

# The organic seed regulations framework in Europe – current status and recommendations for future development

**Thomas F. Döring<sup>1\*</sup>, Riccardo Bocci<sup>2</sup>, Roger Hitchings<sup>1</sup>, Sally Howlett<sup>1</sup>, Edith Lammerts van Bueren<sup>3</sup>, Marco Pautasso<sup>4,5</sup>, Maaïke Raaijmakers<sup>6</sup>, Frederic Rey<sup>7</sup>, Anke Stubsgaard<sup>8</sup>, Manfred Weinhappel<sup>9</sup>, Klaus P. Wilbois<sup>10</sup>, Louisa R. Winkler<sup>1</sup>, Martin S. Wolfe<sup>1</sup>**

<sup>1</sup>Organic Research Centre, Hamstead Marshall, RG20 0HR, UK

<sup>2</sup>Associazione Italiana per l'Agricoltura Biologica, Via Piave, 14 - 00187 Roma, Italy

<sup>3</sup>Louis Bolk Institute, Hoofdstraat 24, 3972 LA Driebergen, Netherlands

<sup>4</sup>Centre d'Ecologie Fonctionnelle et Evolutive, UMR 5175 CNRS, 34293, Montpellier, France

<sup>5</sup>FRB - Centre de Synthèse et d'Analyse sur la Biodiversité (CESAB), 13857 Aix-en-Provence, France

<sup>6</sup>Bionext, Laan van Vollenhove 3221, 3706 AR Zeist, Netherlands

<sup>7</sup>ITAB, 149 rue de Bercy, 75595 Paris Cedex 12, France

<sup>8</sup>VFL, Knowledge centre for Agriculture, Agro Food Park 15, DK – 8200 Aarhus N, Denmark

<sup>9</sup>Agency for Health and Food Safety- Institute for Seed, Austria

<sup>10</sup>FIBL Deutschland FiBL e.V., Forschungsinstitut für biologischen Landbau, Postfach 90 01 63, 60441 Frankfurt am Main, Germany

\*corresponding author; E-mail: [thomas.d@organicresearchcentre.com](mailto:thomas.d@organicresearchcentre.com); Tel. +44(0)1488 658298, ext. 553, Fax: +44(0)1488 658503

## Abstract

Organic agriculture regulations, in particular European regulation EC 889/2008, prescribe the use of organically produced seed. For many cultivated plants, however, organic seed is often not available. This is mainly because investment in organic plant breeding and seed production has been low in the past. To bridge the gap between organic seed supply and demand, national and European regulations define certain circumstances under which organic producers are permitted to use non-organically produced seed. While the organic sector currently depends on these concessions, they also threaten to impede a further increase in the demand for organic seed, thereby potentially restraining present and future investment in organic seed production and plant breeding. We review the current status of the organic seed regulations framework by analysing key issues such as the role of the national derogation regimes, the role of expert groups, databases and seed prices. Key points are that (a) the situation of the organic seed sector has improved over the last few years; however, (b) reporting on organic seed to the EU by different countries needs to be harmonised; (c) the success of the organic seed sector depends critically on the implementation and improvement of national expert groups; and (d) to protect genetic diversity, the use of local varieties and landraces should not be impeded by organic seed regulations.

**Key words:** conservation varieties; Europe; organic; policy; regulation; seed

## Introduction

Seed, as a foundation and focus point for the development of agriculture (Kloppenborg 1988), is at the centre of all principles of organic agriculture – health, ecology, fairness and care (IFOAM 2005; Vaarst 2010; Döring 2011). The organic sector strives to apply organic standards to the entire life cycle of the plant, including the production and use of inputs such as seed (Henatsch 2000, Lammerts van Bueren et al. 2003, IFOAM 2011). However, for many cultivated plant species there is still little or no choice of organic seed. There are three key aspects to this situation (Lammerts van Bueren & Myers 2012). First, in comparison to the conventional sector, very few varieties have been bred specifically for organic systems (Lammerts van Bueren et al. 2011). Second, because of a smaller organic trial programme, there is insufficient information about the performance of registered varieties under organic management; several studies have shown that trialling varieties under high input non-organic conditions does not provide the full picture and that trials under organic conditions provide valuable additional information (Jani & Hallidri 2000, Przystalski et al. 2008, Vlachostergios et al. 2011). Third, there is an insufficient volume of seed produced under certified organic management (e.g. Boelt & Deleuran 2000, Baker 2008, Konvalina 2011).

One of the reasons for the low availability of organically produced seed is the year-to-year variability of organic seed production. Due to its small scale, the organic seed sector is vulnerable to failure of seed crops through, for example, adverse weather events or pest and disease outbreaks (Groot et al. 2004), so its output tends to fluctuate more than non-organic.

Another reason is that organic seed needs to comply with more regulations than conventional seed, in what is already a complex process. First, the varieties from which the seed is produced need to be registered on the EU common catalogue of varieties (according to the Council Directive 2002/53 on the common catalogue of varieties of agricultural plant species and the Council Directive 2002/55 on the marketing of vegetable seed). The seed then needs to comply with conventional regulations on seed quality (e.g., true-to-type, containing no weed seeds). Finally, to be marketed as organic seed, it needs additionally to be certified as organic (according to the Council Directives 834/2007 and 889/2008). It is important to note that at the moment the first two parts of the process are under revision due to the procedural and financial burdens they impose on the seed sector. The revision also identifies additional objectives: conservation of agricultural diversity, environmental protection and the marketing of so-called local varieties for niche markets such as organic agriculture (Anon. 2011).

An even more important underlying reason for the low availability of organic seed is that over the last few decades, investment in organic plant breeding and seed production has been low (Wolfe et al. 2008; Lammerts van Bueren et al. 2010). The serious limitations to organic seed availability and

varietal choice would cause growers problems with some crops if the use of non-organically produced seed was not permitted at all in organic agriculture, and this is why national and international regulations allow organic producers to apply for exceptions from the rule of using organic seed (so called derogations) (Nicola et al. 2011). These regulations define the circumstances and conditions under which the use of non-organically produced seed is permitted.

Investment in organic seed production and plant breeding depends on an increased uptake of organically produced seed (Osman et al. 2008). Since the organic market sector is relatively small and costs in both organic plant breeding and organic seed production are high, there is still a lack or limited choice of appropriate varieties for organic agriculture in many crops (Butler et al. 2007).

