



The International Treaty

ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



INFORMATION ON POSSIBLE INTERRELATIONS BETWEEN THE INTERNATIONAL TREATY AND RELEVANT INSTRUMENTS OF UPOV AND WIPO

Note by the Secretary

*This document contains the submission by **SOLIBAM Consortium** on possible interrelations between the International Treaty, in particular its Article 9 (Farmers' Rights), and the relevant instruments of UPOV and WIPO.*

*The submission is presented in the form and language, in which it was received on **27 November 2014**.*

SOLIBAM
Strategies for Organic and Low-input
Integrated Breeding and Management



Policy recommendations for legal
aspects of seed certification and
protection of Plant Breedeers' Rights
and Farmers' Rights

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Abstract

This booklet sets out policy recommendations for legal aspects of seed certification and protection of Plant Breeders Rights (PBR) and Farmers Rights (FR) in the context of the SOLIBAM strategies, which are innovative sustainable strategies involving plant breeding, crop management and processing based on participatory research and diversity at all levels in organic and low inputs agricultural systems. This document is based on results from studies within a workpackage related to environmental, economic and social sustainability (WP8-Deliverable 8.7). based on Deliverable 8.7. It draws on work within SOLIBAM as a whole and is informed by work by others. It is written within a changing situation in Europe regarding plant propagating material regulations. The current regulatory framework is mostly tailored for intensive agriculture and locks low-input varieties out of the market and field through mandatory regulatory standards that are neither needed, desirable nor helpful for many low-input varieties.

The SOLIBAM project organized a number of workshops on seed laws and regulations both in Europe and Africa to present the preliminary outcomes of the project and check with experts on possible solutions. SOLIBAM worked with the COBRA project and ECO-PB to gain an overview of EU seed companies' breeding strategies for the organic sector and their viewpoints about organic seed production. This showed that the growth in organic seed sales was greatest in France, UK, Germany and

Austria and that the breeders believed that there would continue to be a moderate growth in the market. The main obstacle for developing a dedicated organic plant breeding programme was economic but also the lack of rules for organic seed registration.

SOLIBAM identified three key words that should be at the cornerstone of future agricultural policies: Diversity, Innovation and Embedding in place. These keywords are also in line with the main findings of research that had foreseen different types of varieties for different agricultural systems.

SOLIBAM identified how these key words, or their meanings, can be found within the new regulation proposal for preparatory material but also undermines some of the pillars of current seed laws. In order to deal with seed issues, SOLIBAM named and adopted a Seed System approach, a useful tool for considering varieties in a broader view that encompasses marketing but also research (innovation), exchange and cultivation.

This booklet also contains a number of policy recommendations that SOLIBAM is endorsing covering Seed Policies (scope of a marketing regulation, variety registration, Value for Cultivation and Use - VCU testing and seed certification); Balance between Intellectual property rights (IPRs) and Farmers' Rights (FRs); How to finance organic/alternative breeding and North-South cooperation.



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1. Background

This paper sets out policy recommendations for legal aspects of seed certification and protection of Plant Breeders Rights (PBR) and Farmers Rights (FR) in the context of the SOLIBAM strategies, which combine many disciplines and values with the aim of increasing system diversity and participatory methods on overall the food system (covering plant breeding, crop management and food processes). To reach this objective, SOLIBAM has supported transdisciplinary thinking and research-action. This booklet draws on work within one workpackage related to environmental, economic and social sustainability of organic and low inputs systems adopting SOLIBAM strategies (WP8, specifically from studies performed within 2 deliverables, D8.1 and D8.2) and the outcomes of other WPs and is also informed by work funded under national programmes as well as the CORE Organic 2 project Coordinating organic plant breeding activities for diversity (COBRA - www.cobra-div.eu) and earlier EU projects such as FP6 FSO (Farm Seed Opportunities).

Current EU legislation for the marketing of seed is based on two main pillars i) the registration of varieties and ii) the certification of seed as identified in the Directives. EU seed marketing is governed by a range of directives (Council Directive 66/401/EEC on the marketing of fodder plant seed, Council Directive 66/402/EEC on the marketing of cereal seed, Council Directive 2002/53/EC on the common catalogue of varieties of agricultural plant species, Council Directive 2002/54/EC on the marketing of beet seed, Council Directive 2002/55/EC on the marketing of vegetable seed, Council Directive 2002/56/EC on the marketing of seed potatoes, Council Directive 2002/57/EC on the marketing of seed of oil and fibre plants) which is currently being reviewed and proposals have been tabled to merge these directives and a number of others into a single Directive for Plant Propagative Material.

This paper is being written within a changing situation in Europe regarding plant propagating material. SOLIBAM is participating in

negotiations with DG SANCO and AGRI in order to allow the marketing of more diversity, e.g. local varieties, farmers' varieties, populations and heterogeneous materials, and has contributed to the drafting of the new regulations.

The current regulatory framework is mostly tailored for intensive agriculture and locks low-input varieties out of the market and field. In fact, to get the compulsory market approval, the varieties have to comply with two regulatory standards: the DUS (Distinctness, Uniformity and Stability) registration is mandatory for all the listed-species and the VCU (Value for Cultivation and Use) for agricultural species. VCU achievement is subject to high yield thresholds and varieties are tested in high-input conditions—which ignores the advantages of low-input varieties. The VCU criteria do not consider hardiness and the VCU acceptance is based on the mean of all the data from different experimental

stations and environments which results in the selection of generic varieties with the best average behaviours rather than locally adapted varieties (Bonneuil and Hochereau, 2008). In addition, many varieties that could have been interesting for low-input agriculture are locked out of the market by the DUS standard. In fact, ancient varieties, farmers' varieties, traditional varieties or

landraces are inherently heterogeneous, and thus cannot comply with the DUS requirement (Louwaars, 2007; Anvar, 2008). The corollary of this is that most of the research is carried out under high-input conditions resulting in the maladaptation of commercial varieties in organic conditions. In a context of environmental crisis (climate change, loss of biodiversity, natural resource scarcity) and declining support from taxpayers for a sector considered as polluting, the European regulatory framework needs to evolve in order to provide room for different types of varieties or actors. In March 2014 the EC agreed to a Marketing Experiment for populations of wheat, oats, barley and maize that will allow the marketing of populations of these species within the EU from 2014 until 2018.



2. SOLIBAM outcomes

During the project, the SOLIBAM partners organised a number of workshops on seed laws and regulations both in Europe and Africa. The goals were to present some of the preliminary outcomes of the project and check with experts on possible solutions.

Date	Type of participants	Where
23 rd May 2013	DG Sanco, AGRI and ENVI	Brussels
28 th May 2013	DG Sanco – Standing committee on seeds, workshop on heterogeneous material	Brussels
17 th -18 th March 2014	Farmers' union, Representatives of research centres, Policy makers	Dakar (Senegal)
9 th May 2014	Representatives of research centres, Policy makers, Bioversity international	Addis Ababa (Ethiopia)

In particular the two workshops in Africa were aimed at:

- ♦ Presenting the European situation where the seed law is being revised at a time when participatory plant breeding is beginning to be implemented by public research networks with farmers;
- ♦ Presenting the conclusions of the last session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in Oman in 2013 about the implementation of Article 6 on the sustainable use of plant genetic resources and its links with Article 9 on Farmers' Rights and Article 5 on conservation;
- ♦ Discussing the situation regarding the implementation of the ITPGRFA in West and East Africa in the light of emerging challenges;
- ♦ Highlighting issues and opportunities related to the implementation of a diversified local seed system based on participatory innovation as a way to reduce vulnerability to climate change and other emerging threats for smallholder farmers' communities.

SOLIBAM and COBRA jointly organised a questionnaire aimed at providing an overview of the seed companies' breeding strategies for the organic sector and their viewpoints about organic seed production. It was based on an Internet survey launched in September 2013 and supported by the projects' partners, which allowed a wide and efficient dissemination across Europe. The preparation of the 7th European Workshop on Organic Seed Regulation (October 9th-10th 2013) by the European Consortium for Organic Plant Breeding (ECO-PB) provided a particular opportunity to involve organic stakeholders in this study.

Almost half of the 36 contributors came either from France or the United Kingdom, where the study had probably been more efficiently publicised. Most of the responders were companies producing vegetable and cereal seed. According to the responses, it is in France, the UK, Germany and Austria that the sales of organic seeds have increased the most over the last three years. The majority of the responders also estimated that the organic seed market would continue to grow in the near future, but moderately

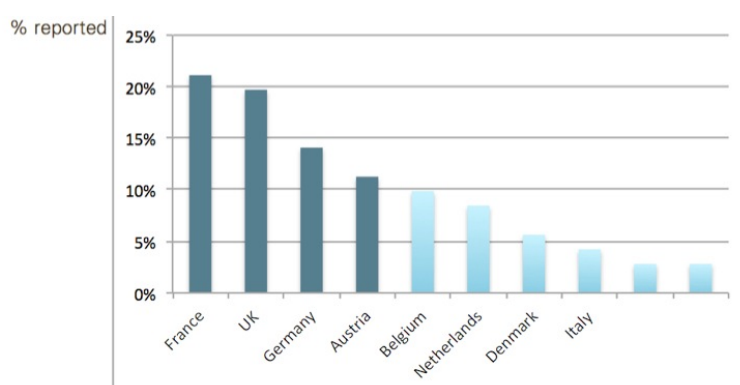


Figure 1: Organic sales increase according to the responders

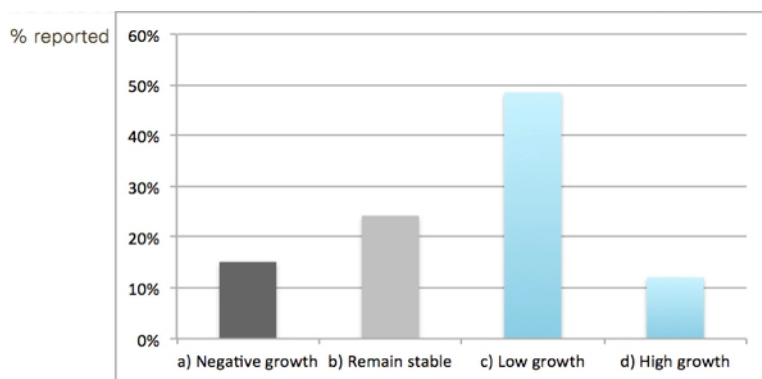


Figure 2: The future of organic seed sector

until the marketing of the seeds (this concerned eight companies);

2. Programmes starting with a conventional approach and switching to organic in later stages;
3. No dedicated organic breeding programmes (entirely conventional).

