences in farmers' property right allocation has not been a widely applied approach in the relevant literature. This approach enables us to delve deeply into both: the potential causes that Member States could have to implement lenient or rigid coexistence measures, and the foreseeable consequences of adopting divergent coexistence measure schemes in the Member States and the EU. To do this, the EU coexistence framework is analysed, as well as the EU Member States' proposals on this subject.

The article is structured as follows: the following section examines the EU framework on coexistence and then the proposals of EU Member States; we end with a discussion of the most relevant issues and then review our primary conclusions.

2. The European Union Institutional Framework for Coexistence

The EU only provides general guidelines to regulate the coexistence of GM, conventional and organic crops; thus, it develops the so-called 'Open Method of Coordination' procedure⁷ based on a multilevel governance approach whose main pillar is the principle of subsidiarity. By means of this procedure, the EU gathers and coordinates the Member States' coexistence information, strategies and best practices. Thus, in a bottom-up approach, the EU receives and reviews information, monitoring and comparing each situation. As a result, the Member States have the main competencies and are able to plan and design coexistence regulatory frameworks that suit the productive features of each national agri-food sector.

The first EU rule to set up the open-governance coexistence procedure was Recommendation No. 556/CE.¹ This rule determines the concept of coexistence exclusively as an economic matter. Then it analyses the potential measures for agricultural management (ex-ante regulations), the viability of establishing GMO-free zones, and liability due to accidental GMO presence (ex-post liability).

In addition, it limits national coexistence regulations by establishing 12 general principles that the Member States have to follow. By these principles the EU aims to guarantee the balance between producers' interests and the equal and adequate compensations for economic damage to farmers. Regarding the latter point, a priori, the farmers who introduce GM crops are responsible for the implementation of agricultural management practices to limit genetic flow, and for damages. As a result, the EU introduced the so-called 'newcomer principle', assigning property rights to non-GM crop farmers.⁸ However, the EU restricts full property right allocation to non-GM farmers by means of the principle of proportionality. Therefore, coexistence measures have to be science-based and proportional to the legal requirement, i.e. according to the threshold of 0.9% which also limits high costs – due to admixture prevention and transaction costs. Nonetheless, Member States have the ultimate legal authority to design these measures and hence their own coexistence models.⁹

Drawing upon Moschini,¹⁰ the assignment of property rights to farmers is made by the definition of the ex-ante and ex-post onus which can lead to difficulties in the adoption of GM crops because of their high cost.

Several EU public bodies, such as the Committee on Agriculture and Rural Development¹¹ and the European Economic and Social Committee,¹² dissented from the position of the European Commission. They define coexistence in a broad sense, considering environmental and human health concerns, and state the need to establish a common regulatory framework – EU-level governance – on coexistence to avoid distorting competition among Member States. This common regulation should apply both precaution and polluter-pays principle. In this regard, those farmers who cultivate GMO are liable for implementing the necessary management measures and responding financially to an admixture problem. Hence, they are in agreement with the assignment of property rights to non-GM crop farmers and, also, extend the responsibility to GM crop farmers.

Later, the European Commission reviewed the coexistence measures applied by the Member States.^{13,14} After this review, the European Commission consolidated the subsidiary-based approach to coexistence, highlighting the national autonomy and not developing further harmonization on this matter.

Nevertheless, the EU enacted the Recommendation of 2010 (Recommendation 2003/556/EC is repealed) to tackle the disparity found in rules.¹⁵ To achieve this aim, EU countries should take into account the available knowledge on probability and sources of admixture as well as science-based criteria, in order to develop proportional measures according to the goal described in the legal requirements. So, the EU again emphasized the above-mentioned principle of proportionality, as a way of attenuating the disparities among the States. However, the EU also recognized potential economic damage even when GMO presence is under the 0.9% threshold level.¹⁵ Based on former economic damage, the Member States can be authorized to implement measures to obtain lower levels of GMO presence. In any case, the Recommendation marks an extension of coexistence policy regarding the previous one.¹⁶ However, the current rule is added as another aim of the coexistence measures to preserve the consumer's right to have a high degree of choice. Thus, consumers should have the chance to purchase GM-free products. This wider aim of coexistence favours the fact that Member States can develop GM-free labelling when there is an actual demand for non-GM products.