Crucially, breeders and seed producers will only invest in developing new supplies of organic seed if the possibility of derogations does not stifle demand (**Fig. 1**). In this way, the derogations themselves limit the market opportunities for producers of organic seed and prevent investments in this area, which in turn limits the number of appropriate varieties with organic seed available (Döring and Howlett 2011).

The percentage of seed used by organic producers that is organic varies widely among countries (**Fig. 2**) and crop species (e.g., Toner et al. 2009). In Italy a recent survey found that in the organic sector overall, 66% of *purchased* seed is certified organic, i.e., the remaining 34% is non-organic (Bocci et al. 2011). However, because of a high proportion of seed saving in Italy, only 44% of seed is purchased; therefore the effective percentage of certified organic seed is much lower (29%). In France, a survey among organic vegetable growers found that 82% of them are intensive organic seed users, i.e., that more than three quarters of their seed is certified organic (F. Rey, unpublished).

Here, we review the current situation of the organic seed regulatory framework in Europe and put it into a wider context. In particular we ask,

- (1) How much progress has been made over the last few years with the use of a no-derogation category?
- (2) What is the role of expert groups in the organic seed sector?
- (3) How are organic seed databases set up and used in different countries?
- (4) What is the effect of the price difference between organic and conventional seed on rates of organic seed usage?
- (5) What rules are currently applied to seed mixtures?
- (6) How, or to what extent, should informal seed systems be integrated into the regulatory framework?

Based on the answers to these questions, we give recommendations for further development of the organic seed sector and highlight directions for policy and research.

### **Crops in the no-derogation category**

Within the organic seed regulations, crop species or sub-species can be placed under two or three categories within country-level derogation systems. Category 1 is reserved for crops in which the use of non-organic seed is not permitted, i.e., *no derogations* are granted (Chable et al. 2012). Currently, the EU Regulation 889/2008 (European Commission 2008) provides for a so-called Category 1 type only by virtue of Annex X to the regulation. When a species or sub-species is placed in this Annex it becomes ‘Category 1’ across the EU as a whole, but there are currently no entries in Annex X. Article 45 of Regulation 889/2008 provides for member states to grant a *general* derogation in respect of species and/or varieties where there is effectively no organic seed available – some national schemes refer to a so-called Category 3 in respect of such general derogations. All species, sub-species, or varieties not in Annex X and not subject to a (national) general derogation are subject to the requirement for an *individual* derogation for each occasion of use (so-called Category 2 according to some).

The number of countries working with a *national* Category 1 is generally increasing. However, in several cases it has been difficult to convince breeders and farmers to list species/sub-species in this category. European countries vary widely regarding which crops and how many crop species they list in Category 1. For example, Austria lists no crop species/sub-species in Category 1, even though for some species sufficient organic seed is available from Austrian suppliers. Austria’s lack of Category 1 is linked to the perceived risk that biodiversity in organic farming would be restricted if this category

were used. Denmark and the UK are also countries without a Category 1. Italy does not use a listing system with Categories at all. In contrast, Sweden has currently placed several crops in Category 1 including spring oats (*Avena sativa*), spring barley (*Hordeum vulgare*), spring and winter wheat (*Triticum aestivum*), peas (*Pisum sativum*), fodder bean (*Vicia faba*), winter rye (*Secale cereale*), triticale ( $\times$  *Triticosecale*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), lettuce (*Lactuca sativa*), rocket (*Eruca sativa*), kohlrabi (*Brassica oleracea*), Spring Beauty (*Claytonia spec.*), five grass species, as well as some herb species. Similarly, France has 14 species/variety types in its equivalent of Category 1 and the Netherlands has more than 60. This variability in the Category 1 lists is partly caused by geographically determined specialisation in particular seed crops. For example, there is a concentration of grass seed providers in Denmark, and of vegetable seed producers in the Netherlands.

Listing crops in Category 1, i.e., disallowing any use of non-organic seed, is not a prerequisite for high usage of organic seed. Even countries which do not have any crops listed in Category 1 may still perform well in terms of the percentage of organic seed usage due to a strict derogation regime. For example, supplies of organic carrot seed (*Daucus carota ssp. sativa*) have expanded and rates of organic seed usage are high among carrot growers in several EU countries even though no country has yet listed this crop species in Category 1. In cases where the usage is close to 100% organic, an appropriate way of further increasing the use of organic seed is by setting a deadline at which a variety is moved into Category 1 and preceding it by a well-publicised ‘countdown’ period. Further, lists of species that are candidates for Category 1 can be communicated to plant breeders in order to promote further breeding activities and investment in these crops.

Similar steps are already being taken in the Netherlands and in France. To make Category 1 more flexible, the so-called flexibility rule is used in the Netherlands. This allows farmers to use non-organic seed of newly-released varieties that show substantial improvements over other varieties which are currently in use. Normally the sector would need to wait for organic seed production to produce sufficient quantities of seed of these new varieties before they become accessible, putting organic growers at a disadvantage. The flexibility rule permits organic production of new varieties to start earlier by allowing derogations for a limited time, e.g. one or two years. A similar system is employed in France where there is a ‘warning list’ of candidates for Category 1, i.e. crops that are close to being fully organic and could be moved into Category 1 in the near future. (An additional rule for Category 1 is applied in the Netherlands to prevent the development of monopolies: if there is only one seed producer for a major crop, it will not be put into Category 1..)

Some countries employ a gradual approach to increasing the rate of organic seed use, allowing organic farms to use a certain percentage of non-organic seed. Here, the idea is to implement percentage rules only in crops for which the seed price contributes significantly to the cost price of the end product (such as carrots). While this approach has reportedly not resulted in an increased administrative burden for organic producers, it seems to be feasible only in smaller countries and for certain crops.

### **The role of expert groups**

In many European countries, Expert Groups (EGs) play an important role in the regulation of the organic seed sector. The EGs help to make decisions about which crops should be listed in which derogation category. EGs normally have an advisory role, supporting official government bodies that make final decisions about listings. For example, in the Netherlands, the EG holds annual discussions on which crops can be put into Category 1. This is based on current availability and also takes into account whether or not major varieties are still missing from the organic seed supply by looking at the content of derogation requests from the preceding three years. The EG also assesses each existing Category 1 inclusion to decide if there is any reason for removal from the category.

Players in the organic seed sector see the involvement of EGs as a way to make the decision-making process on national rules objective and more transparent.