From the survey, the main limiting factor to further development of dedicated organic plant breeding programmes for 54% of the companies was economic. The main reasons given included: i) a lack of return on investment and the absence of a sustainable economic model and ii) the lack of adapted rules for organic seed registration as a major impediment (22%).

However, nine businesses have expressed an interest in the setting-up of an official certification for their organic plant breeding methods (Figure 4).

The survey revealed that the European Commission's draft proposal on seed marketing (6th May 2013) failed to win unanimous support among the companies surveyed. Some consider it as an opportunity, whereas others think that the changes proposed could threaten the future of their business.

so, mainly because of the ease of granting derogations for the use of conventional seed treated after harvest. Technical difficulties and the lack of market opportunities were also cited as limiting factors (Figs. 1-3).

The ideal for organic systems would be breeding programmes dedicated to their specific needs. In reality we can define three different breeding strategies for organic systems:

1. Programmes that are organic from the beginning of the breeding process

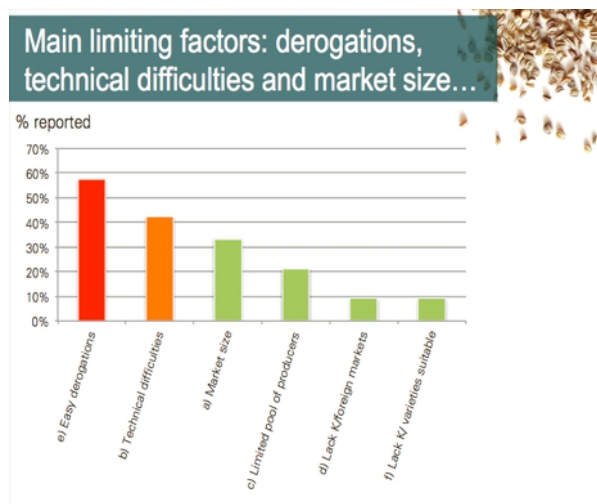


Figure 3: Limiting factors according to 33 responders

Breeding for organic, limiting factors

Economic reasons for **54%**

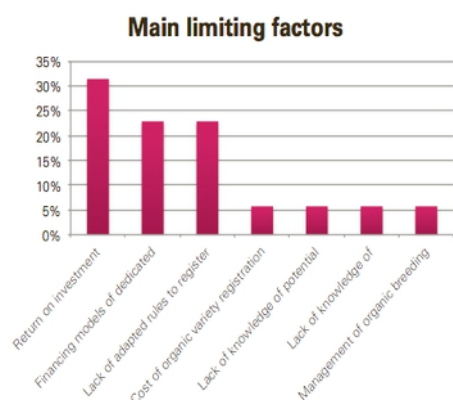


Figure 4: Limiting factors for organic breeding

In summary, the organic seed market has grown significantly in some countries (mostly Northern European) in the last three years. This growth is however hampered by the ease of granting derogations for non-organic seed use in some countries and technical difficulties in the field of multiplication of some organic varieties. Several companies surveyed are currently carrying out organic breeding programmes but they remain relatively few because of the lack of return on investment and the absence of rules adapted to the registration of these varieties bred for the organic sector. This under-investment in breeding for organic agriculture is very problematic. In fact, Lammerts van Bueren et al (2011) show that varieties bred for the conventional high input sector lack important traits required under organic and low-input production conditions. This lack of breeding

investment for organic agriculture is a vicious circle since it hinders the development of a sector (Wolfe et al, 2008) and thus the incentive to invest in R&D.

In general the SOLIBAM consortium identified three key concepts that should form cornerstones for future development of sustainable (*sensu lato*) agricultural policies:

Diversity. The SOLIBAM project showed that agricultural science is increasingly aimed at the management of the complexity of agro-ecosystems and considers their diversity - within and among species - as the key to greater sustainability in the sense of high overall productivity combined with resilience in coping with climate change. In a world increasingly under the stress of climate change, agriculture has an urgent need for seed that is suited to different contexts - social, agronomical, environmental, cultural and economic – rather than trying to adapt the environment to a few commercial varieties through the use of external inputs. Decentralized and participatory research is the key to building this new model of varietal innovation;

Participatory innovation. SOLIBAM partners proved that it is possible to overcome the Plant Breeding Paradox (that “plant breeding has been undermining the very genetic basis on which it rests” (Gepts, 2006)), by re-engaging breeding with diversity. In fact, participatory plant breeding, in all its forms and definitions, can increase cultivated diversity in time and space, through a decentralised and participatory research system (Ceccarelli, 2014). Moreover “the combination of decentralized selection and farmers’ participation in a Plant Participatory Breeding (PPB) program increases the efficiency of a plant breeding program by increasing adoption, and hence, increasing the benefit/cost ratio” (Ceccarelli, 2014);

Plant breeding paradox

“Thus, paradoxically, plant breeding has been undermining the very genetic basis on which it rests, leading to an overall phenomenon of de-diversification or genetic erosion. Plant breeders have become aware of this situation and have attempted to rectify it by broadening the genetic basis of their cultivar gene pool. However, it remains that the genetic diversity represented in the elite gene pools is only a small fraction of that present in the entire gene pool of crop plants. Hence, there is an enduring concern about the disappearance of genetic diversity over the long term.” (Gepts, 2006)

Locality/terroir. The diversity and innovation should be driven by and applied to, the unique combination of biotic, abiotic and human factors interacting at a specific place or area. During the SOLIBAM Congress in July 2014 in Nantes, France, the importance of re-localizing agricultural activities emerged clearly from the presentations of the various keynote speakers (e.g. J.D. van der Ploeg and T. Marsden). Studies highlight the importance of the selection environment (Atlin et al, 2001; Ceccarelli, 1994; Ceccarelli, 1996). In particular, the genotype-environment interactions – the

evidence that the same plants may not express the same traits in different environments- plead for selection in conditions close to those of real-farms. Using chemical fertilisers and pesticides attempts to modify and standardise environments, making them more artificial. This means that in low input agriculture, input limitation tends to decrease further the match between genotype and environment (Dawson et al 2008; Dawson et al, 2011; Chiffolleau and Desclaux, 2006). In these new food systems, diversity at all levels (i.e. ecosystems, species and varieties) can play a major role in achieving sustainability by combining high productivity with high resilience. Not only should social and economic systems foster their linkages with place (the idea of “terroir”) but also agricultural research should be organised to meet the challenges of these systems. Participatory plant breeding, as an extreme form of decentralized research appears to be an asset for organic and low-input agriculture (Dawson et al, 2008).



These concepts are also in line with the main findings of the Farm Seed Opportunities project (FSO - FP6 – 2007-2010), which had foreseen different types of varieties for different agricultural systems. It is quite obvious that in each system different innovation methods are carried out by different actors (see Table 1). None is best for all systems and each has its own values and rationale. The FSO project demonstrated that the usual approach of “one-size fits all” is no longer adequate to describe European farming systems and that different approaches are needed to build more inclusive policies and regulations (Bocci et al., 2012).

	Conventional varieties	Conservation varieties	Populations	Farmers' varieties
Characteristics	DUS/VCU	Adapted DUS	Not uniform	Diverse situations of homogeneity
Research/breeding	Formal research	Formal/informal research	Formal/informal research	Informal research and PPB

Table 1: FSO project: different types of varieties cultivated by farmers in Europe

The same conclusions came from the report of the Food Chain Evaluation Consortium, following the first analysis of stakeholder expectations during the process of evaluation of European seed laws. The report suggested “that the two different systems of the large commercial breeding companies and the smaller market or regional breeders and producers could run side by side because they are targeting completely different markets” (FCEC, 2008).

All these concerns can be found in the text of the new regulation proposal issued by the Commission in May 2013. In fact it undermines some of the pillars of the original seed law. For the first time varieties not listed in a catalogue can be marketed (the so-called niche market) and,

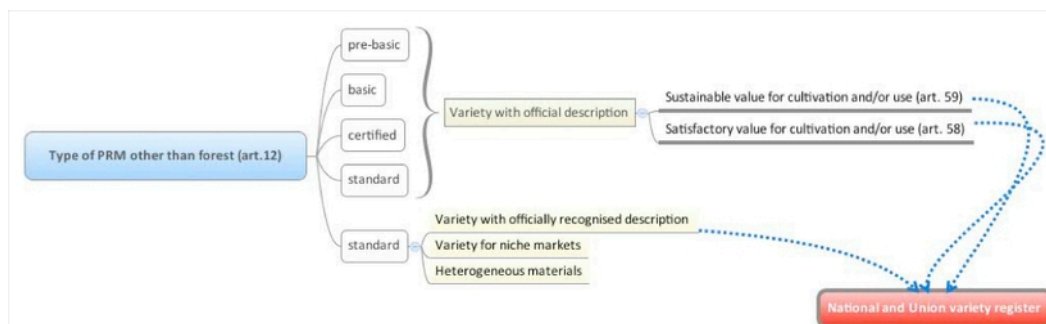


Figure 5: The new types of variety suggested by the Commission proposal

moreover, seed of varieties that are not homogeneous and uniform (the so-called heterogeneous material) can also be entered into the market. The European Parliament rejected the proposal in April 2014, but these important changes need to be brought back into the discussion to achieve a new proposal that can be accepted by the Parliament, particularly because of their relevance to long-term sustainability.

