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Boosting organic seed and Plant breeding across Europe 2017-2021

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LIVESEED in a nutshell

- Budget: 7.4 M EUR EU funding & 1.5 M EUR Swiss funding
- Duration: 4 years
- Coordinator: IFOAM EU
- Scientific coordinator: FiBL (Switzerland)
- Goal: **Boosting organic seed and plant breeding in order to improve the performance, sustainability and competititveness of the organic sector**

- Approach:
  - Inter- and transdisciplinary
  - Policy – economy – science interface
  - Multi-actor & stakeholder involvement
  - Wide geographic representation

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Working together

49 partners
18 countries

23 breeding & research institutes
7 breeding companies
8 seed companies
11 organic associations

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Aim: 100% organic seed of adapted cultivars

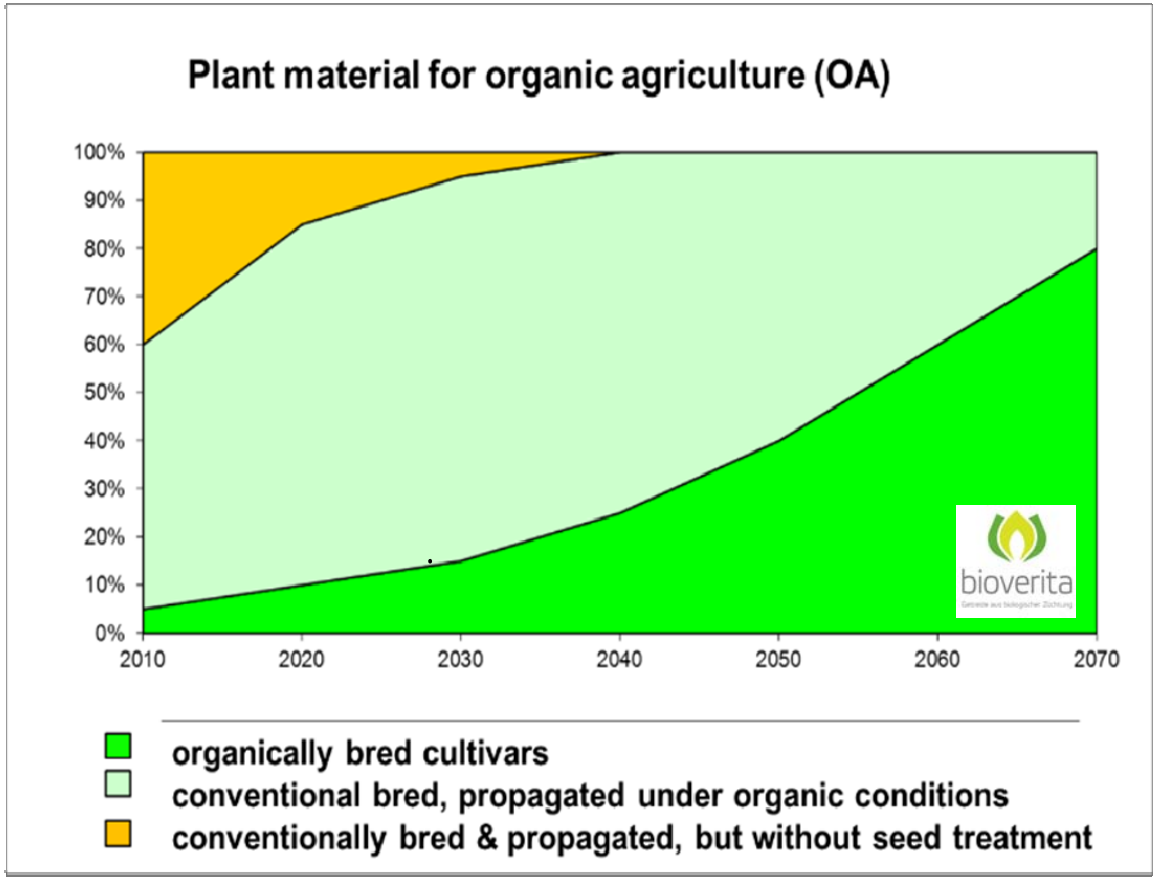

Figure 1 : Schematic time line to reach the goal of 100% organically propagated seed of suitable cultivars (light green) in short term and to foster cultivars specifically bred for organic farming systems (bright green) in the long term

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Main objectives

Policy & regulation
Provide a level playing field for the use of organic seed and variety registration across Europe

Research & development
Innovative approaches in organic plant breeding and improve quality of organic seeds