There is usually more than one EG per country, with different groups focusing on specific crops. In the UK, for example, there are four separate EGs working on four crop-specific areas (potatoes (*Solanum tuberosum*), grass, arable and horticulture); Germany, Denmark and Austria (which only recently established an Expert Group system) each have two EGs (arable and horticulture). Typically,

members of the EGs are various stakeholders involved in the use and production of organic seed and include farmers, the advisory service of organic producer associations, representatives of seed companies, representatives of variety testing authorities, researchers or other experts. In some cases, members are remunerated for their travel expenses; however, remuneration for time input per meeting day in the EGs (as occurs in the case of Dutch farmers) is rare. The role of farmers in the EG is to advise on the appropriateness of varieties for organic production.

In addition to these national expert groups, there are also regular meetings at international level. For example, the European Consortium of Organic Plant Breeding (ECO-PB) organises regular meetings with European stakeholders in organic seed regulation with the aim of increasing the use of organic seed and identifying regulatory and other barriers that prevent it (Lammerts van Bueren et al. 2008). Since 2003, these workshops have taken place every two to three years and provide an opportunity to exchange information on the current situation in various EU member states with regard to the use of organic seed and the corresponding framework of regulations. Participants typically include members of the European Standing Committee on Organic Farming (SCOF), who regularly discuss organic standards at the European Commission level, farmers, seed company representatives, breeders and researchers in organic agriculture, as well as country representatives responsible for handling seed derogation applications.

### **Organic seed databases**

Internet-based publicly available databases are used in many European countries as a central tool in managing the use and regulation of organic seed (European Commission 2012). Seed companies can enter their organic seed products in the database and customers (producers) can then check the availability of organic seed for numerous varieties. Databases are also used to manage derogation requests by producers and can generate statistical information such as changes over time in derogations sought for a particular crop.

While some organic seed databases are large and well used (e.g. OrganicXseeds in Germany), there are some countries for which organic seed databases are not publicly available at all. In others, such as Italy or Switzerland, the available databases are reportedly not used by many producers. Reasons for low usage of databases include the absence of some locally interesting varieties (as reported for Italy) or limited participation of seed companies (as reported for Switzerland). The wider organic movement should therefore recognise that increased investment in seed databases is necessary to improve the situation of the organic seed sector.

Currently there is no common European database, although there is common usage of some larger databases among countries sharing the same language. If a common European database on organic seed were set up, it would need to incorporate national databases within it. One great advantage of a European database would be to encourage sourcing of organic seed from similar environments across Europe. A potential disadvantage of an EU-wide database is that it would be more difficult to resolve derogation queries than when databases are limited to national level.

Several ways in which the databases could be improved and aligned between countries include.

- (1) Latin species names should be shown;
- (2) meaningful and consistent units should be used for quantities of seed;
- (3) cross-links between national databases should be improved, such as by standardising plant names;
- (4) databases should be made more user-friendly;
- (5) in some cases, seed companies need to update entries more regularly;
- (6) varieties on national databases could be marked for their regional appropriateness, e.g. in Denmark information is given on whether the listed variety has been evaluated in Danish field trials;
- (7) information should also be given about how soon a listed variety is to be available (this is particularly significant because organic producers frequently seek derogations if a seed company is not able to deliver organic seed within a short enough time frame, typically a few days).

### **The price difference between organic and conventional seed**

In many cases, a major obstacle to organic seed usage is its higher price compared with non-organically produced and non-chemically treated (NCT) seed. However, the importance of this price

difference seems to be dependent on the crop species (Deleuran 2011). For example, it was reported that in France the price difference between organic and conventional vegetable seeds is not the most important factor in farmers' decisions of whether to use organic seed, but it is a more important criterion in wheat and potato seed (Sinoir et al. 2011). Apparently, seed sourcing decisions also depend on the size of the farm: in several countries (UK, France, Belgium), smaller producers usually use a higher percentage of organic seed than larger ones (Sinoir et al. 2011).

The Swiss operate a system whereby for certain crops, farmers granted a derogation to buy NCT seed pay the same price as they would have paid for equivalent organic seed. The margin then goes to a fund that helps to finance development of the organic seed sector. This system works on a private basis (i.e. it is not a government-led regulation system). To illustrate with an example, a potato-grower may only have a derogation validated if he or she has paid the difference between the organic and the conventional batch seed potatoes as verified by an invoice from the potato control body. A similar funding system is also in operation for wheat and strawberries, but not for any vegetable varieties. In vegetables, the high diversity of varieties and also the major price difference between hybrid and open pollinated varieties make it difficult to calculate the price difference between organic and 'equivalent' NCT seed in a fair and objective way.

A difficulty of the Swiss system is that it is not easily transferable to other countries. It needs to operate on a non-binding (private) basis through the cooperation of companies, and companies using the system would be likely to lose customers to other companies who would not charge the price difference for NCT seed. One way to alleviate this problem might be to compensate farmers through their membership in organic farmer associations, and this has been discussed; a problem could then arise, however, in those countries where a large proportion of growers are not members of any such organisation. This would tend to increase competition between those farmers who are in an organisation and those who are not if the price difference is refunded only to member farmers.

To reduce the price differential and to encourage more development of organic seed markets, government subsidies could be helpful; so, indeed, could traders (such as supermarkets), by agreeing to pay a premium for crops produced from organic seed.

### **Seed mixtures**

For grassland or fertility building leys, organic farmers often use mixtures of several plant species. Regarding such seed mixtures there are two approaches to determining the percentage of organic seed: considering the organic content of each component individually or considering the overall organic content in the mix as a whole.

Currently, France, Austria and Belgium use the individual component approach whereas Germany, Switzerland, Denmark and the UK use the whole-mix approach. When farmers have to apply for derogations for every individual component of the mix, the result is an increased number of derogations. Specifying individual component quantities can represent a problem because derogations would be the only option if a particular component is not available organically. It is therefore not permitted to include both organic and conventional seed from the same variety in one mixture. Further, derogations are only granted on a per-farm, per-mix basis and not to a seed merchant for supplying a mixture to a number of farms. Therefore, seed mixtures which contain a proportion of conventional seed cannot be exported or imported.

Experience over the last few years in various European countries has shown that it is possible to gradually increase over time the required percentage of organic components in seed mixtures, and this can result in an increase in organic seed use. In the UK, the percentage of organic seed in mixtures used by organic farms has been gradually increased from 30% to 70% over the last few years. For Switzerland, however, it proved difficult to increase the percentage above a threshold of 60%, especially with seed mixtures for long-term pastures.