In order to deal with seed issues, SOLIBAM named and adopted a Seed System approach, a useful tool for considering varieties in a broader view that encompasses marketing but also research (innovation), exchange and cultivation. New seed systems can be considered as a way to guarantee sustainable use of plant genetic resources, as stated in the ITPGRFA. According to this approach the problem of having good quality seed is related not only to seed marketing rules, but also to agricultural policies in general. Different policies (e.g. on training, rural innovation, collective action and multi-actor research) when implemented together can improve the quality of seed systems and guarantee good seed in the different systems.



It is crucial that the suggested changes are not in the form of an 'us and them' division, i.e. a division between the current 'professional breeders' and the small-scale amateurs. The overall long-term aim must be to improve the introduction and dissemination of diversity to deal with the multiple and simultaneous environmental problems, which are growing rapidly with the expansion of the human population on the one hand and the increasing effects of climate change on the other. In this sense, there must be, as far as is possible, a capability for easy and rapid introduction and exchange of genetic diversity across the whole spectrum of agriculture and horticulture. This requires a radical re-think of the ways in which we develop and handle genetic material for all farmers and growers; 'business as usual' is not an option, nor is anarchy. Certification of seed should remain as a main pillar: it requires little change. It is the registration pillar, which is most in need of revision.

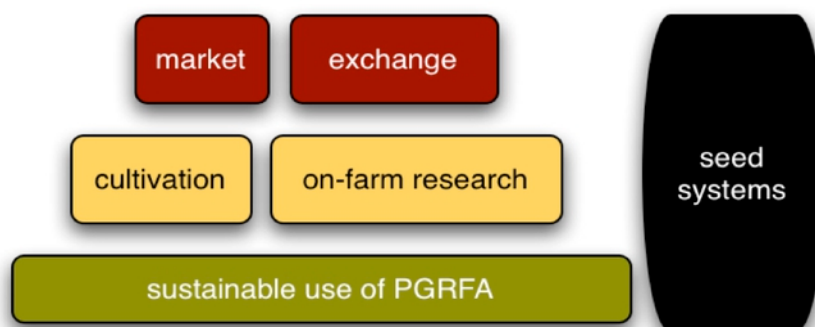


Figure 6: The Seed System Approach

Seed Systems

The term 'seed system' is understood in various ways. It is often understood as referring to the organized, formal mechanisms through which farmers obtain seed and through which seed quality can be guaranteed. These formal seed systems consist of chains of interlinked activities, starting from genetic resource management, breeding research and crop improvement, through seed multiplication, marketing and distribution, to use of the seed by farmers. However, farmers, especially those in developing countries, obtain seed from many sources, including producing their own seed and exchanging seed with neighbours, and these 'informal' systems must be taken into account in any consideration of seed systems. Formal and farmers' seed systems differ in how they use resources for food and agriculture (PGRFA). Formal systems tend to produce uniform varieties through scientific breeding. Informal systems tend to generate materials adapted to local requirements (landraces) but also may provide a conduit for exchange of materials derived from modern varieties. Combining the systems may broaden the genetic base of our crops and support use of wider genetic diversity in the field. The focus of policies affecting particular policy environment. seed systems depends on the cultural identity of farmers' seed systems, while efforts of seed commonly target the formal varieties. For example, efforts to support communities commonly focus on to promote the commercialization target either formal and farmers' seed system and uniform high-yielding agriculture and promote food security could target either formal and farmers' seed systems, or both, depending on the ecological and institutional environment. These different policy objectives and focuses can lead to differing and often conflicting pressures on seed systems." (FAO, 2009)



3. Policy recommendations

3.1 Seed Policies

The new European seed policies should be able to meet the differing needs of the range of EU farming systems (from local to agri-business). The new EU regulation on marketing of Plant and Propagating Material will be the main pillar of this new seed policy, but not the only one. Seed policy will also be affected by other regulations such as those relating to pest and disease control, seed import, rural development and agricultural research. It is therefore important to coordinate all these regulations around the vision and the principles of the European seed policies in a complementary way.

The idea is to develop an integrated seed system (ISS) where the current informal and formal systems can co-exist with mutual exchange of germplasm to foster variety innovation (see Louwaars and De Boef 2012 for details). Until now seed policies and programmes have been inconsistent with practice and have not taken into consideration the variations that exist in the wider farming system. The principles of an integrated seed system are:

National Seed Policy

"A national seed policy is a statement of principles that guide government action and explain the roles of relevant stakeholders in the coordination, structure, functioning and development of the seed sector. Although not legally binding, the seed policy normally serves as the overall framework for regulatory instruments, such as the seed law and related legislation. The seed policy ensures that the government's vision is adequately reflected in day-to-day operations within the seed sector. This link is important because well-prepared seed policies help stakeholders to understand their roles, responsibilities and contributions within defined boundaries, thus facilitating the smooth operation of the sector. Seed policy formulation should be undertaken within the wider context of national agricultural policy development, while ensuring synergy and consistency with environmental, trade and socio-economic policies at national, regional and international levels" (FAO, 2014)

- Full recognition and integration of formal and informal systems;
- Seed sector development should be approached in a pluralistic manner.

Putting these principles into practice will allow the creation of a dynamic model that, through appropriate seed policies, will guarantee a vibrant and pluralistic seed sector (Louwaars and de Boef, 2012). This approach has been established in developing countries. The case studies analysed, the outcomes of the SOLIBAM project and the discussions around the regulation proposed by the Commission in 2013, indicate that it can be useful for the future of agriculture, including in Europe.

Moreover such an approach has to be considered as an obligation for the implementation of articles 5, 6 and 9 of ITPGRFA signed by the European Union and all its Member States.

3.2 Marketing regulation

In order to meet the goal of an integrated seed system, the marketing of plant and propagating material should be flexible and allow the possibility of putting different kinds of variety into the market in order to meet the needs of different clients.

3.2.1 Scope of regulation

Marketing is central to all seed legislation. However, many battles have been fought around its definition, particularly over recent years. The different directives are not clear in the definition of marketing, which leaves the floor open to different interpretations by Member



States. A major point is whether exchange should be considered as one particular type of marketing (in-kind marketing), or not. The actual directives define marketing as “the sale, holding with a view to sale, offer to sale and any disposal, supply or transfer aimed at commercial exploitation of seed”. This definition allows different interpretation in different Member States, but exchange among farmers was considered as marketing in most Member States. However, the only exchange usually allowed was the transfer of seed among seed savers or gardeners because they do not exploit the seed commercially, i.e. they do not sell the product of the seed but use it themselves.

SOLIBAM Recommendations on the scope of the regulation

- 1. The marketing regulation should concern only material put onto the market and not farm saved seeds or seed exchanged as stated in article 2 of the proposal;**
- 2. Farmers should not be considered “professional operators” according to the marketing proposal. Their primary activity is farming and not producing seed;**
- 3. In order to thoroughly implement Farmers’ Rights in Europe, the marketing of seeds of non-protected varieties to end users by farmers who reproduce those varieties on their own farms should be considered outside the scope of the marketing regulation.**

Because of these difficulties the new regulation does not offer a definition of marketing, but it will be applied to all material that will be placed on the market with some exceptions. The draft regulation changes this definition and “placing on the market” becomes “the holding for the purpose of sale within the Union, including offering for sale or for any other form of transfer, and the sale, distribution, import into, and export out of, the Union and other forms of transfer, whether free of charge or not”. After this, within the draft regulation, the idea of commercial exploitation of seed is not considered further.

According to article 2 (scope) of the proposal networks of conservation of plant genetic resources, exchanges in-kind between persons other than professional operators, are excluded by the scope of the Regulation. This article should clarify once and for all the difference between “exchange” and “marketing”, recognising and allowing the activities of farmers, seed savers and gardeners conserving agricultural biodiversity.

Reading the definition of “professional operators” it seems that farmers are excluded and therefore seed exchange among farmers is not considered as placing seeds on the market. This point needs to be clarified in the negotiations in order to allow the exchange of seeds of non-protected varieties within farmers’ seed networks.



3.2.2 Variety registration

The Commission proposal suggested four types of varieties:

1. Commercial varieties (the varieties that have to follow the “normal” system);
2. Officially Recognised Description varieties (ORD);
3. Niche varieties;
4. Heterogeneous materials.

SOLIBAM Recommendations on variety registration

1. The four categories should be maintained as a general structure in order to have sufficient flexibility;
2. The ORD variety category should include not only past conservation varieties or landraces, but also new varieties that are not sufficiently uniform to fulfill the procedure of DUS testing of commercial varieties;
3. Niche market varieties should be maintained as such and the size of the companies allowed to sell these varieties should be reviewed after analysis of the structure of the seed market in Europe. If the definition of micro enterprise is not suitable a new definition should be proposed. In this category it should be possible to sell not only vegetables (the so-called amateur varieties) but also cereals and fruit trees;
4. In the case of open pollinated varieties registered as commercial varieties, the DUS testing should be adapted in order to allow sufficient diversity

3.2.3 VCU testing

The idea behind VCU testing is twofold. On the one hand, VCU aims at informing farmers about the characteristics of the varieties they are going to cultivate (see Figure 7). On the other hand, VCU requirements enable public authorities to influence the orientation of plant breeding through the choice of criteria, their respective weights and the evaluation protocols. This system is aimed at improving the varieties put onto the market and testing them for their important features. It has been a useful tool in the past to increase yields, but now it seems to be an obstacle for alternative agriculture and the need to have varieties adapted to their systems. First, the evaluation criteria and testing protocols are criticized for hindering exchanges and commercialization of low-input varieties. The importance given to yield in the VCU evaluation process has favoured the development of varieties that are highly productive but also highly dependent on agricultural inputs. Traits crucial for organic agriculture such as pest resistance or competitiveness with weeds have been allocated less weight and were consequently under-

explored by breeders.

