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Co-existence of agricultural production systems

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Strategies and best practices for the co-existence of GM and non-GM crops need to be developed and implemented with the participation of farmers and other stakeholders. According to the principle of 'subsidiarity', decisions should be made by the lowest authority possible. When applying this concept to the case of GM crops, the affected society should determine their use and management in a regional decision-making process. Public participation is better accomplished at a lower level, and democratic deficits in decision-making on GMOs are better resolved, enabling farmers to manage or avoid GM crops. Ultimately, voluntary GMO-free zones might be a tool for sustainable co-existence and GM-free production and GMO-free zones might create a specific image for marketing regional products and services, such as tourism.

Introduction

For the first time, genetically modified varieties based on insect-resistant maize MON810 have been included in the EU seed catalogue [1]. However, the cultivation of genetically modified organisms (GMOs) has implications for the organization of agricultural production. Conventional products – those produced without genetic modification – can be contaminated, unintentionally, by GM material during seed production, cultivation, harvesting, storage, transport or processing. However, according to European Commission (EC) guidelines for the development of national strategies and best practices to ensure the co-existence of GM crops with conventional and organic farming, farmers should be able to cultivate the types of agricultural crops they choose, be they GM, conventional or organic. None of these forms of agriculture should be excluded in the EU [2].

On the one hand, the possibility of the adventitious presence of GM lines in non-GM crops raises the question as to how producer choice for the different production types can be ensured now and in the future: organic farms found to have their produce containing GM material are in danger of losing approval for their organic status. On the other hand, the issue is linked to consumer choice: to provide consumers with a real choice between GM food and non-GM food, there should not only be a traceability and labelling system that functions properly but also an agricultural sector that can provide the different types of goods. In summary, the ability of the food industry to deliver a high degree of consumer choice goes hand-in-hand with the ability of the agricultural sector to maintain different production systems.

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Socio-economic considerations

Co-existence refers to the ability of farmers to make a practical choice between conventional, organic and GM crop production, in compliance with the legal obligations for labelling and purity standards. The adventitious presence of GMOs above the legal tolerance threshold [3–5] requires a crop that was intended to be a non-GM crop to be labelled as containing GMOs. This might cause a loss of income because of a lower market price for the crop or difficulties in selling it. Moreover, additional costs might be incurred on farmers if they have to adopt monitoring systems and measures to minimise the admixture of GM and non-GM crops. Therefore, co-existence is concerned with the potential economic impact of the admixture of GM and non-GM crops, the identification of workable management measures to minimize admixture and the cost of these measures.

Management measures for co-existence should reflect the best available scientific evidence on the probability and sources of admixture between GM and non-GM crops, and should permit the continued possibility for cultivation of non-GM crops. They can include technical measures, such as isolation distances and cleaning of machinery, and organizational measures, such as the voluntary clustering of fields [2]. If the cultivation of GM crops is permitted in addition, then it should be ensured that non-GM crops remain below the tolerance thresholds for labelling and purity standards with respect to genetically modified food, feed and seeds. The available scientific evidence should be continuously evaluated and updated to take account of results from monitoring studies on the experimental and commercial cultivation of GM crops, in addition to the findings of new studies and models validated by field experience (http://www.pgeconomics.co.uk/crop_coexistence.htm) [6].

The conditions under which farmers work are extremely diverse: farm and field sizes, production systems, crop rotations, cropping patterns and natural conditions vary enormously. This variability needs to be taken into account when devising, implementing, monitoring and coordinating co-existence measures. The measures that

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are applied must be specific to the farm structures, farming systems, cropping patterns and natural conditions in a particular region [2].

Decentralized organization and new networks

Subsidiarity is a concept whereby the smallest or the lowest authority should handle problems that are best solved in the subsystem where they arise (Box 1). Following this principle, the EC expressed itself in favour of an approach that would leave it up to Member States to develop and implement management measures for co-existence. Subsystems are encouraged to resolve internal conflicts themselves, and to implement the solution they adopt without reference to a higher authority. Formally, the principle of subsidiarity applies to those areas where the EU does not have exclusive competence – the principle delineates those areas where the EU should and should not act. In practice, the concept is frequently used in a more informal manner in discussions as to which competences should be given to the EU and which retained by the Member States alone.

The role of the EC would include gathering and coordinating relevant information based on on-going studies at EU and national level, offering advice and issuing guidelines that should assist Member States in establishing best practices for co-existence. Strategies and best practices for co-existence need to be developed and implemented at national or regional levels, with the participation of farmers and other stakeholders, and taking account of national and regional factors [7]. In general, public participation can be better accomplished at a lower level and, thereby, democratic deficits in decision-making regarding GMOs can be better addressed [1].

GM-free production

In line with the EC guidelines, some Member States have adopted national liability rules in the event of economic damage from admixture [2,8]. The question remains: who will have to bear the costs of monitoring systems, technical and organizational measures for co-existence and why – only the GMO farmers or also the conventional and organic producers? Groups of farmers in a neighbourhood might achieve a significant reduction in the costs related to the segregation of GM and non-GM production types if they coordinate their production, on the basis of voluntary agreements, into zones of a single production type [2].

