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On the proportionality of EU spatial *ex ante* coexistence regulations: A comment

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ABSTRACT

In their recent article in this journal, Demont et al. (2009) discuss the effects of alternative spatial *ex ante* coexistence regulations (SEACERs) in the context of the EU regulatory framework. We retain from Demont et al. (2009) that small pollen barriers should be considered as a possible regulatory option in all identifiable situations in which they are as effective as large isolation distances. This idea is in accordance with the proportionality principle of the 2003 EC Recommendation. But further analysis of how consumer choice and consumer welfare are affected should be conducted before supporting the idea that SEACERs should be flexible, that is that GMO farmers should always have the option of paying their non-GMO neighbours to implement the SEACERs in their own fields. We reject the authors' argument that pollen barriers are necessarily more easily negotiable among neighbours (more "flexible") than are isolation distances. We contest the relation of proportionality to the size of market signals for IP products. We contest the idea of shifting coexistence regulation from *ex ante* to *ex post*. We believe that any economic analysis of coexistence measures should include their welfare effects on consumers as well as on producers.

Introduction

The EU has introduced a legal framework that allows Member States to impose mandatory regulations on farmers growing genetically modified (GM) crops, in order to limit gene flow from their fields to neighbouring non-GM fields, and thereby facilitate the coexistence of GM and non-GM crops.[2] In their recent article in this journal, Demont et al. (2009) extend simulations presented in Demont et al. (2008) to discuss the effects of two alternative spatial *ex ante* coexistence regulations (SEACERs) in the context of this EU regulatory framework, isolation distances and pollen barriers.[3] They also closely follow Demont et al. (2008), Demont and Devos (2008), and Devos et al. (2008) in an analysis of such coexistence regulations. In the following we discuss and take issue with certain aspects of that analysis.

The agronomic literature does not conclude that small pollen barriers are as effective as large isolation distances in all situations

In their Proposition 2, Demont et al. (2009) argue in favour of pollen barriers over isolation distances because "*pollen barriers need not to be as large* [as isolation distances] *to achieve a similar rate of cross-fertilization*". From the agronomic literature, they conclude that for maize, "*the effectiveness of 10–20 m pollen barriers, ideally planted around the recipient field ... is shown to be comparable to 50 m isolation distances of bare ground*" and "*an isolation perimeter of 50 m would be sufficient to keep cross-fertilization levels below 0.5% at the border of the recipient maize field*", and "*scientific evidence suggests that 50 m [of isolation distance] is sufficient to achieve the required threshold*".

Actually, these assertions introduce some confusion as some are stated for isolation distances consisting of bare ground while other are stated under the general definition of isolation distances – which may include bare ground, but also planting a non-GM variety of the same crop as the GM crop, or planting another crop (see Footnote 2). In addition, in the literature that the authors quote, nowhere are such assertions provided with such generality. The substantial agronomic literature on SEACERs actually shows that

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[1] Both authors contributed extensively to the work presented in this paper.

[2] The EC 2001/18 Directive establishes the basic principles of coexistence regulation, but operates in practice according to the principle of subsidiarity, delegating to the Member States authority for its detailed implementation. The EC 1829/2003 Regulation makes labelling of products containing GMOs mandatory, unless the presence is adventitious and less than 0.9% per ingredient. The 2003 EC Recommendation sets up general principles for coexistence regulation, upon which each Member State may base its own particular coexistence rules (EC, 2003).

[3] Following the definitions of the authors, an isolation distance defines a minimum spacing between GM plantings and non-GM plantings dedicated to identity preserved (IP) non-GM markets. This isolation distance may either be planted with a non-GM variety of the same crop, or planted with another crop, or left uncultivated. A pollen barrier may be created in a GM field, by planting strips at the outer border of the GM field with a non-GM variety of the same crop, or in a non-GM field, by harvesting separately the border of the non-GM field (and selling that grain as GM grain). From these definitions, an isolation distance entirely planted with a non-GM variety of the same crop as the GM crop is actually equivalent to a pollen barrier of the same width.

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the effectiveness of both coexistence measures depends on many factors, notably the crop type, the particular characteristics of the agricultural landscape, and the other sources of adventitious commingling than cross-fertilization at the growing stage. Most studies rely on many assumptions about some of these crucial elements, and in all this literature many precautions are used on how the particular design of each study may affect the results obtained and how far the results of each paper may be applied generally. Being economists, here we attempt no detailed review of the relevant agronomic literature. But we mention a few basic points made therein to illustrate how the authors' account over-simplifies the issues.

First, the authors' assertions suggest that pollen barriers located in GM fields are effective, although not as effective as located in non-GM fields. Actually, the literature identifies clearly that when neighbouring fields are non-adjacent, a pollen barrier is less effective when it is located in the GM field.[4] The literature quoted by the authors provides little evidence on the effectiveness of a pollen barrier located in the GM field. Only two of the articles that the authors quote actually do consider pollen barriers in a GM field not adjacent to the neighbouring non-GM field. Gustafson et al. (2006) conclude that a pollen barrier is then less effective than when located in the non-GM field. Messéan et al.'s (2006) simulations identify worst-case scenarios in which a 50 m isolation distance is sufficient, but an 18 m pollen barrier in the GM field is insufficient to reach a 0.5% or a 0.9% threshold.