The FCEC notes that the

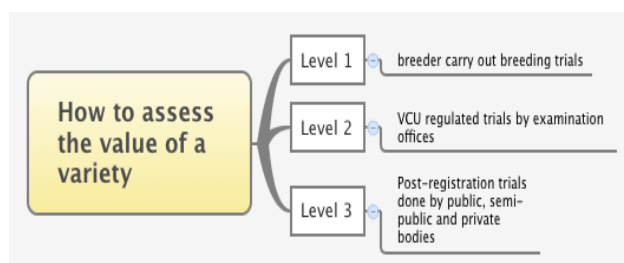


Figure 7: The VCU testing system within the general framework of assessing the agronomic value of a variety



importance given to yield characteristics for VCU trials may have contributed to missing an opportunity for increasing intra-specific biodiversity for some species. The VCU evaluations are also criticized for being applied in conditions far from realistic to those on-farm. They are carried out with high levels of input, so that the competitive advantages of varieties adapted to low-input farming cannot be revealed. Besides, they are realized in a limited number of situations that do not capture the wide diversity of the contexts and needs of low-input farming. VCU acceptance is furthermore based on the mean of all results from the different experimental stations and environments, which results in the selection of generic varieties with the best average behaviours rather than

locally adapted varieties.

Moreover, the FCEC report (FCEC, 2008) clearly stated that in the vegetable sector, where VCU testing was not planned, there is a general improvement in the varieties marketed. This, together with the recent plateau in cereal production in the EU, suggests that the VCU system is not essential for progress in agriculture and that it is not the best way for informing farmers on the varieties

that they should cultivate. In the case of organic agriculture the situation is even worse because only a few EU countries have implemented trials under organic conditions and these have been done in different ways and with different costs (see Table 2).

The new proposal from the Commission is not clear about the species that will have to pass the VCU testing before being placed in the catalogue and it creates two different types of VCU: satisfactory or sustainable (defined in art. 58 and 59 of the proposal). Even if, for the first time, organic trials become mandatory for Member States, the costs of the testing and difficulties of doing so in different geographical areas (and their related costs) will affect the availability of organic varieties on the market. In the end these tests could act as a barrier to entry of varieties into the market, without informing farmers about the kinds of variety they are buying.

Country	Organic VCU trials		Crops	Cost of testing
	Yes	No		
Germany	X		Winter wheat	370€ per application 2.900€ per year
Portugal			No information	
United Kingdom		X		
Denmark	X			600€ per application approx. 2.000€ per year
Italy		X		
France	X		Winter wheat	3.500€ first year 1.750€ second year
Spain			No information	
The Netherlands		X		
Austria	X		Winter wheat, rye, triticale, spring oat and barley	217€ per application 603€ per year
Belgium		X		
Czech Republic		X		
Estonia	X		Spring barley, oat	12,78€ per application 190€ per year
Ireland		X		
Latvia	X		Winter wheat, spring wheat, buckwheat, spring barley, oat, winter rye	VCU 258€ per year
Lithuania		X		
Norway	X			1.500 NOK per application 8.985 NOK per year
Poland		X		
Sweden		X		
Switzerland		X		

Table 2: The organic VCU testing in Europe (modified from Pedersen 2012)

SOLIBAM Recommendations on VCU testing

- VCU testing should be optional in order to allow companies a choice depending on the intended type of market for the variety;**
- Organic VCU testing must be in place in all the EU countries in order to allow companies to use it if they wish to do so.**

3.2.4 Seed certification

There needs to be a range of seed certification processes, undertaken by public bodies. The basis of seed certification needs to ensure that there is a wide range of seed that meets all markets and to ensure that it is of suitable quality (free from disease and weeds etc. and meets a minimum quality standard).

SOLIBAM Recommendations on Seed certification

- 1. ORD, Niche market varieties and Heterogeneous materials should have a post-market control, based on conformity to the label;**
- 2. Operators should have a registration procedure, which differs according to their markets. For example, in the case of operators selling ORD, Niche market varieties and Heterogeneous materials, the registration procedure and the relative controls should not be burdensome or block companies from entering into these markets.**

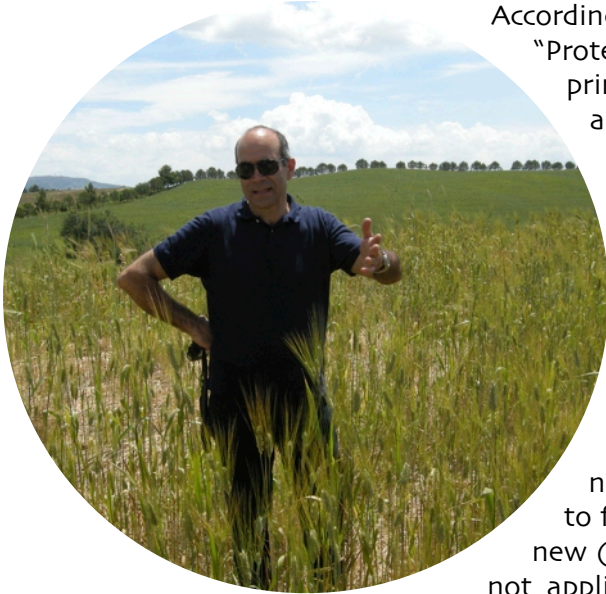
3.3 Balance between Intellectual property rights (IPRs) and Farmers' Rights (FRs)

The concentration of the seed sector is a trend that in the long run can lead to a "corporate bottleneck" (Louwaars et al., 2014), posing a serious threat to agricultural diversity in the future. Learning from the examples of corn, cotton and soybean in the US, Schimmelpfennig et al (2004) show that a higher market concentration has resulted in a reduction in research intensity. The authors suggest decreasing competition as an explanatory factor:

According to industry analysis, the global seed market will continue its growth to over \$60 billion in 2020, due to improved seed quality, hybridization and further penetration of GM crops in the world. It is generally believed that the tendency towards more consolidation in the global seed industry will continue. The level of investment required, the quality of genetic resources and breeding experience needed represent some of the high barriers to entry in the seed market for new companies. (EC report 2013)

The concentration in the seed-breeding sector can be tracked through the requests of companies for plant breeder rights for commercially important species. For instance, between 2000-2011 just 5 companies applied for 83% of the plant breeder rights (PBR) for tomato varieties (the most profitable vegetable species) in the Netherlands. At EU level this concentration effect was even more pronounced, with the top 5 seed companies applying for 91% of intellectual property right (IPR) protection. In 2011, Monsanto and Syngenta were responsible for 57% of PBR applications for tomato, against only 12 % in 2000 (Mammana, 2014).





According to the report Breeding business (Louwaars et al., 2014) “Protection of Intellectual Property in plant breeding is not the primary driver to develop new, innovative varieties but it is an adequate tool to protect the new varieties in the market against (illegal) reproduction and sales”. From the time of their introduction, PBRs rapidly became a tool whose main function was to protect market share and not a tool to promote innovation. Innovations tend to be introduced principally to ensure novelty and effective competition against other breeders rather than as major advances in sustainability of those varieties and the farming systems that they serve.

The proposition that obtaining plant breeder’s rights is not the prime drive of innovation but in particular serves to facilitate protection is illustrated by the fact that for many new (particularly vegetable) varieties plant breeder’s rights are not applied for and that nevertheless a decent market share is

acquired with an appropriate profit margin. This has to do with the specific introduction speed and turnover of varieties in the market (Louwaars et al., 2014).

The PBRs system in Europe should not block the flow of germplasm between formal and informal seed systems. In this regard it is important to point out that the notion of essentially derived variety (EDV) can de facto block further incremental innovation by farmer-breeders who, through cultivation and selection, can adapt new varieties to their farming conditions or needs, e.g. by crossing the protected variety with a local one. This position was clearly stated by the NGO Southeast Asia Regional Initiatives for Community Empowerment (SEARICE – www.searice.org.ph) during the Seminar on essentially derived varieties held in Geneva (Switzerland) on 22nd October 2013 within the UPOV framework.

Indeed, in the case of heterogeneous materials or populations, much of the interest is in the further evolution of these varieties in farmers’ fields when exposed to natural (including climate change) and human selection.

We see PBRs as a better approach to maintaining the rights of breeders than the US approach of also allowing patenting of varieties especially since plant breeding is characterized by the incremental nature of innovation. We would not encourage patenting of varieties to be extended to the EU because enforcement of the patent would restrict the use of such a variety in future breeding programmes (either conventional or otherwise) and so restrict the availability of germplasm and diversity at a time when this need is rapidly increasing.

There is a need to balance PBRs (and the need to recoup their costs and to fund future breeding – be it by the seed/breeding industry or by PPB) and Farmers’ Rights as stated in article 9 of the ITPGRFA. Promoting the integrated seed system approach and recognising the existence and the importance of the informal one, is a good way to find the right balance between PBRs and FRs.



SOLIBAM Recommendations on IPRs and FRs

1. **Maintain within IPRs regulations, breeders' exemption and farmers' privilege in the EU;**
2. **Eliminate the concept of essentially derived variety (EDV), at least for farmers' varieties;**
3. **Do not permit the double protection of varieties, i.e. PBRs plus patent;**
4. **Find new ways for protecting heterogeneous materials and farmers' varieties. If PBRs is not a tool for recovering the cost of research activities and thus only a way of protecting company market share, then, in the case of heterogeneous material and farmers' varieties, we need technical and other tools that protect these materials from misappropriation by third parties without blocking the innovation process (e.g. their fair use in breeding activities). The idea is to create a kind of protected common resource, through the use of a specific license that allows further use for breeding provided that the new material will be protected by the same license;**
5. **FRs have to be considered collective rights and not individual rights as is usually the case with IPRs;**
6. **Forms of non-monetary benefit sharing should be put in place as a way to implement article 9 of the ITPGRFA;**
7. **A European/national fund to finance PPB should be promoted from the levy on protected varieties;**
8. **Recognition of the role of farmers in breeding and maintaining diversity in the fields.**



3.4 How to finance organic/alternative breeding

The funding of alternative and organic breeding is a major limitation for the development of organic and low-input varieties. The 2004 FAO conference on organic seeds (Lammerts van Bueren, 2004) highlighted the seed companies' hesitation to invest in organic seed because of small production batches and high costs and risks.