In some countries, including the USA (http://www.newrules.org/agri/gmomendocino.html; http://www.santacruzsentinel.com/archive/2005/June/15/local/stories/07local.htm) and the EU, several regions declared themselves GMO free, and founded a political network (http://www.gmofree-conference.org/pics/Charter_of_Regions_Feb_05.pdf). Legally, GMO-free zones (Box 2) and measures for co-existence have been established in the EU (http://europa.eu.int/rapid/pressReleasesAction.do?reference=SPEECH/06/3&format=HTML&aged=0&language=EN&guiLanguage=en). First, GMO-free zones can be established as measures for co-existence, provided they are proportional; region-wide measures should only be considered if sufficient levels of purity cannot be achieved by other means. Furthermore, they will need to be justified for each crop and product type (e.g. seed versus crop production) separately. For further examples of measures for co-existence, see http://www.fairtrade.net/pdf/sp/english/Generic% 20Standards%20SP%20version%20Dec%2005.pdf and http://www.fairtrade.net/pdf/hl/english/Generic%20Fairtrade%20Standard%20Hired%20Labour%20Dec%202005%20EN.pdf.

Second, voluntary agreements among farmers on zones of a single production type are always possible. Under appropriate circumstances, the extension of such GMO-free zones on the use of non-GM feed in the production of milk, eggs and meat is conceivable. According to the provisions for mandatory labelling of GM food and feed in the EU, products obtained from animals fed with GM feed are not subject to labelling [1]. In addition, voluntary GM-free food labelling schemes that also take into account the use of non-GM feed exist at national level (http://europa.eu.int/comm/food/committees/regulatory/scfcah/modif_genet/summary02_en.pdf).

A recent study in Austria demonstrates, in principle, the economic feasibility of a non-GM feed supply in this context (http://www13.ages.at/servlet/sls/Tornado/web/ages/content/9937017D95F53920C12570C100559C93). It is noteworthy that, from a different perspective, studies in the UK and Germany arrive at similar conclusions as regards the availability and the costs of non-GM feed (http://www.pgeconomics.co.uk/GM_food_avoidance.htm). Furthermore, for those who oppose the application of GMOs in agriculture, an increasing number of regional food products labelled as GM-free are already available. Altogether, GM-free production and GMO-free zones might create a specific image for marketing regional products and services, such as tourism.

Box 1. Subsidiarity

The Oxford English Dictionary defines subsidiarity as the idea that a central authority should have a subsidiary function, performing only those tasks that cannot be performed effectively at a more immediate or local level. The concept is applicable in the fields of government, political science, cybernetics and the management of large organizations. Subsidiarity is, ideally or in principle, one of the features of federalism.

Subsidiarity is found in several constitutions around the world (e.g. the Tenth Amendment to the United States Constitution). It is presently best known as a fundamental principle of EU law. According to this principle, the EU might only act (i.e. make laws) where Member States agree that the action of individual countries would be insufficient. The principle was established in the 1992 Treaty of Maastricht, and is contained within the proposed new treaty, which establishes a constitution for Europe.

Box 2. GMO-free zone

A connected area where no GM plants are introduced and only non-GM seeds are used. Because of its size and conception the likelihood of contaminations, for example, by in-crossing is minimized, thereby crops not labelled as GM can be produced. Under appropriate circumstances, the extension of the use of non-GM feed to the production of milk, eggs and meat is conceivable.

In summary, the consequent implementation of the subsidiarity concept provides an opportunity to develop regionally sound co-existence arrangements. Furthermore, an increasing number of examples show that GM-free production and GMO-free zones can be used for marketing regional products and services beyond food and feed supply, thus broadening the economic relevance.

References

1 Jank, B. *et al*. (2005) Genetically modified organisms and the EU. *Trends Biotechnol.* 23, 222–224

2 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 (2003/556/EC); (http://europa.eu.int/comm/agriculture/publi/reports/coexistence2/index_en.htm). *Official Journal of the European Union* OJL 189/36 (http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_189/l_18920030729en00360047.pdf)

3 Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC. *Official Journal of the European Union* OJ L106/1 (http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/l_106/l_10620010417en00010038.pdf)

4 Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed, *Official Journal of the European Union* OJ L268/1 (http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_268/l_26820031018en00010023.pdf)

5 Regulation (EC) No 1830/2003 of the European Parliament and of the Council of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms and amending Directive 2001/18/EC. *Official Journal of the European Union* OJ L268/24 (http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_268/l_26820031018en00240028.pdf)

6 Bock, A-K. *et al.* (2002) Scenarios for co-existence of genetically modified, conventional and organic crops in European agriculture. *ESTO Publications* EUR 20394 EN (ftp://ftp.jrc.es/pub/EURdoc/eur20394en.pdf)

7 Commission Decision of 21 June 2005 establishing a network group for the exchange and coordination of information concerning coexistence of genetically modified, conventional and organic crops (2005/463/EC). *Official Journal of the European Union* OJ L164/50 (http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2005/l_164/l_16420050624en00500051.pdf)

8 European Commission Technical Assistance Information Exchange Unit, DG Enlargement, Symposium on Co-existence of GMO in Seeds and Agricultural Production, 22-23 February 2005, Vienna, Austria (http://www.bmgf.gv.at/cms/site/attachments/5/5/1/CH0255/CMS1111661111745/taiex_symposium_on_coexistence.pdf)