3. European Union Member States' Proposals for Coexistence

According to the principle of subsidiarity, EU Members plan, design and adopt national regulations on coexistence. These regulations should allow economic agents to act freely in accordance with the above-mentioned guidelines and the aims marked by EU regulations at large.⁶ Notification of national coexistence measures should be presented to the European Commission. Each of the coexistence measures adopted or proposed by the Member States is monitored, analysing feasibility and efficiency. Many States (such as Austria, Belgium, the Czech Republic, Denmark, France, Germany, Hungary,

Lithuania, Luxembourg, Latvia, the Netherlands, Portugal, Romania, Sweden, and Slovakia) have proposed some type of coexistence regulations.¹⁷ These regulations are composed of both ex-ante measures and ex-post liabilities. The main coexistence instruments within national regulatory frameworks have been: technical segregation measures – isolation distance (rules governing the minimum distance between GM and non-GM crop fields of the same species) and buffer zones (pollen barriers of conventional crops to buffer the unintentional presence of GMO by cross-pollination in bordering fields) – given that cross-pollination is the main contaminating source; administrative measures in farm management for ex-ante regulations; and ex-post liabilities at different degrees of severity. The main technical segregation measures, which have been submitted to the European Commission, are shown in Table 1.

Isolation distances vary in different EU countries, and are mostly between 25 and 200 m. Indeed, in Spain, the isolation distance has increased from 25 m in the first project of coexistence law to 220 m in the last draft.¹⁸ In addition, some States have designated additional distances for organic farming. The success of the isolation distance and/or buffer zones will depend largely on structural barriers. Some researchers^{19,20} show that a distance between 10 and 50 m is enough to prevent cross-pollination in maize from surpassing the threshold level. In those States where it is possible to replace large isolation distances with buffer zones, coexistence will be easier and less costly both technically and economically.^{21,22}

Concerning administrative measures in farm management (Table 2), mandatory agricultural training and the duty to inform adjacent neighbours are the most outstanding. Both measures become fundamental not only for the farmers' training in GM production particularities but also for those neighbours who want to take precautions. In this regard, many EU Members, e.g. Portugal or Spain, allow region by region segregation according to their productive orientation, determined by voluntary agreements among producers. Thus, costly segregation measures are minimized. In countries that do not have such a procedure, the future development of agro-biotechnology is seriously restricted. However, Greenpeace²³ claims that organic production has fallen drastically in Spain due to problems of genetic contamination with GM crops.

On the other hand, the ex-post liability measures present a broad range of severity. Germany has proposed the strictest liability regime because it does not allow any exceptions. In this regulation, farmers using GM crops are totally responsible for GMO pollution even if coexistence measures have been met. In other countries, such as Norway or Finland, part of the liability regime is considered within the general environmental liability regulations, which are much more severe than the EU rules on this matter. Sanvido *et al.*²⁵ point out that GM legislation leads to an irrational situation in the sense that the same environmental damage may be judged differently depending on the agricultural management practice that caused it. In a less strict position, Denmark and Portugal have liability regimes where a public compensation fund has been provided for when coexistence proceedings are followed, and fault cannot be determined. For example, in Denmark, the fund is financed through a statutory fee of €13 per ha cultivated that all GM-crop growers have to pay. In Portugal, the money for the compensation fund comes from a €4 tariff that the

Table 1. Isolation distances and buffer zones for coexistence in Bt maize in the EU.

States	Distances of isolation (metres)		Buffer zones
	Conventional	Ecological	
Austria	Not required, as the crop is prohibited		—
Luxembourg	600	600	Not specified.
Hungary	400	400	Not specified.
Germany	150	300	—
Poland	200	300	—
Portugal	200	300	The distance can be substituted by 24 perimeter rows. In the ecological case, a minimum of 50 m plus 28 perimeter rows.
Slovakia	200	300	—
Netherlands	25	250	—
Czech Republic	70	200	They can be substituted by 2 m of distance per row of maize. In the case of ecological crop, a minimum of 100 m is established.
Denmark	150	150	Not specified.
Belgium	200	200	—
Lithuania	200	200	Minimum of 3 m.
Latvia	200	200	Minimum 1.8 m.
Romania	200	200	—
United Kingdom	110 (grain) 80 (silage)	110 (grain) 80 (silage)	—
Ireland	50	75	—
France	50	50	—
Spain ^a	50	50	At least four rows considered as a refuge zone.
Sweden	25 (grain) 15 (silage)	25 (grain) 15 (silage)	—

^aIn the last draft (2006) the future RD on coexistence proposed a safety distance of 220 m (25 m was set in 2004 and 50 m in 2005).