Overall it can be concluded that in the area of seed mixtures for organic farming, it remains necessary to work towards a higher degree of clarification and harmonisation.

### **Harmonisation of formal and informal seed systems**

A distinction can be made between the formal seed sector, where seed is bought from catalogues, and the informal sector, in which seed is locally and regionally exchanged among farmers (Bocci and

Chable 2008). In several European countries, high plant genetic diversity is still harboured in the informal seed system in the form of ‘conservation varieties’ (Bocci 2009). We see a need to build a bridge between both systems, i.e. between farmers using local varieties and those using formally registered varieties (Dawson et al. 2012; Louwaars and de Boef 2012). In particular, organic seed regulations in Europe (and elsewhere) need to make sure that they do not endanger local crop diversity but help to protect and maintain it (Pautasso et al. 2012; Thomas et al. 2012). The importance of informal seed systems in both developed and developing countries has been highlighted in the recently issued IFOAM Position Paper on the Use of Organic Seed and Plant Propagation Material in Organic Agriculture, which stated that “the informal seed sector is of major importance for food production and food sovereignty, especially in the developing world and needs to be strengthened” (IFOAM 2011).

At present there are hardly any local varieties, landraces or amateur varieties on organic seed databases, as they are not always produced organically (Serpalay et al. 2011b). Also, expert groups rarely, if ever, take these varieties into account. In order to facilitate the conservation of local varieties and landraces, we suggest allowing derogations for conservation varieties within Category 1 species. In addition, more emphasis should be placed on these varieties in expert group discussions and within the organic seed databases.

In some countries, for instance Italy, self-propagation and exchange of seed by farmers is extensive (Chable et al. 2011; Portis et al. 2012). A problem is that these farmers cannot always prove where their seed is from and whether it is organic because it is not organically registered or listed in the EU common catalogue. A further problem is that, at present, this kind of informal seed exchange is not considered by officials to be legal. To protect seed diversity there is therefore a need to allow both the informal and the formal seed systems to coexist. Current legislation on conservation varieties and seed exchange is being intensively discussed (Serpalay et al. 2011a; Arche Noah et al. 2012).

## Conclusions and recommendations

At the European level, there is considerable variability in organic seed regulation systems; however, the amount of variability that can be tolerated is not equal for all components (**Fig. 3**). While low variability (with rules being largely harmonized among different countries) facilitates communication and trading, high variability allows more flexibility. Therefore, components of the organic seed regulation system may have different optima on this variability continuum.

Between-country variability in the organization of expert groups (see below) may be high without the risk of disrupting the functioning of the international organic seed sector. On the other hand, variability should be low with regard to organic seed databases and national reporting on organic seed derogations. For other issues (e.g. price difference between organic and conventional seed, category systems for derogations and seed mixtures), the tension between harmonization and flexibility may be less easy to resolve. Determinants of variability (circled on **Fig. 3**) include cultural, historical and economic issues.

Over the last few years, the situation of the organic seed sector has improved in several respects in a number of European countries. The use of a National Category 1 has increased, and seed companies are reporting a rise in organic seed sales in several countries. However, there are large differences among countries in the way organic seed derogations are handled (see above). In addition, the way in which derogation data are reported to the EU varies among countries, making it difficult to extract the information that is relevant for the further development of organic seed policies and regulations (**Fig. 4**). The quality of the derogation data should be such that it is possible to analyse whether the regulations have the desired effects on the organic seed sector and where the most important obstacles for further development of the organic seed sector lie; but the current situation is that derogation data are confounded by a range of factors, including inconsistencies in the quantitative units of seed measurement.

Currently, potential players lack a strong incentive for development because current regulations are not clear or coordinated enough among countries. Stakeholders in the organic sector therefore agree that in order for the organic seed sector to move forward it should aim (a) to sell or use more organic seed; (b) to have more seed companies involved in producing organic seed; (c) to reduce the price of

organic seed; and (d) to further harmonise European organic seed regulations as different rules are still applied by member states.

In particular, in order to achieve these aims it is recommended:

- (1) to harmonise member states' reports to the EU on organic seed by improving textual explanations of derogation, including information on the availability of Category 1 species or varieties, and by organising data by Category;
- (2) to introduce and announce crop-specific deadlines prior to the introduction of Category 1;
- (3) to clarify the rules for the labelling of seed mixtures which contain organic and conventional seed;
- (4) to increase the involvement of stakeholders, in particular seed companies, food processors and traders, and to establish and improve expert groups;
- (5) to invest in seed databases in order to modernise them and make them more user-friendly;
- (6) to build a bridge between informal/local seed systems and the formal organic seed system, in particular with regard to seed databases and expert groups;
- (7) to further develop guidelines dealing with varieties bred using techniques not complying with organic values such as cytoplasmic male sterility derived through protoplast fusion (e.g. in cauliflower and broccoli);
- (8) to harmonise criteria for variety equivalence so that inspection bodies have a reliable basis for evaluating derogation requests for non-organic seed;
- (9) to clarify interpretations of terminology in the European organic seed regulation (e.g., regarding the terms "database" or "report"); and
- (10) to reduce hurdles in the registration procedures for organic varieties.

It is evident that beyond these specific recommendations, there are more general issues that need to be addressed if the organic seed sector is to thrive. These are the need (a) to strengthen *research* on organic farming in general and organic breeding, seed production and exchange in particular (Pautasso et al. 2012); and (b) to widen the geographic scope of organic seed regulatory frameworks within Europe, in particular in Eastern Europe (Michelsen 2008), as well as beyond Europe.

## Acknowledgements

We thank Rikke Andersen, Inger Bertelsen, Peter Brinch, Véronique Chable, Robin Fransella, Rob George, Andrew Henderson, Helle Lachmann, Lars Holdensen, Margreet Hofstede, Aki Imaizumi, Bart Kuin, Loes Mertens, Monika Messmer, Gebhart Rossmann, Andreas Thommen, Lena Tinghuus, Malgorzata Verleyen-Szulc, Andrew Vincent, Bram Weijland, James Winpenny, Jean Wohrer, Robin Wood and Lawrence Woodward for providing inputs in the discussions relating to this paper.