Socio-economics
Increase accesability of organic seed and adoption of new cultivars

Economy & market
Improve the competitiveness of the organic seed supply chain

Communication & network
Enhance knowledge & rise awareness on the benefits of organic plant breeding and seed

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Crop categories

Research activities of LIVESEED will cover five main crop categories:

- Legumes (lupin, pea)
- Vegetables (carrot, tomato, broccoli, cauliflower)
- Fruit trees (apple)
- Cereals (wheat, barley, maize)
- Fodder crops (lucerne, grasses)

→ considering different farming systems (mixed cropping, agroforestry) pedoclimatic zones across Europe

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LIVESEEED ambitions

- Co-development of knowledge by transdisciplinary multi-actor approach
- Holistic approaches for breeding and seed production in complex environment
  - Plant – Plant interaction
  - Plant – Soil microbiome interaction
  - Plant – Seed microbiome interaction
- Enabling more sustainable food production systems
  - Mitigate risks of crop failure through breeding for diversity
  - Safeguard genetic resources for future generations

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What LIVESEED will do:

- Foster **harmonised implementation of the EU organic regulation** on organic seed. Strengthen organic seed databases in the whole EU.
- **Widen the choice of organic cultivars** meeting the demand of farmers, processors, retailers and consumers
- Develop **innovative breeding and seed health strategies**
- Investigate socio-economic aspects related to **production and use of organic seed**
- Improve availability and quality of organic seed. Develop **guidelines for organic cultivar testing and registration**

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Framework of organic seed and plant breeding

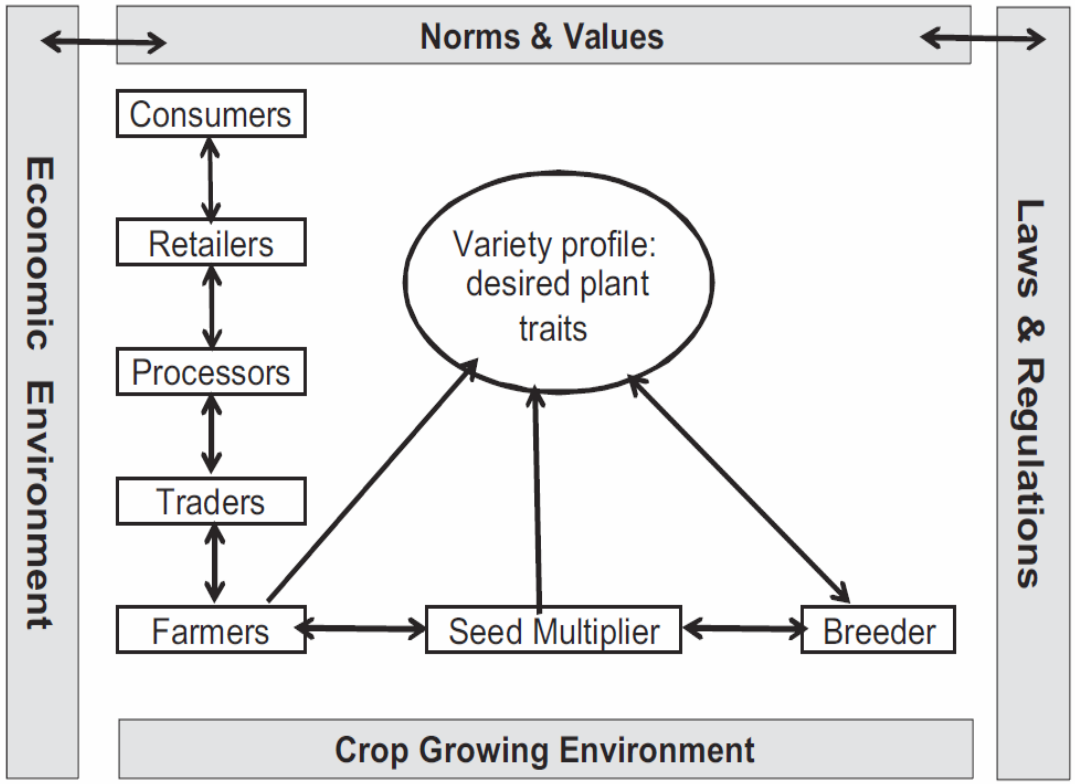
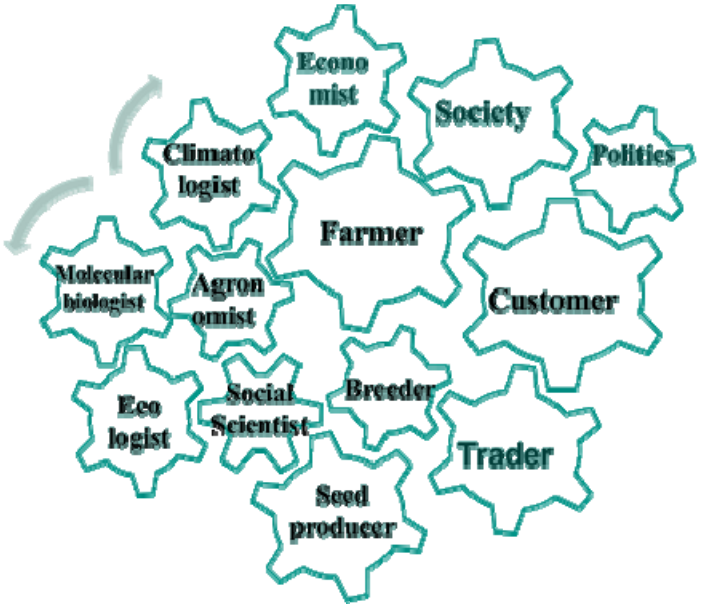