Source: Our own based on the European Commission^{13,17,24}.

government has placed on the price of standard GM seed bags. Spain does not have any of such regimes. Austria and Luxembourg are the only countries where there is an obligatory insurance to cover damages due to admixture; if GMO producers cannot contract insurance, financial guarantees are required. The primary difficulty in applying insurance is the lack of scientific consensus in specifying an admixture-likelihood threshold and potential loss value, given heterogeneous features of crops. In any case, the aim of the liability regime is to compensate for economic damages due to admixture, but it is being converted by some countries into a preventive mechanism to avoid adventitious mixing due to the high potential costs for GM farmers if contamination is produced.

Table 2. Information, registration and training procedures for coexistence in the EU.

Administrative measures in farm management	Included	Excluded
Information to public authorities and national registry with public access regarding transgenic crops	All the countries (there are differences with respect to the degree of detail in the information)	—
Mandatory agricultural training.	AT, BE, DE, DK, EE, HU, IR, IT, LV, LT, NL, PT, SI, SK, ES (optional), FI, UK (optional), RO (optional)	CZ, LU, PL, CY, CZ, FR
Licence to cultivate (prior authorization mandatory or prior written notification)	AT, BE, CY, DK, EE, FI, HU, IR, IT, LT, LV, RO, SI, SK	CZ, DE, ES, FR, LU, NL, PL, PT
Duty to inform adjacent neighbours	All countries (CY, PL – have not yet established measures)	—
Record keeping (farm notebook)	BE, CZ, DE, DK, EE, ES, FI, HU, IR, IT, LT, LV, NL, PL, PT, RO, SI, SK	AT, LU, CY, FR, IT, LU, NL, PL

AT: Austria; BE: Belgium; CY: Cypress; CZ: Czech Republic; DE: Germany; DK: Denmark; EE: Estonia; ES: Spain; FI: Finland; FR: France; HU: Hungary; IR: Ireland; IT: Italy; LT: Lithuania; LU: Luxembourg; LV: Latvia; NL: Netherlands; PL: Poland; PT: Portugal; RO: Romania; SE: Sweden; SI: Slovenia; SK: Slovakia; UK: United Kingdom. Source: Adapted from European Commission^{13,17}.

The heterogeneity of ex-ante and ex-post measures shows a great asymmetry in the allocation of property rights in many national coexistence schemes. As a result, the magnitude of admixture prevention and transaction costs and the potential distortions in the European Union market will be very different. Countries such as Austria have fully allocated property rights to non-GM farmers by rigid coexistence measures that are barely implementable (coexistence compliance costs are not affordable). In contrast, in countries such as Portugal, the allocation of property rights seeks a balance between the interests of GM and non-GM farmers (e.g. buffer zones instead of isolation distances and farmer cooperation schemes) in order to maximize joint profit through efficient land allocation.

Reflecting on the significant differences in property rights assignments, European civil society is generally suspicious of GMO. According to the Eurobarometer,²⁶ 57% of EU citizenry are not willing to support GM food, although this trend is not uniform among Member States. Thus, the development of rigid coexistence proposals is more related to social opinion than governmental concerns for environmental or rural protection. In fact, a link might exist between citizens' attitudes and public policies, as countries with a ban on GM crops show citizens' low support for GM food, and those where GM crops are grown show highest citizens' support.²⁶

Furthermore, trade interests are emerging in some States. France, one of the main EU grain exporters, has provided a voluntary GM-free label scheme for food and livestock produced with certified non-GM ingredients. Negative social opinions

concerning GM crops would be advantageous to French national agri-business interests since their farmers would become the main suppliers of GMO-free grain. In fact, earlier in 2008, France banned the growing of Bt maize and promoted a proposal urging upon the European Commission that GMO introduction must be assessed at a national level.