## References

- Anonymous (2011) Options and analysis of possible scenarios for the review of the EU legislation on the marketing of seed and plant propagating material. 35 pp. [http://ec.europa.eu/food/plant/propagation/evaluation/index\\_en.htm](http://ec.europa.eu/food/plant/propagation/evaluation/index_en.htm). Accessed 23/7/2012.
- Arche Noah, ARC2020 Agricultural and Rural Convention, APRODEV Association of World Council of Churches related Development Organisations in Europe, Birdlife Europe, Euro Coop, ECVC European Coordination Via Campesina, EEB European Environmental Bureau, EPBA European Professional Beekeepers Association, Grain, IFOAM EU Group International Federation of Organic Agriculture Movements, Slow Food Foundation for Biodiversity (2012) Seed diversity in need of help - Open letter to the Members of the European Parliament. [http://www.seedforall.org/files/openletters\\_pm.pdf](http://www.seedforall.org/files/openletters_pm.pdf) 2 pp. Accessed 4/5/2012
- Baker B (2008) Commercial availability of organic seeds: certifier perspectives. Proceedings of the 5th Organic Seed Growers Conference, Salem, Oregon, USA, 14-15 February, 2008 pp. 55-60

- Bocci R (2009) Seed legislation and agrobiodiversity: conservation varieties. *J Agr Env Int Dev* 103: 31-49
- Bocci R, Chable V (2008) Les Réseaux Semences Paysannes en Europe et l'évolution des lois sur les semences - The Peasant Seeds Network in Europe and the evolution of seed laws. *Cahiers d'études et de recherche francophones/Agricultures* 17:216-221
- Bocci R, Ortolani L, Micheloni C (2011) The seed sources of organic farmers in Italy. In: The 17th IFOAM Organic World Congress: Organic Seed Preconference, Cheongwon-gun, Korea: Heuksalim Institute pp 172-176
- Boelt B, Deleuran LC (2000) Organic forage seed production. In: Alföldi T, Lockeretz W, Niggli U (eds): IFOAM 2000: the world grows organic. Proceedings 13th International IFOAM Scientific Conference, Basel, Switzerland, 28 to 31 August, 2000. p 228
- Butler G, Newton H, Bourlakis M, Leifert C (2007) Factors influencing supply and demand for organic foods. In: *Food Supply Chain Management*, (Bourlakis, MA and Weightman, PWH, eds), Oxford: Blackwell, pp 199-210
- Chable V, Kastler G, de Kochko P (2011) Seed in transition: the trends of Participatory Plant Breeding and "Farmer Breeding" in France. In: IFOAM World Congress Seed conference, Korea pp 177-181
- Chable V, Louwaars NP, Hubbard K, Baker B, Bocci R (2012) Plant breeding, variety release, and seed commercialization: laws and policies applied to the organic sector. In: *Organic Crop Breeding*, (Lammerts van Bueren, ET and Myers, JR, eds), Oxford: Wiley, pp 139-159
- Dawson J, Serpolay E, Giuliano S, Schermann N, Galic N, Berthelot J-F, Chesneau V, Ferté H, Mercier F, Osman A, Pino S, Goldringer I (2012) Phenotypic diversity and evolution of farmer varieties of bread wheat on organic farms in Europe. *Genetic Resources and Crop Evolution* (in press): doi: 10.1007/s10722-012-9822-x
- Deleuran LC (2011) Innovation in vegetable seed production and the role of consumers in the organic and conventional babyleaf chains: the case of Denmark. *Renew Agr Food Syst* 26:149-160
- Döring T (2011) Organic seed and the conservation of plant genetic resources – a call for vigilance. In: The 17th IFOAM Organic World Congress: Organic Seed Preconference, Cheongwon-gun, Korea: Heuksalim Institute pp 195-197
- Döring TF, Howlett S (2011) Europe's organic seed dilemma. *The Organic Research Centre Bulletin* 106:6
- European Commission (2008) Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic production, labelling and control [2008] OJ L250/1
- European Commission (2012) Seed databases. [http://ec.europa.eu/agriculture/organic/eu-policy/seed-databases\\_en](http://ec.europa.eu/agriculture/organic/eu-policy/seed-databases_en). Accessed 4/5/2012
- Groot SPC, van der Wolf JM, Jalink H, Langerak CJ, van den Bulk RW (2004) Challenges for the production of high quality organic seeds. *Seed Testing International - ISTA News Bulletin* 127:12-15
- Henatsch C (2000) "Organic farming needs biological cultivation" - a network for independent seed production. In: Alföldi T, Lockeretz W, Niggli U (eds): IFOAM 2000: the world grows organic. Proceedings 13th International IFOAM Scientific Conference, Basel, Switzerland, 28 to 31 August, 2000. p 230
- IFOAM (International Federation of Organic Agriculture Movements) (2005) Principles of Organic Agriculture. [http://www.ifoam.org/about\\_ifoam/principles/index.html](http://www.ifoam.org/about_ifoam/principles/index.html). Accessed 26/7/2012.
- IFOAM (International Federation of Organic Agriculture Movements) (2011) IFOAM Position on the Use of Organic Seed and Plant Propagation Material in Organic Agriculture. [http://www.ifoam.org/press/positions/Seed\\_Position\\_Paper.pdf](http://www.ifoam.org/press/positions/Seed_Position_Paper.pdf). Accessed 26/7/2012.
- Jani & Hallidri (2000) Comparison between native and modern cultivars in organic and conventional vegetable production. In: Alföldi T, Lockeretz W, Niggli U (eds): IFOAM 2000: the world grows organic. Proceedings 13th International IFOAM Scientific Conference, Basel, Switzerland, 28 to 31 August, 2000. p 230
- Kloppenborg, JR Jr. (ed) (1988) *Seeds and Sovereignty: The Use and Control of Plant Genetic Resources*. Duke University Press.