3.5.1 Market mechanisms

Farmers have a high willingness to pay for an innovation when they expect to profit from its adoption. This is notably the case for high yielding varieties. This higher demand for innovative varieties induces an incentive for private firms to invest in research to create new and more productive varieties. As regards the demand for environmental traits, more resistant varieties limit the use of pesticides. But when choosing between different varieties, farmers mainly consider the impact on their own returns. They value the savings on the pesticides enabled by a better varietal resistance, but pollution is not included in their decision-making process whilst they incidentally generate costs for society (pollution of soils, air, water...). Taxes on chemical inputs could increase the demand for low-input varieties by reinforcing interest in resistant varieties. It is acknowledged, however, that high levels of taxes are required to obtain a significant reduction of the

consumption of such inputs (Carpentier et al, 2005). Some other market mechanisms can create a demand for these specific characteristics. For instance, by differentiating and increasing the value of the goods produced without pesticides, the organic label can indirectly increase the demand for resistant varieties. But, because the organic market segment is small, volumes are rarely sufficient to cover the fixed costs of specific research programmes.

3.5.2 Public support

Public research can be justified as a tool to address market failures. A classical point developed by Nelson (1959) and Arrow (1962) is the idea that private actors under-invest in scientific research from a social welfare perspective because of their inability to capture all the returns from the new knowledge created (Steinmueller, 2010). The existence of IPRs may in part limit this phenomenon but in the case of seeds, another explanatory factor is the size of the market. The small size of the organic market hinders low-input varietal innovation but the lack of organic varieties also limits the development of these practices (Wolfe et al, 2008). Public research could break this vicious circle by developing varieties more adapted to low input farming. The issue of the provision of public services by the State is all the more important in the case



of breeding since research is incremental (some varieties developed today may turn out to be very useful parents tomorrow). Another major rationale that can justify public support is the provision of environmental innovations. For instance, PPB projects produce public goods by adapting varieties to local contexts and limiting agricultural pollution, providing methodologies and knowledge about plant breeding for low-input farming, exploring different research directions that could open up the path to future research and limiting genetic erosion of agrobiodiversity. Biodiversity, limitation of pollution and the preservation of options for future research are typically public goods that are under-provided if they are left to the free market since there are insufficient or no private incentives to produce them.

One strong argument, which would be supported by many, would be for member states to fund pre-breeding activities nationally, or even at the EU level. To some extent this is in progress at the moment through the FP7 programme, WHEALBI. This approach helps to ensure that useful diversity, which is effectively 'hidden' in gene banks, is made more accessible to breeders and others.

SOLIBAM Recommendations on Organic breeding

- 1. Maintain public funds for agricultural research for alternative farming systems;**
- 2. Strengthen the decentralization and participation of public research systems;**
- 3. Find new ways to evaluate public research systems in order to favour decentralised and participatory activities;**
- 4. Include in the Private-Public partnership the idea that farmers can also be part of the system, as private actors;**
- 5. Use the European Innovation Partnerships (EIP) to develop new business models of seed production and marketing, in a multi-actor approach.**

3.5 North-South cooperation

During the two workshops held in Senegal and Ethiopia we learned that the situation in Africa is quite paradoxical. One by one countries are adopting a seed law model (both on seed certification and marketing and intellectual property rights) that replicates the European system without any changes or attempts to adapt the regulations to their needs and social/agricultural systems. They are not at all aware of the process that the European Union embarked in 2008 to overhaul of the entire regime of seed regulations so that it could correspond to the changing objectives of society.

So, on the one hand we in Europe are rectifying our legislative framework in a move to make room for the needs of local agricultural models and on the other the majority of African countries are adopting the old European seed legislation and its model of protection of varietal innovation without adapting it to suit the specificities of their own culture, crops, agriculture, society and economy.



The Douglas approach to seed systems - proposed by Douglas in the 1980's and applied by the FAO for a long time in its seed policies – is merely reproduced as if the world hadnot changed in the last 20 years. This linear approach, called the Seed System Development Paradigm, has the ultimate goal of creating a commercial seed system in every country (Louwaars, 2007), trying to eliminate the informal seed systems. But, according to the FAO, in Africa, the contribution of the informal seed sector to overall seed supply is still very high, ranging from 70-90% in East Africa to almost 95% in West Africa.

SOLIBAM Recommendations on North/South Cooperation

- 1. Show how the complexity of European agriculture gives enough room to allow alternative models, through EC official meetings and consultations with developing countries;**
- 2. Facilitate the exchange of knowledge and experiences between stakeholders of the EC and Southern countries;**
- 3. Promote agricultural research programmes that include non-EU countries.**

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Policy recommendations for legal aspects of seed certification and protection of Plant Breeders' Rights and Farmers' Rights

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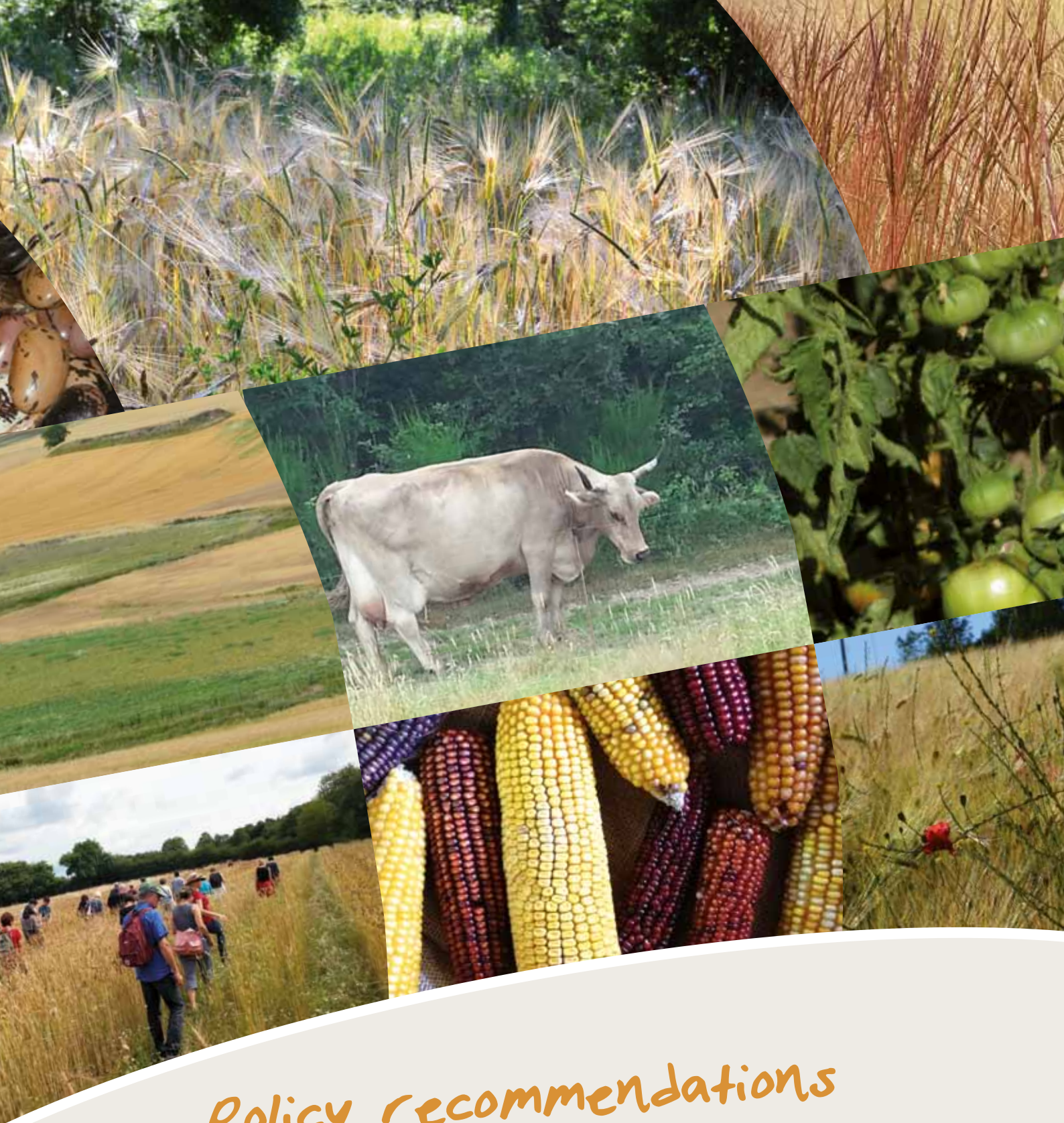
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*Policy recommendations
to sustain* DIVERSITY
STRATEGIES
WITHIN FOOD
SYSTEMS

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Introduction

The overall objective of SOLIBAM was to develop specific and novel breeding approaches integrated with management practices to improve the performance, quality, sustainability and stability of crops adapted to organic and low-input systems, in their diversity in Europe and taking into account small-scale farms in Africa. In SOLIBAM we have combined many disciplines and values with the aim of increasing system diversity and participatory methods on the overall food system. In addition to developing techniques and assessing quantitative and qualitative data, SOLIBAM has supported transdisciplinary thinking and research-action.