In other EU States, e.g. Austria, agriculture has not been developed under a productive paradigm. As a result, rigid coexistence measures are applied in order to satisfy social demands and are used as a protectionist instrument in an agrarian-based rural development paradigm. Actually, Austria keeps, *de facto*, banning GM crops even though this was declared illegal by the Court of Justice of the European Union.²⁷

4. Discussion

Under the so-called ‘newcomer principle’,¹ i.e. farmers who introduce GM crops are responsible for avoiding incidents and damages, property rights are assigned to non-GM farmers resulting the EU regulation enforcement at large in a tendency toward rigid coexistence measures. Hence, the EU defines legal rules on coexistence to protect non-GM crop farmers from negative externalities.¹⁹ To modulate trade-off involved in the property rights between GM and non-GM farmers, the EU has introduced the proportionality principle. Nonetheless, the principle of subsidiarity prevails and enables the Member States, which frequently obviate the principle of proportionality, to allocate the farmers’ property rights.

From the supply side, some empirical examples^{6,8,22} show that the implementation of rigid coexistence regulations could discourage GM farming. Nevertheless, the EU position has led the Member States to use the 2010 guidelines’ flexibility approach to pursue their own aims. These aims are closely related to both specific trade interests (GM-free market emergence) and the need for further social acceptance of political interventions in agro-food markets (social demand of GM-free food). Therefore, the EU multilevel approach may not be efficient to achieve the main aim of assuring the coexistence of all the agricultural production methods. Accordingly, the legislative framework for coexistence should involve a harmonization of national frameworks to set maximum legal thresholds for the design of national coexistence measures. In this line of action, ex-ante technical measures and ex-post liability regimes may allow the reduction of the admixture prevention and transaction costs associated with field-by-field segregation, fostering and improving the farmers’ spatial aggregation in order to guarantee a balance in producers’ interests. This harmonization does not mean an exclusive regime from the EU, but it does mean a similar treatment for the homologous counterpart cases occurring in two different countries, leading to the elimination of the wide differences among national coexistence regimes.

Concretely, spatial aggregation benefits should be boosted by means of cooperative coexistence schemes. This rule allows the segregation of areas with the same productive orientation through farmers’ voluntary agreements. GM and non-GM regions can be shaped, achieving highly efficient land allocation because farmers’ clustering greatly reduces coexistence costs.⁹ Using cooperative coexistence schemes, ecologically sensitive

areas with small-scale landholdings, great heritage or rich in natural resources can be an example of GMO-free zones. However, cooperative coexistence schemes have to be carefully designed to avoid unintended effects. First, a regulation based on very rigid coexistence rules, which include voluntary agreements to segregate regions, may lead to granting legal support only for 'GMO-free regions'. Second, voluntary agreement schemes can be used as a pressure tool between GM and non-GM farmers, particularly if no regional policies are implemented. Nonetheless, when spatial agglomeration units reach a minimum size and isolated areas are replaced by pollen barriers, admixture prevention and transaction costs should decrease significantly and this problem would lose its initial relevance. Obviously, it would be necessary to use existing cooperative structures in order not to incur additional costs when establishing groups of farmers (see Ref. 9).

From the demand side, coexistence makes sense as long as there are consumers who demand non-GM products. The coexistence framework considers implicitly that the 0.9% threshold level may be restricted if there is noticeable market demand (or a lack thereof) for 100% GM-free products. In this sense, the EU also considers coexistence as a problem of social cost. According to this rule, Member States are legitimated to form GM-free regions by implementing rigid coexistence regulations in order to satisfy consumer demands, which involve that Member States would fulfil the principle of proportionality since the accepted adventitia contamination threshold would decrease from 0.9% to technically a zero level. As a result, consumer property rights would take priority over GM crop farmers' property rights, although consumers can access imported GM products in the market. With this approach, the EU coexistence policy is inefficient because Member States can require the elimination of the externality⁸ and remove the incentive for non-GM crop farmers of self-protection.²⁸ Hence, the coexistence policy aim at guaranteeing the three agricultural production methods could be in conflict with ensuring consumers' freedom of choice.

The development of a GM-free food market in the EU may reveal an emerging demand, and the concrete price gap between GM and non-GM products may increase considerably. With a higher price premium and restrictive coexistence regulations, the opportunity costs derived from maintaining or adopting GM crops would be very high. As a result, a domino effect would be triggered²² at farming level by forcing farmers to give up GM crops.