Figure 2. Situational context influencing organic plant breeding and seed production adapted from Osman et al., 2015

Support participatory processes in breeding and cultivar testing



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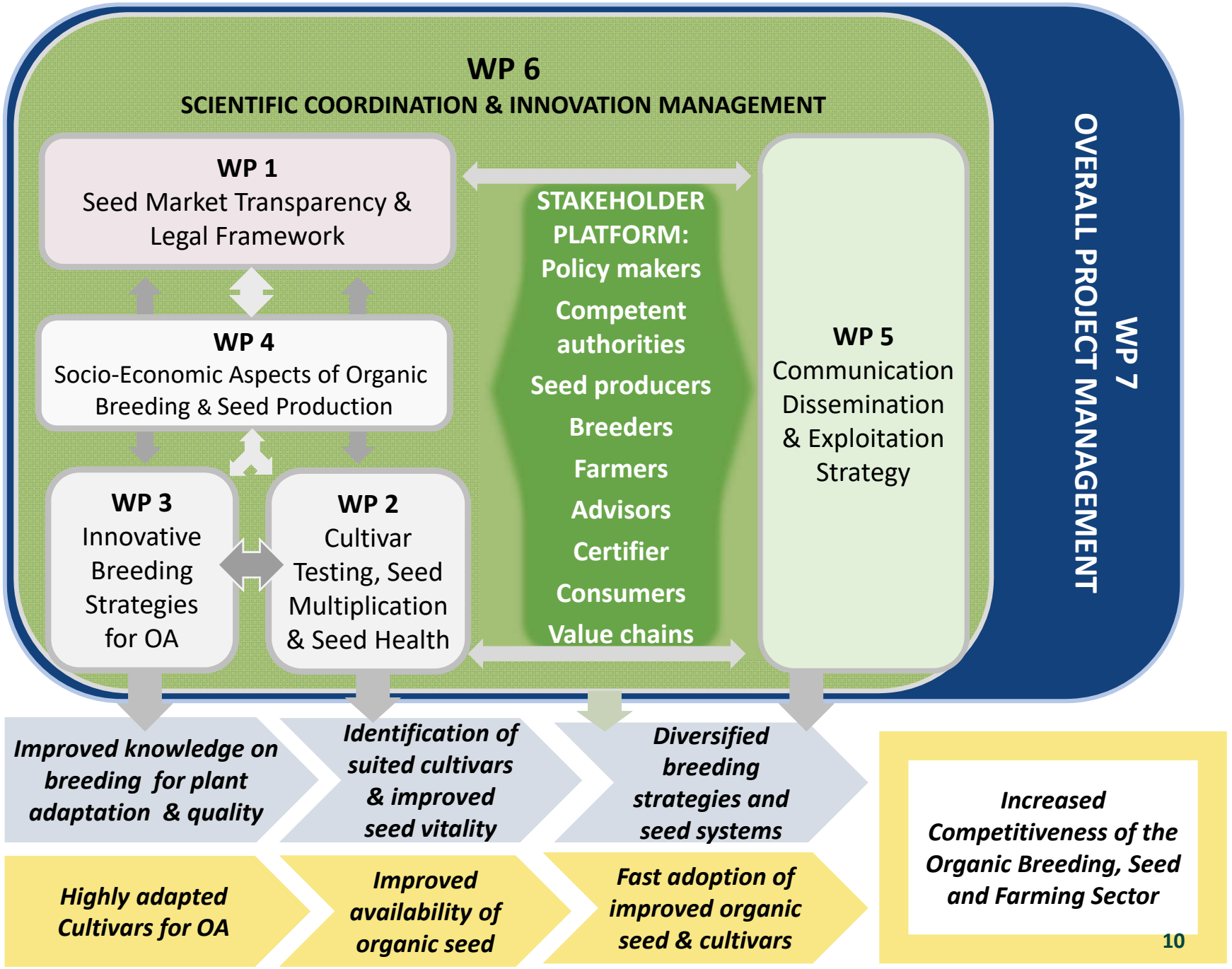
WP 6
SCIENTIFIC COORDINATION & INNOVATION MANAGEMENT
WP 7
OVERALL PROJECT MANAGEMENT
WP 1
Seed Market Transparency & Legal Framework
WP 4
Socio-Economic Aspects of Organic Breeding & Seed Production
WP 3
Innovative Breeding Strategies for OA
WP 2
Cultivar Testing, Seed Multiplication & Seed Health
STAKEHOLDER PLATFORM:
Policy makers
Competent authorities
Seed producers
Breeders
Farmers
Advisors
Certifier
Consumers
Value chains
WP 5
Communication Dissemination & Exploitation Strategy
Improved knowledge on breeding for plant adaptation & quality
Identification of suited cultivars & improved seed vitality
Diversified breeding strategies and seed systems
Highly adapted Cultivars for OA
Improved availability of organic seed
Fast adoption of improved organic seed & cultivars
Increased Competitiveness of the Organic Breeding, Seed and Farming Sector