- Konvalina P, Capouchova I, Stehno Z, Huda P, Blaha L, Moudry J Jr., Moudry J (2011) Current conditions for seed use in the Czech organic farming. *Lucrări Științifice, Seria Agronomie*, 54 7-10
- Lammerts van Bueren ET, Jones SS, Tamm L, Murphy KM, Myers JR, Leifert C, Messmer MM (2011) The need to breed crop varieties suitable for organic farming, using wheat, tomato and broccoli as examples: A review. *NJAS - Wageningen J Life Sci* 58:3-4
- Lammerts van Bueren ET, Myers JR (2012) Organic crop breeding: integrating organic agricultural approaches and traditional and modern plant breeding methods. In: *Organic Crop Breeding*, (Lammerts van Bueren, ET and Myers, JR, eds), Oxford: Wiley, pp 3-13
- Lammerts van Bueren ET, Struik PC, Jacobsen E (2003) Organic propagation of seed and planting material: an overview of problems and challenges for research. *NJAS - Wageningen J Life Sci* 51:263-277
- Lammerts van Bueren ET, Wilbois K-P, ter Berg C (2008) Report on the ECO-PB meeting on International Attuning of the Assortment, Supply and Demand of Organic Seed in vegetable production of North-West Europe Warmenhuizen. 14 pp
- Louwaars NP, de Boef WS (2012) Integrated seed sector development in Africa: a conceptual framework for creating coherence between practices, programs, and policies. *J Crop Impr* 26:39–59
- Michelsen J (2008) A Europeanization deficit? The impact of EU organic agriculture regulations on new member states. *J Eur Publ Pol* 15:117-134
- Nicola S, Tibaldi G, Fontana E (2011) Issues facing organic transplant production in Europe. *Acta Hort* 898:197-203
- Osman AM, Almekinders CJM, Struik PC, Lammerts van Bueren ET (2008) Can conventional breeding programmes provide onion varieties that are suitable for organic farming in the Netherlands? *Euphyt* 163:511-522
- Pautasso M, Aistara G, Barnaud A, Caillon S, Clouvel P, Coomes O, Delêtre M, Demeulenaere E, De Santis P, Döring T, Eloy L, Emperaire L, Garine E, Goldringer I, Jarvis D, Joly H, Leclerc C, Louafi S, Martin P, Massol F, McGuire S, McKey D, Padoch C, Soler C, Thomas M, Tramontini S (2012) Seed exchange networks for agrobiodiversity conservation. A review. *Agron Sust Dev* (in press):doi: 10.1007/s13593-13012-10089-13596
- Portis E, Baudino M, Magurno F, Lanteri S (2012) Genetic structure and preservation strategies of autochthonous vegetable crop landraces of north-western Italy. *Ann Appl Biol* 160:76–85
- Przystalski M, Osman A, Thiemt E, Rolland B, Ericson L, Østergård H, Levy L, Wolfe M, Büchse A, Piepho H, Krajewski P. (2008) Comparing the performance of cereal varieties in organic and non-organic cropping systems in different European countries. *Euphyt* 163:417-433
- Serpoly E, Dawson JC, Chable V, Lammerts van Bueren ET, Osman A, Pino S, Silveri D, Goldringer I (2011a) Diversity of different farmer and modern wheat varieties cultivated in contrasting organic farming conditions in western Europe and implications for European seed and variety legislation. *Org Agr* 1:127–145
- Serpoly E, Schermann N, Dawson J, Lammerts van Bueren ET, Goldringer I, Chable V (2011b) Phenotypic changes in different spinach varieties grown and selected under organic conditions. *Sust* 3:1616-1636
- Sinoir N, Rey F, Chable V (2011) Stakeholder's expectations concerning breeding for LI/organic systems: French inputs on vegetables. In: *The 17th IFOAM Organic World Congress: Organic Seed Preconference*, Cheongwon-gun, Korea: Heuksalim Institute pp 230-233
- Thomas M, Demeulenaere E, Dawson JC, Khan AR, Galic N, Jouanne-Pin S, Remoue C, Bonneuil C, Goldringer I (2012) On-farm dynamic management of genetic diversity: the impact of seed diffusions and seed saving practices on a population-variety of bread wheat. *Evol Appl* in press, doi:10.1111/j.1752-4571.2012.00257.x
- Toner A, Raskin B, Stocker P, Sleaf V (2009) UK annual non-organic seed authorisation report for 2009 - UK authorisations to use seed and seed potatoes and vegetative propagating material not produced by the organic production method in organic farming. *Soil Association* pp 21. [www.organicXseeds.co.uk](http://www.organicXseeds.co.uk); Accessed 4/5/2012
- Vaarst M (2010) Organic farming as a development strategy: who are interested and who are not? *J Sust Dev* 3:38-50

- Vlachostergios DN, Lithourgidis AS, Roupakias DG (2011) Adaptability to organic farming of lentil (*Lens culinaris* Medik.) varieties developed from conventional breeding programmes. *J of Agr Sci* 149: 85-93
- Willer, H. (2012): European organic farming statistics. <http://www.organic-europe.net/europe-statistics.html>. Research Institute of Organic Agriculture (FiBL). Accessed 16/7/2012.
- Wolfe MS, Baresel JP, Desclaux D, Goldringer I, Hoad S, Kovacs G, Löschenberger F, Miedaner T, Østergård H, Lammerts van Bueren ET (2008) Developments in breeding cereals for organic agriculture. *Euphyt* 163:323-346