5. Conclusions

The EU has adopted a pragmatic and short-term vision, giving up the idea of boosting a harmonization of Member States' coexistence regulations. Therefore, the EU intends to support both the Member States that want to legitimate agricultural production from GMO-free areas and those that want to develop agro-biotechnology. The Recommendation of 2010 consolidates the current concentration process between GM-free and GM production regions, losing another opportunity to initiate a convergence process among Member States.

In addition, the EU multilevel governance framework has not achieved its aim of instituting a true coexistence of GM- and non-GM crops, and this may lead to trade conflicts at international, intra-European Union and even intra-country level.

Currently, the price gap between GM and conventional productions is limited largely because it is not compulsory to label those products derived from GM-fed animals. However, in the medium-long term, large GMO-free regions could be consolidated and generalized in the European Union. Such a situation could cause a partial moratorium across EU Member State borders that could damage the single market as a primary mechanism of cohesion. In all probability, the entrance of GM propagation material will be prevented. Thereby, GM products will be discriminated against and some countries could even ban the import of GM feed for livestock breeding. This situation may result, in the short term, in legal battles^{27,29} at different judicial institutions and involving heterogeneous actors. Furthermore, these distortions in the trade of agri-food products inside the EU could also have consequences at the international level. Legal frictions regarding international trade agreements may arise within the World Trade Organization similar to those related to the *moratoria de facto* in the period 1999–2003.

In any case, the social acceptance of GM foods will probably continue to largely determine regulations on coexistence. It is expected that the coexistence frameworks within the EU will respond to the need of social legitimization in political interventions to a greater extent.³⁰

In short, farmers will set up production decisions based on their own economic strategies. However, the political interventions on coexistence involve property rights allocation between farmers. The EU could assign them with a view to getting maximum economic efficiency, but property rights are assigned in order to protect non-GM crop farmers and, recently, consumers' right to choose. Thus, the EU position on coexistence is characterized by not founding the pillars of the GM debate in the public arena and an attitude of *laissez-faire* policy towards Member States' interventionism.

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References

1. European Commission (2003) *Commission Recommendation of 23 July 2003 on Guidelines for the Development of National Strategies and Best Practices to Ensure the Coexistence of Genetically Modified Crops with Conventional and Organic Farming, DOCE L 189* (Brussels: European Commission).
2. W. J. Baumol (1972) On taxation and the control of externalities. *American Economic Review*, **62**(3), pp. 307–322.
3. Council of the European Union (2003) *Regulation (EC) no. 1829/2003 on Genetically Modified Food and Feed, OJEU L 268* (Brussels: Council of the European Union).