The SOLIBAM consortium identified three key concepts that should form the cornerstones of future European agricultural and research policies:

> **a. Diversity.** The SOLIBAM project showed that agricultural science is increasingly aimed at management of the complexity of agro-ecosystems and considers their diversity - within and among species - as the key to greater sustainability and a robust strategy for coping with climate change. In a world increasingly under the stress of climate change, agriculture has an urgent need for more diversified seeds that are suited to different contexts - social, agronomical, environmental, cultural and economic. Decentralized and participatory research (with the involvement of public and private researchers) is an opportunity to build new models of varietal innovation;

> **b. Participatory innovation.** SOLIBAM partners have explored and evaluated several strategies in order to re-engage breeding with diversity. Among them, participatory plant breeding, in all its forms and definitions, can increase cultivated diversity in time and space, through a decentralised and participatory research system. Moreover “the combination of decentralized selection and farmers’ participation in a Plant Participatory Breeding (PPB) program increases the efficiency of a plant breeding program by increasing adoption, and hence, increasing the benefit/cost ratio”;

> **c. Locality/terroir.** The diversity and innovation should be driven by and applied to, the unique combination of biotic, abiotic and human factors interacting at a specific place or area. During the SOLIBAM Congress in July 2014 in Nantes, France, the importance of re-localizing agricultural activities emerged clearly from the presentations of the various keynote speakers. Studies highlight the importance of the selection environment.

In particular, genotype-environment interactions –the evidence that the same plants may not express the same traits in different environments– pleads for selection in conditions close to those of the real-farm. Using chemical fertilisers and pesticides attempts to modify and standardise environments, making them more artificial. This means that in organic and low input agriculture, input limitation tends to decrease further the match between genotype and environment. In food systems, diversity (at all levels: ecosystems, species and varieties) can play a major role in achieving sustainability. Not only should social and economic systems foster their linkages with place (the idea of “terroir”), but also agricultural research should be organised to meet the challenges of these systems. Participatory plant breeding, as an extreme form of decentralized research appears to be an asset for organic and low-input agriculture.

These three concepts are the pillars around which agricultural and research policies should be based. In order to elaborate appropriate policies, SOLIBAM developed a series of recommendations, grouped in three main areas:

- 1 Seed system;
- 2 Knowledge system;
- 3 Food system.

In each system, the recommendations are based on the findings and the discussions within the **SOLIBAM** project with the partners engaged in participatory research, and the specific paragraphs below show the **SOLIBAM** outcomes and deliverables¹ related to the particular system and recommendation.

The targets of these recommendations are at the same time agricultural and research policies, because it became clear during the project that farming systems are open field laboratories, where research and practice should go hand in hand.

¹ - SOLIBAM deliverables are available on www.solibam.eu
In the text each deliverable is designated by the letter « D » and the related number.

#1

Seed system



SOLIBAM findings

Diversity is a key element to increase adaptation, yield stability and some quality aspects in organic and low input systems (D2.3, D3.4, D4.3, D5.6, D6.4, D6.6). The 51 **SOLIBAM** experiments covered several breeding strategies and diversity studies to meet the diversified situations of organic and low input agricultures, associated with the different crop management systems of European and African farmers. Among the model species, the project created and evaluated **1** Composite Cross Populations – CCPs for wheat, barley, broccoli, **2** mixtures and evolving mixtures for wheat, barley, maize, **3** new populations from farmers' breeding for maize or synthetic population with several bred parents for broccoli and tomato, **4** hybrids of populations from PPB of maize **5** hybrid of non fixed lines for broccoli. New populations (CCPs, hybrids of populations, mixtures) increase performance and stability if they are bred from adapted genetic resources, landraces or local varieties (D3.4, D4.3, D5.6). Level of yield was always discussed according to the stability level (D3.4 and D5.6) and to the qualities of the products (sensorial, nutritional and end-use): the value of a cultivar (which designates here all forms of genetic structures) is complex and always dependent on the farming and food systems being considered.

Several results from **SOLIBAM** have demonstrated **the great interest in on- farm evolution of cultivated diversity**. Both phenotypic observations and genetic studies using several molecular approaches demonstrated that more genetic diversity within landraces and farmers' mixtures are conserved on-farm than within landraces conserved ex situ (D2.3); On-farm dynamic management and on-farm breeding allows for new diversity to be created (D2.3, D6.4 and D6.6): CCP (in wheat, barley) or synthetic populations (maize) showed new diversity through generations when they evolve in diversified conditions.

SOLIBAM trials experimented with complex genetic structures to manage robustness, yield, stability of performance and quality. In several situations, modern cultivars were associated with landraces or farmers' populations to create a large framework of diversity to fit to environmental conditions, climate instability and diversified markets (D3.4, D5.6, D6.4 and D6.6). Moreover **SOLIBAM** associated **professional breeders with farmers/researchers** in PPB programmes to increase the relevance and efficiency of breeding programmes to face the demand from organic and low input sectors (examples can be found in D3.4, D5.6, D6.4 and D6.6 for wheat, faba beans, broccoli and tomato).

Within the **SOLIBAM** project, the involvement of end-users took several forms, within PPB projects (wheat, barley, maize, beans, broccoli, D6.4 and D6.6), quality evaluation (bread, broccoli, tomato, D7.4, D7.5 and D7.6) or innovation in food products. For all of these experiments, diversity of genetic resources was a prerequisite to cover all forms of qualities for end-uses or agronomic traits needed for robustness



or adaptation. Several PPB projects are several years old and **SOLIBAM** provided an opportunity to better understand the efficiency of **on-farm management of diversity** (D2.3) or to better share know-how and knowledge for innovation within the food system (D6.4). Moreover, several experiments (on-station D4.3, D4.4, or on-farm D6.6) have shown the interest in intercropping which is mostly limited in its efficiency by the lack of co-adapted species/cultivars within species. Several groups of farmers wish to diversify experiences of breeding on-farm and need to enlarge the genetic background of their local varieties to cope with innovative cultivars (D6.4, D6.6 and D9.7). Within **SOLIBAM**, on-farm experiences on management of diversity have also been collected (D6.5) and witnessed through the solid experience of European farmers. **SOLIBAM** D8.7 deals specifically with seed policies and laws.

Context and goal

The main goal in the Seed System is to develop an integrated seed system (ISS) where the current informal and formal systems can co-exist with mutual exchange of germplasm to foster variety innovation. Until now seed policies and programmes have been inconsistent with practice and have not taken into consideration the variations that exist in the wider farming system. The principles of an integrated seed system are:

- a. Full integration and recognition of formal and informal systems;
- b. Seed sector development should be approached in a pluralistic manner.

Putting these principles into practice will allow the creation of a dynamic model that, through appropriate seed policies, will guarantee a vibrant and pluralistic seed sector. This approach has been established in developing countries. The case studies analysed, the outcomes of the **SOLIBAM** project and the discussions around the regulation proposed by the Commission in 2013, indicate that it can be useful for the future of agriculture, even in Europe. Moreover, such an approach has to be considered as an obligation for the implementation of articles 5, 6 and 9 of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) signed by the European Union and all its Member States.

In order to meet the goal of **an integrated seed system**, the marketing of plant and propagating material should be flexible and allow the possibility of putting different kinds of variety into the market in order to meet the needs of different clients. The new EU regulation on marketing of Plant and Propagating Material will be the main pillar of this new seed policy, but not the only one. Seed policy will also be affected by other regulations such as those relating to pest and disease control, seed import, rural development and agricultural research. It is therefore important to coordinate all these regulations around the vision and the principles of the European seed policies in a complementary way.

Regarding **access to Plant Genetic Resources** for Food and Agriculture (PGRFA) it is important to point out that there are different types of users of PGRFA who have different needs and constraints in accessing plant genetic resources (PGRs). In this regard, farmers should be included among the users as a particular group that at the same time uses, conserves and improves PGRs. Farmers' participation will allow integration of ex situ and on-farm/in situ conservation maintaining the flow of germplasm between formal and informal systems. According to the last report of FAO on the State of the World Plant Genetic Resources, informal seed systems are a vital haven for diversity. It means that farmers will generate new diversity in the field during cultivation and use, and that diversity can be collected again and stored in public gene banks. A two-way relationship can be established between farmers and gene banks, fruitful for both.

The European Cooperative Programme for Plant Genetic Resources (ECPGR) can play an important role in this field supporting the EU and its Member States in the implementation of the Treaty. **The inclusion of farmers** as potential users of PGRs in the work of ECPGR can be considered as a non-monetary measure of benefit-sha-



ring providing facilitated access to national or European collections (e.g. the Aegis system). But it should be clear that farmers or farmers' organizations need adapted rules for guaranteeing their participation. This inclusion of farmers in the ECGPR system can also be useful for gene banks in order to regenerate their collections in the area of origin and to test them in farmers' fields. Specific activities and projects can be set up in this area. Transparent rules should be set up regarding Intellectual Property Rights (IPRs).

Regarding IPRs, the concentration of the seed sector is a trend that in the long run can lead to a “corporate bottleneck”, posing a serious threat to agricultural diversity in the future. In fact, it can block the flow of germplasm between formal and informal seed systems. Moreover it is important to point out that the notion of essentially derived variety (EDV) contained in UPOV 91 convention can *de facto* block further incremental innovation by farmer-breeders who, through cultivation and selection, can adapt new varieties to their farming conditions or needs, e.g. by crossing the protected variety with a local one. **There is a need to balance IPRs** (and the need to recoup their costs and to fund future breeding – be it by the seed/breeding industry or by PPB) **and Farmers' Rights** as stated in article 9 of the ITPGRFA. Promoting the integrated seed system approach and recognising the existence and the importance of the informal one, is a good way to find the right balance between IPRs and FRs. For years scholars have seen the conservation of plant genetic resources as an alternative paradigm to the development of a modern farming system. According to this paradigm conservation and development are considered contrary forces and *in situ* conservation is considered as a way to conserve a number of local varieties in a sort of open-air museum. Such a reductionist approach has been challenged in recent years by the practical activities of many farming communities all around the world and by many scholars and reports from FAO and Bioversity International. The **SOLIBAM** findings go in the same direction. Therefore **on-farm management, and more precisely agrobiodiversity management, should be considered as a new way of approaching PGRFA conservation**, through a new paradigm that challenges not only the functions of PGRFA conservation, but also the role of farmers and agriculture in society as a whole.