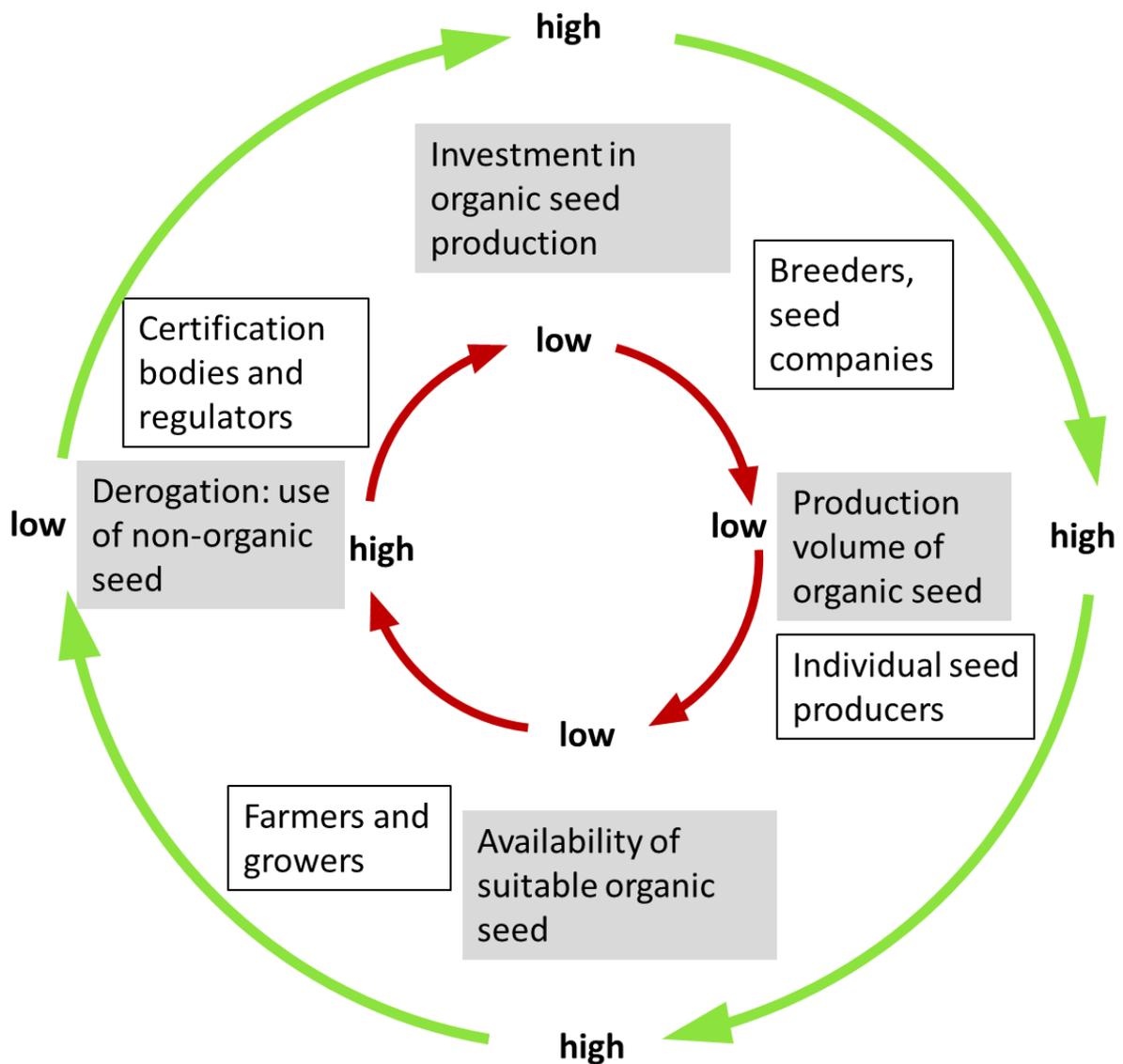


Figure 1: A vicious circle (dark red, inner circle) and a virtuous circle (light green, outer circle) in the organic seed system; properties of the system in grey boxes, stakeholders in white boxes. In the vicious circle, low investment in organic seed production (top of the circle) leads to a low production volume of organic seed (right hand side), which results in low availability of suitable organic seed for organic farmers and growers (bottom of the figure); because of this low availability of organic seed, farmers and growers then increasingly apply for derogations (left hand side), i.e., for the exceptional use of non-organic seed. In turn, this dampens investment in organic seed production (back at the top of the circle). In the virtuous circle, high investment in organic seed production leads to high production of organic seed, and high availability of organic seed, and decreasing applications for derogations, which sends a positive signal to further strengthen investment in organic seed production.

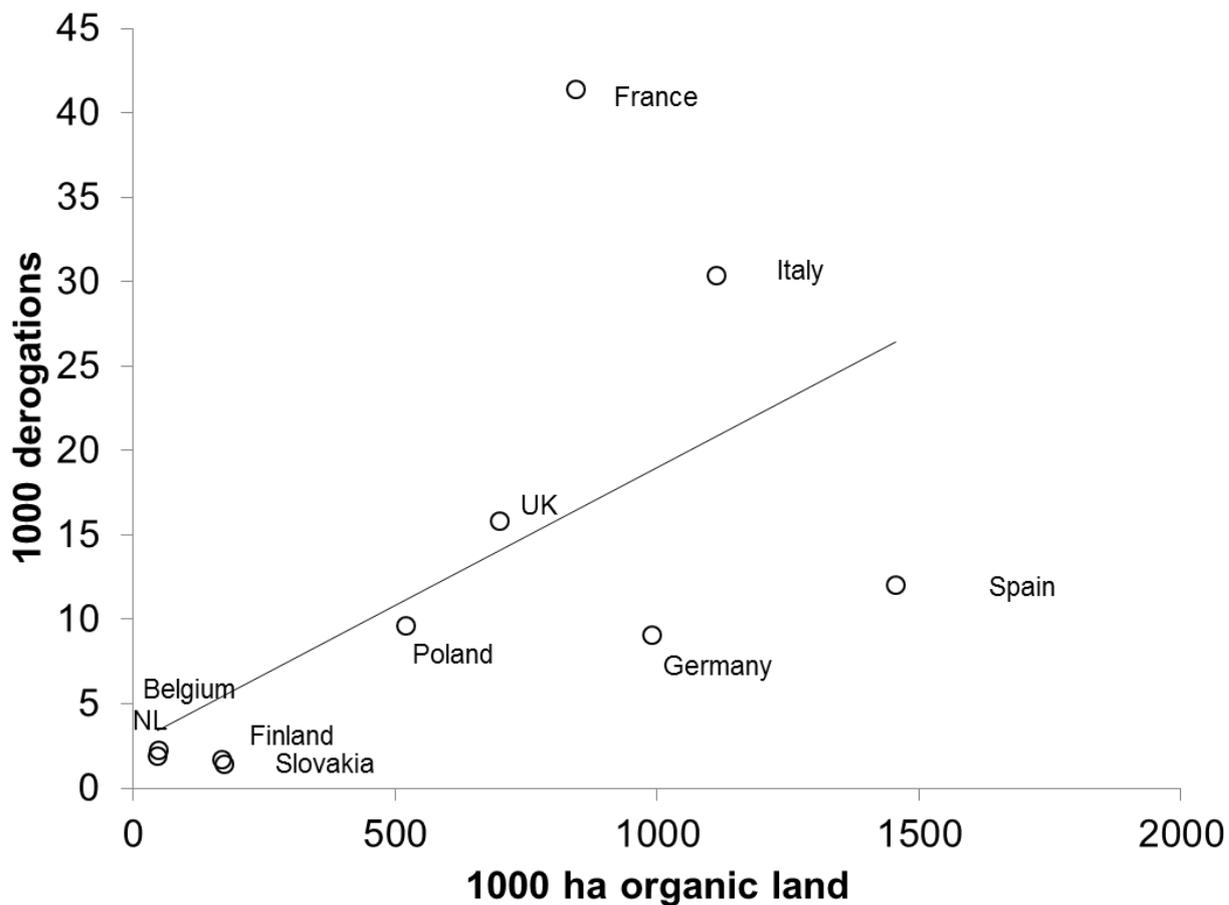


Figure 2: Numbers of organic seed derogations plotted against organic land area. Shown are the ten countries that had the highest numbers of derogations in Europe; data for 2010, based on Willer et al. 2012 and national seed derogation reports (unpublished compilation by N. Sinoir & F. Rey, ITAB, France). Note that the number of derogations might not be entirely comparable among countries due to different data formats reported (see Figure. 4).