Different strategies for cultivar development

- **Conventional breeding:** **Status quo**
  - Selection with application of seed treatments, herbicides, optimal nutrient supply
  - Breeding goals and variety development for conventional / IP farming
  - Test registered varieties under organic farming (organic variety trials)

- **Breeding for organic farming** **Product oriented**
  - Considering of the breeding goals of the organic agriculture
  - No GMO (no cell fusion)
  - Selection partly under organic farming conditions
  - Last multiplication step under organic farming conditions

- **Organic plant breeding:** **Process oriented**
  - Breeding specifically /exclusively for organic agriculture
  - Every selection step under organic conditions
  - Breeding technics in harmony with the organic farming
  - Multiplication steps under organic conditions

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Position paper on Organic Plant Breeding from ECO-PB 2012

- **Principles of Organic Plant Breeding (OPB)**
  - **dignity of living organisms**
  - **goals of organic plant breeding**
  - **ethical criteria** – cell integrity, reproductive capacity, scope for extended breeding, respect for crossbreeding boundaries, reproducibility
  - **strategic breeding criteria** - phenotypic selection under ecological cropping conditions, possible extensions eg using molecular markers
  - **socioeconomic criteria** - no patenting, transparency regarding breeding parents and breeding techniques, participatory breeding, as many breeding programmes as possible
- **consequences for choice of cultivars from**

(I) Conventional Breeding programmes

(II) Breeding for Organic farming (BfO)

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Definition of Organic Plant Breeding
according to IFOAM Norms 2012

4.7 Breeding of organic varieties

General Principles

- Organic plant breeding and variety development is sustainable, enhances **genetic diversity** and relies on natural **reproductive ability**. Organic breeding is always creative, cooperative and open for science, intuition, and new findings. Organic plant breeding is a holistic approach that respects natural **crossing barriers**. Organic plant breeding is based on fertile plants that can establish a **viable relationship with the living soil**. Organic varieties are obtained by an **organic plant breeding program.**

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Definition of Organic Plant Breeding
according to IFOAM Norms 2012

Requirements:

4.7.1 To produce organic varieties, plant breeders shall select their varieties **under organic conditions** that comply with the requirements of this standard. All multiplication practices except meristem culture shall be under certified organic management.

4.7.2 Organic plant breeders shall develop organic varieties only on the basis of genetic material that **has not been contaminated by products of genetic engineering**.

4.7.3 Organic plant breeders shall **disclose the applied breeding techniques**. Organic plant breeders shall make the information about the methods, which were used to develop an organic variety, available for the public latest from the beginning of marketing of the seeds.

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Definition of organic plant breeding
according to IFOAM Norms 2012

Requirements:

4.7.4 The **genome is respected as an impartible entity**. Technical interventions into the genome of plants are not allowed (e.g. ionizing radiation; transfer of isolated DNA, RNA, or proteins).