Second, there is indisputable evidence from this literature neither that a 50 m isolation distance is always sufficient, nor that 10–20 m pollen barriers, even when located in non-GM fields, are always sufficient. For example, in the literature quoted by the authors, Messéan et al.'s (2006) simulations identify worst-case scenarios in which a 50 m isolation distance is not sufficient to keep cross-fertilization below 0.5% in the non-GM field. Most of the articles quoted by Demont et al. on the effectiveness of 10–20 m pollen barriers consider only a 0.9% threshold for cross-pollination (while many studies include a lower threshold to account for other sources of commingling and uncertainty on GMO content measurement) and consider a single GM pollen source (while pollen source from several sources would increase the necessary size of coexistence measures). Ranging outside the literature cited by the authors, for oilseed rape, Damgaard and Kjellsson (2005) state that "*an increasing isolation distance is more effective to reduce GM pollen dispersal than the use of a buffer zone, especially for small recipient fields*" (their definition of a buffer zone is equivalent to a pollen barrier in the non-GM field as defined by Demont et al., 2009).

We agree that small pollen barriers should be preferred to large isolation distances in all situations where they perform as well while imposing fewer constraints on GMO producers – as long as such situations can be identified clearly and safely. This is actually in accordance with the 2003 EC Recommendation which states that coexistence measures should reflect the best available scientific evidence and should be "*efficient and cost-effective, and proportionate*" (EC, 2003). But we contend that a review even of the articles quoted by the authors should lead to a more cautious assessment of the effectiveness of pollen barriers and isolation distances. The 10–20 m pollen barrier may be insufficient when located in the GM field; the 10–20 m pollen barrier in the non-GM field and the 50 m isolation distance may well be sufficient for many situations in European agriculture. But the proportion of potentially problematic situations is unclear to us.

Also, the authors induce some confusion by failing to recognize that evidence obtained for one crop type is not necessarily relevant for another crop type (as emphasized by the 2003 EC Recommendation which states that "*the choice of measures should take into account [...] the specific nature of the crop concerned,*" and that "*best practices for co-existence should take into account the differences between crop species*"). With this respect, their quote of the study of Ceddia et al. (2009), which pertains to oilseed rape, is out of scope in their discussion of coexistence measures for maize. Also, their use of the 50 m isolation distance envisioned for maize as a base case for their simulations is not adequate, since these simulations use an existing landscape in France in which the proportion of arable land planted to the crop of interest is calibrated as equal to the existing proportion of oilseed rape plantings in this landscape. Although we agree with the general results of the Demont et al. (2009) simulations, we disagree that using a real geographical dataset for these simulations makes a contribution to papers that rely on a stylized or simplified spatial economy, given that these simulations mix up data pertaining to different crops.[5]

Pollen barriers are not necessarily "*flexible* and isolation distances are not necessarily "*rigid*

In their Proposition 1, the authors postulate that the shorter are the distance requirements, the more inclined farmers will be to negotiate with their neighbours about borders. They contend that therefore pollen barriers are "*flexible*", that is, negotiable among neighbouring farmers, but isolation distances are "*rigid*", that is non-negotiable.[6] For pollen barriers, they describe in much detail (in their systems 1 and 2, a and b) how neighbours could bargain over various issues, for example over whether the pollen barrier is located in the GM or in the non-GM field, and over which bargaining party plants or harvests. They conduct their discussion under the assumption that if the pollen barrier is in the non-GMO field, the non-GMO farmer receives financial compensation from the GMO farmer.

Actually, it is not clear to us that isolation distances may not be every bit as "*flexible*" as pollen barriers—for example, that a 10–20 m pollen barrier could encourage voluntary coordination between neighbours while a 50–100 m isolation distance would not. In many cases interchanging an isolation distance makes the GMO farmer gain more, and the non-GMO farmer lose more, than if they interchange a pollen barrier, meaning that the compensation has to be higher for the isolation distance. But as long as the

[4] When different fields are separated by gaps, the first rows of recipient fields are more cross-fertilized than in a continuous field at the same distance. Therefore, when open ground or short barrier crops separate maize fields, the first few rows of crops in the non-GM field intercept much of the pollen coming from other fields (e.g. Devos et al., 2005). With a pollen barrier in the non-GM field, the outside rows of this non-GM field, which contain most of the pollen coming from surrounding GMO fields, are harvested separately and channelled outside of the IP supply stream. While with a pollen barrier in the GM field, GM cross-fertilization in the neighbouring non-GM field is reduced because competing non-GM pollen is introduced in the GM field, but still there is some cross-fertilization of the first rows of this non-GM field, which are not harvested separately in this case.

[5] In contrast to maize, pollen drift is a minor problem for oilseed rape. As recognized by the 2003 EC Recommendation, for this crop the major determinant of coexistence feasibility at the farm scale is the presence or absence of volunteers in non-GM fields (plants sprouted from seeds that drop from a parent plant to the soil before and during harvest). If the farmer does not undertake appropriate measures to prevent volunteers or to control them once they have appeared, he will probably not be able to reach the 0.9% threshold of GMO presence in his non-GM oilseed rape, whatever the isolation distance with neighbouring oilseed rape fields. If the farmer either has almost no volunteer seeds in the field (because he has never grown oilseed rape) or undertakes appropriate measures to manage them (by delayed post-harvest tillage and adaptation of herbicide programs), in many cases an isolation distance from the GM field of 10 m should suffice if the non-GM variety presents full male fertility and emit all its pollen, while an isolation distance of approximately 120 m may be necessary if the non-GM variety is cleistogamous (with closed blooms) or comprises male-sterile plants (Colbach et al., 2009).

[6] Without further explanation or interpretation, the authors state that a rigid regulation comes under "civilian responsibility" while a flexible regulation comes under "financial responsibility". To us, this type of new-term-generation seems counter-productive for the public discussion.