To achieve the goal of an integrated seed system in Europe, recommendations are addressed to different policy themes:

- 1 Seed marketing;
- 2 Intellectual property rights (IPRs);
- 3 Access and Benefit Sharing (ABS);
- 4 Agrobiodiversity conservation.

Recommendations on seed marketing

- a. The marketing regulation should concern only material put into the market and not farm-saved seeds or seed exchanged as stated in article 2 of the Commission proposal of the 6th May 2013²;
- b. Farmers should not be considered “professional operators” according to the marketing regulation. Their primary activity is farming and not marketing seed;
- c. In order to thoroughly implement Farmers' Rights in Europe, the marketing of seeds of non-protected varieties by farmers who reproduce them on their own farms for end-users should be considered outside the scope of the marketing regulation;
- d. The four categories of varieties suggested by the Commission proposal (Commercial varieties, Officially Recognised Description ORD varieties, niche varieties and heterogeneous materials) should be maintained as a general structure in order to have sufficient flexibility;

2 - EC (2013). Proposal for a regulation of the European Parliament and of the Council on the production and making available on the market of plant reproductive material (plant reproductive material law). http://ec.europa.eu/food/plant/plant_propagation_material/review_eu_rules/index_en.htm

- e. The ORD variety category should include not only past conservation varieties or landraces, but also new varieties that are not sufficiently uniform to fulfil the procedure of DUS (Distinctness, Uniformity and Stability) testing of commercial varieties;
- f. Niche market varieties should be maintained as such and the size of the companies allowed to sell these varieties should be reviewed after analysis of the structure of the seed market in Europe. If the definition of micro-enterprise is not suitable a new definition should be proposed. In this category it should be possible to sell not only vegetables (the so-called amateur varieties) but also cereals, arable crops, potatoes and fruit trees;
- g. In the case of open-pollinated varieties registered as commercial varieties, the DUS testing should be adapted in order to allow sufficient diversity;
- h. VCU (Value for Cultivation and Use) testing should be optional in order to allow a choice of company depending on the type of the market for the variety;
- i. Organic VCU testing must be in place in all EU countries in order to allow companies to use it if they wish to do so;
- j. ORD, Niche market varieties and Heterogeneous materials should have a post-market control, based on conformity to the label;
- k. Operators should have a registration procedure, different according to their markets. For example, in the case of operators selling ORD, Niche market varieties and Heterogeneous materials, the registration procedure and the relative controls should not be burdensome or block small companies from entering into these markets.

For more details, see the SOLIBAM Booklet “Policy recommendation for legal aspect of seed certification and protection of Plant Breeders’ Rights and Farmers’ Rights” (D8.7).

Recommendations on Intellectual Property Rights

- 1 Maintain IPRs regulations breeders’ exemption and farmers’ privilege in the EU;
- 2 Eliminate the concept of essentially derived variety (EDV), at least for farmers’ varieties;
- 3 Find new ways for protecting Heterogeneous materials and farmers’ varieties. In the case of heterogeneous material and farmers’ varieties, we need technical and other tools that protect these materials from misappropriation by third parties without blocking the innovation process (e.g. their fair use in breeding activities). The idea is to create a kind of protected common, through the use of a specific license that allows further use for breeding provided that the new material will be protected by the same license;
- 4 Farmers’ Rights (FRs) have to be considered as collective rights and not as individual rights, as usually are IPRs.

Recommendations on Access and Benefit Sharing

- 1 Guarantee access to PGRFA to end users;
- 2 Forms of non-monetary benefit sharing should be put in place as a way to implement article 9 of the ITPGRFA;
- 3 Establish a permanent forum with farmers’ organizations or networks working in the field of on-farm conservation of PGRs. The objective of the forum is to find appropriate ways to communicate with farmers and implement, day-to-day, their participation in the ECGPR system;

- 4 Guarantee the participation of representatives of the farmers' forum in the on-going groups of ECPGR, promoting the sharing of knowledge and points-of-view among scientists, bank curators and farmers;
- 5 Negotiate a facilitated standard transfer agreement for farmers or farmers' organizations in order to simplify their participation;
- 6 Create a multilingual website about PGRs in Europe, with the names of the institutions conserving the collections and how to access them;
- 7 A European/national fund to finance PPB should be promoted from the levy on protected varieties.

Recommendations on Agrobiodiversity Conservation

- 1 Recognition of the role of farmers in breeding and maintaining diversity in the field;
- 2 Switch from direct aid to individual farmer as a contribution to the conservation of a particular variety to the financing of local projects that see the participation of more farmers / actors together;
- 3 Shift from the concept of "conservation" to agrobiodiversity management;
- 4 Include the Descriptors for farmers' knowledge of plants in the list of descriptors of gene banks (see as a reference the book published by Bioversity International);
- 5 Farmers' organizations and seed savers' networks are setting up and implementing their own databases in order to track the varieties conserved and described by them. One of the objectives of ECGPR can be to support this work of the civil society sector, and to try to harmonize it with the formal sector.



#2 knowledge system



SOLIBAM findings

Throughout the duration of the project, **SOLIBAM** wished to enhance the innovative movement of organic farming since the impulse of the pioneers in the first part of 20th century, and to foster an overall sustainable agriculture sector (D1.2). Based on diversity at all levels, there is room for further improvements in the organic sector, enhancing the application of the organic principles of health, ecology, fairness and care. SOLIBAM has developed various agro-ecological innovations, which are at the core of its strategies; ten of them applicable from soil to fork are presented in the published booklet “**SOLIBAM 10 key Innovations – Cultivating Diversity**” (D9.4).

One of the first results of **SOLIBAM** was to confirm (surveys in D1.4) useful plant traits for organic and LI agriculture which may differ considerably from one country to another and from one region to another depending on the agroecological conditions and on the market. Results fit with the hypothesis that **the market is a significant factor influencing the choice of seeds and varieties**. Expectations and practices of producers selling on a local market (i.e. direct sale) differ radically from those of producers selling to long food supply chains. Quality criteria were also very diverse even for one species according to farmer's practices and end-users: for example, soft wheat or maize qualities required for traditional recipes are specific and different from those of the modern bakery (D6.4 and D7.4). The diversification of production is associated with a large diversity of environments in Europe and Africa for which the main criterion was mostly stability of performance (yield, health and quality) rather than yield (D1.7). The complexity of the notion of performance and plant adaptation (D1.8) calls for the enlargement of participatory research, not only for plant breeding but to cover all aspects of sustainability of farm systems (**SOLIBAM Congresses**) and the solicitation of farmers on a broader scale as expressed during the 84 farm days organised within **SOLIBAM** (D9.7) demonstrating the results of current experiences (D3.4, D4.3, D4.6, D6.4 and D6.7).

Two aspects characterise varieties that fit to organic and low inputs farming systems: **diversity and adaptation**. Experiments in research stations that test for performance and stability of diverse cultivars without considering the previous adaptation of cultivated resources have all concluded that diversity should be evaluated after the phase of breeding for plant adaptation in the conditions where crops will be further exploited (D3.4, D4.3 and D5.6).

Adaptation means a large number of varieties but also a **decentralised organisation of research**, where locally, different actors manage the creation and evaluation of varieties and the organisation of seed multiplication. Within **SOLIBAM** we showed how new knowledge might emerge from collective action in the field with PPB (D6.4 and D6.6) but also, dealing with the specific question of evaluation, mainly for sensory qualities. We have adapted methods (making them affordable) and demonstrated their reliability with wheat, maize, broccoli and tomato breeding activities (D7.4, D7.5, D7.6). These activities are supported in practice by farmers local organisations, mainly facilitators /brokers whose position are not easy to finance, since their actions does not fit with the current roles of agricultural extension services. The difficulties include the lack of researchers involved in participatory research. These research actions were managed mainly by PhD students. Nearly 20 such students were involved in **SOLIBAM** where



they implemented trans-disciplinary and multi-actor research. Institutions are not ready to include this kind of research profile and research evaluation does not consider the relevance of research outside the context of the scientific discipline.

A study carried out within **SOLIBAM** (D8.6) showed that the **farmers** who have been engaged in organic farming for the longest time, are more likely to **adopt sustainable practices**. Using survey data from 352 Italian and Portuguese organic certified farmers, the study uses a probabilistic model to look at the factors that influence the choice of organic farmers in their transition to sustainability. According to the model, each year of experience in organic farming has a positive influence on the probability of applying a strategy to increase sustainability at the farm level. Another interesting result relates to the impact of the source of information on influencing the definition of farm strategies. The model shows that having the public knowledge system as a reference (Universities and other public services) increases the probability of farmers applying sustainability strategies.

SOLIBAM suggested the **Crop-Design System** (CDS) for enhancement of crop production by local wild pollinators as an integrated agro-ecological-socio-economical and win-win-strategy for crop, pollinator and farmer. The idea is to maximize the benefit delivered by pollinators on yield quantity and/or quality by designing a pollinator-friendly crop, thereby contributing to pollinator conservation and to increase farmer income (greening payment) because of the engagement in the protection of wild biodiversity.

Even though data support the idea that breeding of populations instead of pure line varieties could be a **cost efficient option for small markets**, marginal areas or neglected crops, the questions of financing the appropriate breeding and maintaining and checking remain unsolved (D5.6 and D8.7). Line breeding in wheat is self-financing by royalties. Local or regional adaptation is most important for wheat performance in organic agriculture.

In the case of plant breeding, the **funding of alternative and organic breeding** is a major limitation for the development of organic and low-input varieties. The 2004 FAO conference on organic seeds highlighted the seed companies' hesitation to invest in organic seed because of small production batches and high costs and risks.