4.7.5 The **cell is respected as an impartible entity**. Technical interventions into an isolated cell on an artificial medium are not allowed (e.g. genetic engineering techniques; destruction of cell walls and disintegration of cell nuclei through cytoplast fusion).

4.7.6 The **natural reproductive ability** of a plant variety is respected and maintained. This excludes techniques that reduce or inhibit the germination capacities (e.g. terminator technologies).

4.7.7 Organic plant breeders may obtain plant variety protection, but organic varieties shall **not be patented**.

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Definition of Breeding for Organic (BfO)

Breeding programs for organic are more product oriented

- have a special focus on the **breeding goals** which are specific for organic agriculture (e.g. tolerance against seed born diseases, weed tolerance, nutrient use efficiency),
- do not use **critical breeding techniques listed in IFOAM Position Paper 2017**
- **Selection occurred at least partially under organic conditions**
- **Cultivar testing and seed production** under organic conditions

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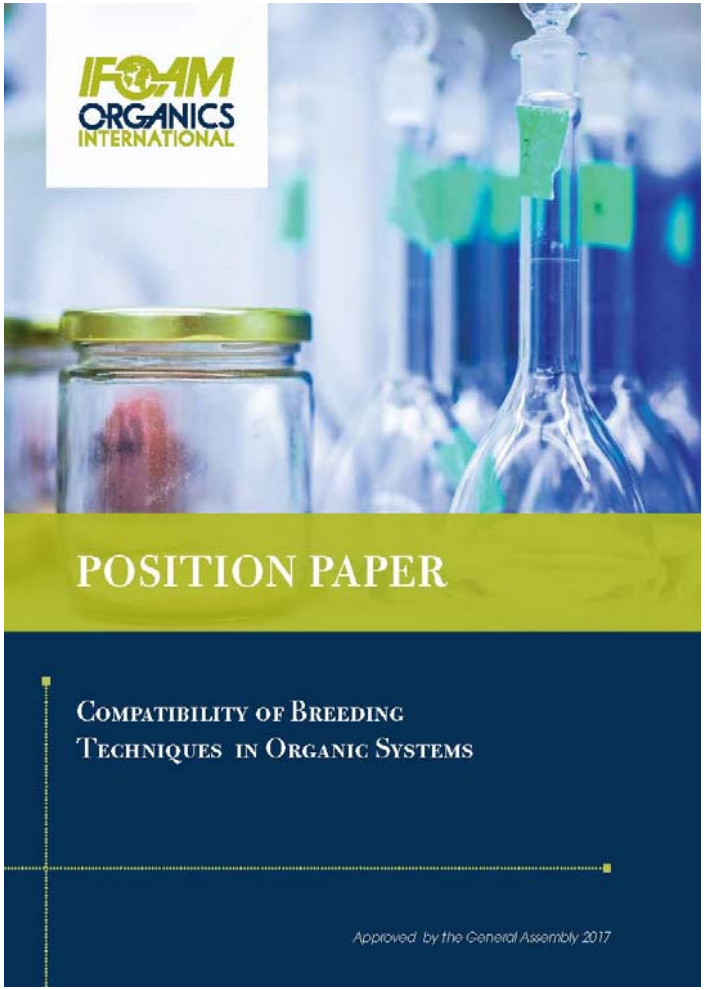
Position of the Organic Sector on the complience of New Breeding Techniques (NBT)

- **Position Paper of ECO-PB on Organic Plant Breeding 2013:**
  - Organic plant breeders in Europe will refrain from any breeding technique that technically interfers below the cell level
  - www.eco-pb.org/fileadmin/ecopb/documents/ecopb_PostitionPaperOrganicPlantBreeding.pdf
- **IFOAM EU Position Paper on New Plant Breeding Techniques 2015:**
  - NBT are not compatible with organic farming
  - Should be declared as GMO according to EU regulation and labelled accordingly
  - http://www.ifoam-eu.org/fr/file/position-paper-new-plant-breeding-techniques
- **IFOAM International: Position Paper on New Breeding Techniques 2017**
  - Draft February 2017, consultation and final approval on General Assembly of IFOAM in November 2017
  - Transparency & traceability to allow freedom of choice for farmers & consumers
  - https://www.ifoam.bio/sites/default/files/position_paper_v01_web_0.pdf

Compatibility of Breeding Techniques in Organic Systems

Ifoam International Position Paper approved Nov 2017



Clarity & Transparency on the Criteria Used to determine what breeding techniques are compatible with Organic Farming Systems

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- Interviews
- Workshops
- Events

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