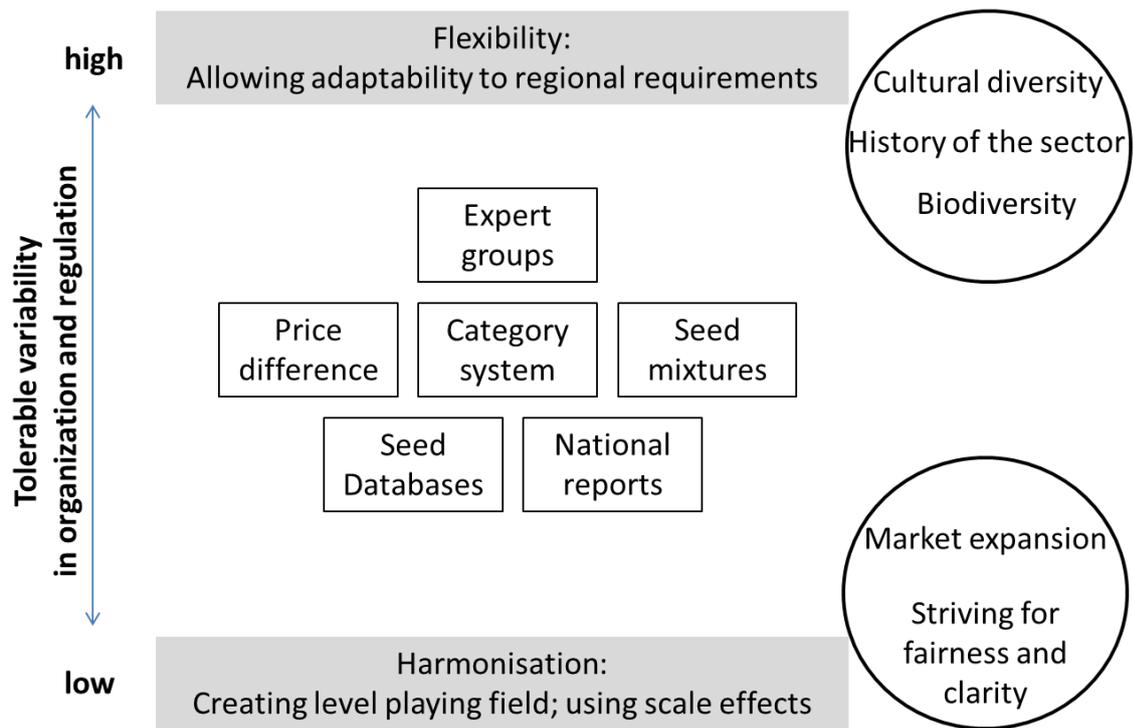


Figure 3: Variability of rules and regulations in the organic seed system. The position of the rectangles (e.g., with expert groups, price difference, etc.) indicates how much variability may be tolerated. For further explanations, refer to text.

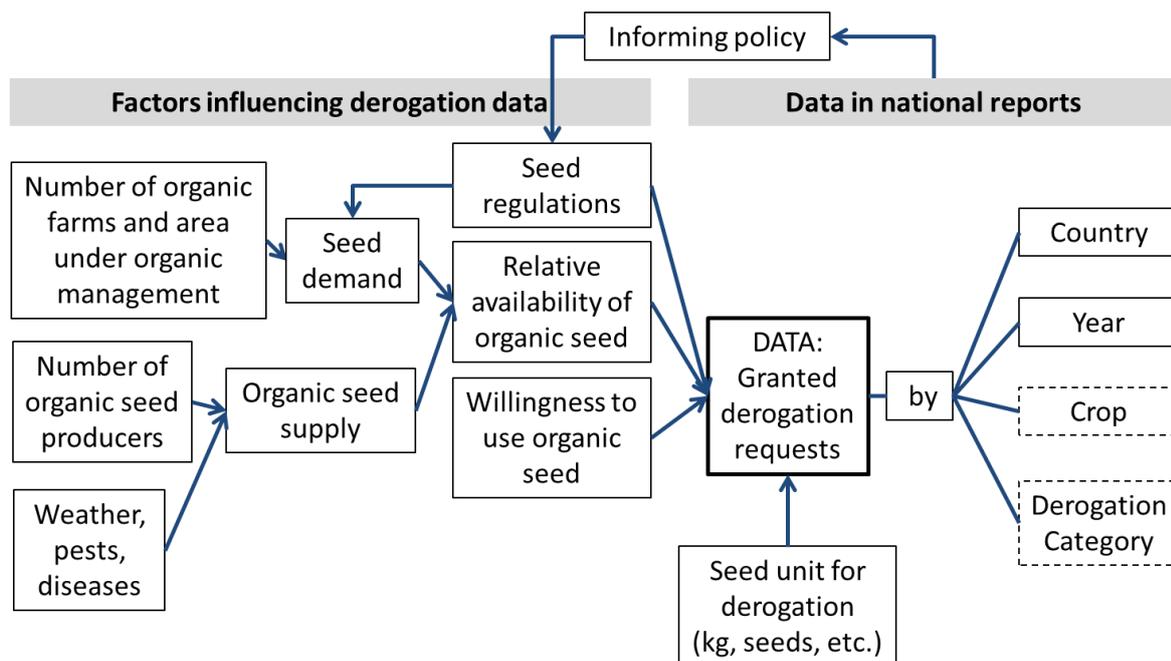


Figure 4: Factors that influence the organic seed derogation data, as collated in national reports. The collected data (bold line box) is organised by country and by year (see right hand side of the figure), and for certain European countries also by derogation category and by crop (dashed line boxes). Currently, the data can be reported in different units (e.g. as weight of seeds or number of seed packages). The derogation data from the national reports is used to inform regulators and policy makers about the status and development of the organic seed sector and about the degree of compliance with regulations (top of the figure). However, the interpretation of the derogation data is difficult as it is influenced by many interacting factors (left hand side of the figure) and crucial information (e.g. about derogation category) is sometimes missing.