4. V. Beckmann and J. Wesseler (2007) Spatial dimension of externalities and the Coase Theorem: implications for coexistence of transgenic crops. In: W. Heijman (Ed.), *Regional Externalities* (Dordrecht: Springer), pp. 215–234.
5. A. M. Honore (1961) Ownership. In: A. G. Guest (Ed.), *Oxford Essays in Jurisprudence* (Oxford: Oxford University Press).
6. V. Beckmann, C. Soregaroli and J. Wesseler (2010) Ex-ante regulation and ex-post liability under uncertainty and irreversibility: governing the coexistence of GM crops. *Economics: The Open-Access, Open-Assessment E-Journal*, **4**, 2010–2019.
7. T. F. M. Etty (2009) *Regulating Coexistence in the EU: Moving beyond 'Subsidiarity vs. Harmonization' towards Synergetic Governance* (Amsterdam: Institute for Environmental Studies (IVM)).
8. M. G. Ceddia, M. Bartlett, C. De Lucia and C. Perrings (2011) On the regulation of spatial externalities: coexistence between GM and conventional crops in the EU and the 'newcomer principle'. *Australian Journal of Agricultural and Resource Economics*, **55**, 126–143.
9. T. Skevas, P. Feveireiro and J. Wesseler (2010) Coexistence regulations and agriculture production: a case study of five Bt maize producers in Portugal. *Ecological Economics*, **69**, 2402–2408.
10. G. C. Moschini (2008) Biotechnology and the development of food markets: retrospect and prospects. *European Review of Agricultural Economics*, **35**, 331–355.
11. Committee on Agriculture and Rural Development (2003) *Report on Coexistence between Genetically Modified Crops and Conventional and Organic Crops, A5-0465/2003* (Brussels: European Parliament).
12. EESC (2005) *Opinion of the European Economic and Social Committee on the Co-existence between genetically modified crops, and conventional and organic crops. DOCE C157* (Brussels: European Economic and Social Committee).
13. European Commission (2006) *Communication from the Commission to the Council and the European Parliament – Report on the Implementation of National Measures on the Coexistence of Genetically Modified Crops with Conventional and Organic Farming. COM (2006) 104 final* (Brussels: European Commission).
14. European Commission (2009) *Report from the Commission to the Council and the European Parliament on the Coexistence of Genetically Modified Crops with Conventional and Organic Farming. COM (2009) 153 final* (Brussels: European Commission).
15. European Commission (2010) *Commission Recommendation of 13 July 2010 on Guidelines for the Development of National Coexistence Measures to avoid the Unintended Presence of GMOs in Conventional and Organic Crops. DOCE C 200/1* (Brussels: European Commission).
16. J. Corti-Varela (2010) Coexistence of genetically modified, conventional and organic products in the European Market: state of the art. *European Journal of Risk Regulation*, **1**, pp. 63–71.
17. European Commission (2009) *Implementation of National Measures on the Coexistence of GM Crops with Conventional and Organic Farming. SEC (2009) 408 final* (Brussels: European Commission).
18. MAPA (2006) *Proyecto de Real Decreto por el que se aprueba el reglamento sobre coexistencia de los cultivos modificados genéticamente con los convencionales y los ecológicos* (Madrid: Ministry of Agriculture, Fishery and Food).
19. Y. Devos, M. Demont, K. Dillen, D. Reheul, M. Kaiser and O. Sanvido (2009) Coexistence of genetically modified (GM) and non-GM crops in the European Union. A review. *Agronomy for Sustainable Development*, **29**, pp. 11–30.

20. O. Sanvido, F. Widmer, M. Winzeler, B. Streit, E. Szerencsits and F. Bigler (2008) Definition and feasibility of isolation distances for transgenic maize cultivation. *Transgenic Research*, **17**, 317–335.
21. W. H. Furtan, A. Guzel and A. S. Weseen (2007) Landscape clubs: co-existence of genetically modified and organic crops. *Canadian Journal of Agricultural Economics*, **55**, pp. 185–195.
22. M. Demont, W. Daems, K. Dillen, E. Mathijs, C. Sausse and E. Tollens (2008) Regulating coexistence in Europe: beware of the domino-effect! *Ecological Economics*, **64**, 683–689.
23. Greenpeace (2006) *La imposible coexistencia. Siete años de transgénicos contaminan el maíz ecológico y el convencional: una aproximación a partir de los casos de Cataluña y Aragón* (Barcelona: Asamblea PAGESA, Plataforma Transgénicos Fora and Greenpeace).
24. GMO-Safety (2009) Coexistence in the countries of the EU: a European patchwork. Available at: www.gmo-safety.eu/en/coexistence/513.docu.html (accessed 20 February 2010).
25. O. Sanvido, J. Romeis, A. Gathmann, M. Gielkens, A. Raybould and F. Bigler (2012) Evaluating environmental risks of genetically modified crops: ecological harm criteria for regulatory decision-making. *Environmental Science & Policy*, **15**, pp. 82–91.
26. European Commission (2010) *Europeans and Biotechnology in 2010. Winds of Change?* (Brussels: Directorate-General for Research Communication Unit).
27. Court of Justice of the European Union (2005) *Land Oberösterreich and Austria vs Commission of the European Communities*. *OJEU C 296* (Brussels: Court of Justice of the European Union).
28. W. J. Baumol and W. E. Oates (1988) *The Theory of Environmental Policy* (Cambridge: Cambridge University Press).
29. Court of Justice (2012) *Case C-36/11: Reference for a preliminary ruling under Article 267 TFEU from the Consiglio di Stato (Italy) made by decision of 14 January 2011* (Brussels: Case-law Judgment of the Court).
30. M. Salazar-Ordóñez, M. Rodríguez-Entrena and S. Sayadi (2013) Agricultural Sustainability from a Societal View: An Analysis of Southern Spanish Citizens. *Journal of Agricultural and Environmental Ethics*, **26**, pp. 473–490.

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