Farm days proved to be a very efficient tool for the dissemination of the project outcomes amongst farmer's communities and stakeholders in general. Each year, they enabled breeders, farmers, extension services and researchers involved in **SOLIBAM** to share their skills, information, and knowledge also with non-participating farmers. Farm days were also a way to communicate about **SOLIBAM** project, distributing booklets and other dissemination tools to farmers and other stakeholders. In addition, Farm days stand as a space for discussion of the project results and related topics with farmers. Between 2010 and 2013, 84 Farms days were organized in the framework of **SOLIBAM**. Participants' feedbacks are very positive: several new farmers wish to join future participatory projects and to implement trials on their farms. They also wish to have Farm days organized even after the end of the **SOLIBAM** project. Farmers and experimental sites were very proactive in organising these visits and therefore they need to be implemented in the future to carry on the work started by **SOLIBAM**. **This tool seems to be very promising for supporting innovation in rural areas at local level.** This approach can be thoroughly implemented in the new Common Agricultural Policy (CAP) within the framework of the European Partnership for Innovation.

Context and goals

Agricultural Knowledge Systems (AKS) is a term used to define a set of public and private organisations dedicated to research, education and extension, and includes their interaction with knowledge users (generally farmers). The organisation of AKS is the basis of a paradigm shift in agricultural models. With respect to the classical structure of agricultural research, education and extension services, the AKS should evolve and adapt to the new context of integrated rural sustainable development. The study of knowledge dynamics within rural society should also be considered in assessing the sustainability of farming systems. The "transfer of technology" typical of a top-down linear process of innovation cannot be used for innovation in sustainability. Instead, research and innovation policies should promote the combination of different types of knowledge (e.g. scientific, lay, tacit and local) and sectors (e.g. science and production) in a process of mutual learning, with the aim of finding practical solutions for com-



plex problems. The agricultural innovation literature recently developed the concept of **Agricultural Innovation Systems (AIS)**, in which innovation is considered as the result of a process of networking and iterative learning among a heterogeneous set of actors. This network-based governance improves the efficiency of innovation systems where researchers co-produce knowledge in constant interaction with other stakeholders, farmers in particular, developing processes of mutual learning.

Production and exchange of technical knowledge and information should be combined with several additional factors such as policy, legislation, infrastructure, funding and market developments. **Innovation emerges** as a more or less coordinated effort to create synergy and coherence among economic, social, technological and environmental components of the system. AIS are built on a network-like structure which includes as actors all persons or organisations who develop or contribute otherwise to economic activities in rural areas, mainly rural (micro-) entrepreneurs and specifically farmers, but also consultants, policy makers, supply and processing industries, retail outlets, consumers, NGOs, financial service providers, knowledge institutes and researchers. This structure recognises the bottom-up nature of many innovations as a result of inter-sector collaborations among different types of actor. Researchers should be able to support adaptation to change by encouraging a capacity to self-innovate through experimentation with new methodologies and approaches, as well as through detailed discussions with various stakeholders. In a systemic approach to understand innovation it is necessary to focus on the process that leads to innovation and the context in which that process takes place. Organic agriculture (OA) is at the core of the current agronomic transition toward more sustainable food systems. Technical research is being developed in the organic sector in order to define the best species/varieties adapted to organic practices, to improve rotations by including more legume crops, to improve weed management and to propose alternative solutions for pest control. In the same way, the increased knowledge of soil biology, its fertility and more globally the life cycles are part of the focus of organic research. Moreover, agrobiologists are developing innovative practices in terms of fertility sources (green manure, compost...), weed management, intercropping and rotation design. These practices are very dependent on the pedo-climatic context, and consequently some dynamic and creative organic farmers have developed locally innovative practices without the direct support of research or development organisations. For these reasons innovation is very strong in OA, and is mostly initiated and developed by farmers themselves. **It is important to transfer this bottom-up knowledge (as opposed to top-down), in order to develop diversity and organic farming on a larger scale.**

It becomes crucial to challenge the actual system of research evaluation. To date, national agencies that carry out periodical evaluation of the research performance of institutions and individuals (e.g. AERES in France and ANVUR in Italy) mainly focus their assessment on classical bibliographical indicators, like Impact Factor, Citation Index, H index and the like. This also applies to agricultural research. Furthermore, for these agencies 'innovation' is basically a synonym of patent and has no relationship at all with the actual take-up of a solution from end-users, especially farmers. An excellent piece of research which is published on a high-ranked international scientific journal but whose knowledge is not transferred to the end-users in a given field of study is not at all an innovation. In the world of research there is a clear idiosyncrasy. On one hand the trend towards researchers/institutes evaluation based on bibliographic indicators and patents (with clear consequences on fund allocation) is being strengthened. On the other hand, major funders (e.g. the EC through the new Horizon 2020 funding programme) are clearly advocating a multi-disciplinary, 'multi-actor' approach, at least in agricultural research. This means that stakeholders, much more than in the past, should be actively involved in research projects from the very beginning and not be just passive recipients of dissemination of project results. In agricultural research, this applies to farmers and their organisations, companies (including breeders), and other potential end users of new knowledge generated in research projects. Following this pathway should guarantee that collaboration between researchers and 'multi actors' (including farmers) will be fully exploited for the mutual benefit of all partners engaged in a project and of society at large. The current approach of research evaluation agencies denies the current trends in research funding fostered by the EC and hence the importance of collaboration between scientists and 'multi actors'. Leaving aside personal inclinations, there is very little structural incentive for researchers to become engaged in participatory research because this part of their work is not considered a valuable research output. **The consequence of this is that real innovation – in the sense explained above – is discouraged and the gap between researchers and farmers/other end users is increased.** This trend should urgently be reverted.

SOLIBAM acknowledges that producing excellent research papers and patents is important and should still be pursued but thinks that considering these as the only valuable outputs of research is narrow-minded and will **I** increase the gap between researchers and farmers and other end-users, and **II** jeopardize the production of real innovation.

The collective organization allows improving farmers' autonomy and ability to manage agrobiodiversity on farm. **The network organization** increases the sharing of knowledge among farmers and between farmers and researchers and the reliability of information and data associated with seeds. **A close multi-disciplinary collaboration is fundamental** to an in-depth analysis and management of the PPB programs.

Recommendations on Knowledge system

- 1 Maintain public funds for agricultural research for organic and low-input farming systems;
- 2 Strengthen the decentralization and participation of the public research systems;
- 3 Include in the Private-Public partnership the idea that farmers can also be part of the system, as private actors;
- 4 Use the European Innovation Partnerships (EIP) to develop new business models of seed management, production and/or marketing, in a multi-actor approach.
- 5 Use the EIP to develop the CDS breeding strategy in a multi-actor approach (pollination ecologist scientists - breeders and germplasm managers - farmers and NGOs);
- 6 Promote collective and/or multi-actor action through public funds (e.g. CAP) or civil society funds (at local or regional scale);
- 7 Foster dynamic exchange of knowledge among peers as a training tool in agriculture;
- 8 Fund exchange visits among different realities/experiences from different countries;
- 9 Give a complete new role to extension services (brokers/facilitators), enhancing knowledge sharing;
- 10 Find new ways of financing organic breeding, as for example supporting the integration of breeding in the food chain, involving consumers' in the process;
- 11 The approach of research evaluation agencies should promptly incorporate new indicators based on the production of real innovation from research institutions and individual researchers; The development and selection of such indicators should be done in collaboration between researchers and end users;
- 12 The DG Research of the European Commission should establish a working group to develop such indicators and hence to re-elaborate and improve the working approach of national research evaluation agencies. This working group should include **I** representatives of relevant DGs, **II** representatives of national research evaluation agencies in EU member states, **III** representatives of end users (for agricultural research e.g. farmers, companies, consumers, NGOs), **IV** distinguished independent scientists whose curriculum clearly shows their ability to work in a context of real innovation and multi-disciplinarity. The **SOLIBAM** community is ready to help support the establishment and activities of this working group.

#3

Food System



SOLIBAM findings

Considering eleven indicators, based on product **life cycle assessments** (LCAs - D8.5), **energy assessment** (D8.8) and **economic analysis** (D8.6), applied to compare seven **food supply systems**, results led to the conclusion that the indicators chosen have demonstrated that even for innovative food supply systems there are large potentials for **improvement of environmental sustainability, resource use and economic outcome**. Our results raise two further fields of questioning, one on relevant methods and the other on the necessity to enlarge the approach on sustainability within a broader trans-disciplinary team considering more aspects on the farm activities and food system organisation dealing for example with energy supply and agricultural machinery innovation (D8.8).

The studies from WP8 revealed that multifunctional organic farms tend to be more sustainable, with services provided as for example agri-tourism and education about environment. The survey done in WP8 revealed that sustainability is not unrelated to the source of information predominantly used by farmers. **Farmers who have universities and other public services as one of the main sources of information are more likely to adopt sustainable agricultural practices.**

We saw that in many cases experiences already implemented in several countries (D6.1) are often much more advanced than any theory. By analyzing them we can highlight the innovations ensuing from interactions among the several different actors and factors at a local level (social, environmental, economic, cultural...) (D8.6). This is the so-called “art de la localité” which gets reinvented each time according to local specificities. In facing the current crisis of agriculture, these experiences implement resistance practices – not just subsistence or survival practices – that can form the base from which to build future actions. Stakeholder congresses (D9.8), which enlarged the **SOLIBAM** network, confirmed the necessity of **connecting European experiences for methodological sharing**.

The learning from the combined analysis is that data collection and validation is very demanding in such complex systems. Further, the systems boundaries are difficult to define and different methodologies have different traditions for how to do this. Finally, many indicators of importance in diverse food systems such as ecosystem **services at the farm level** in addition to yield, quality characteristics of the product and consumers health issues, could not be used in this project because of the lack of available data. New studies need to include these aspects to give the true picture of the advantages and disadvantages of food supply systems based on the concepts of diversity, reduced use of resources, nutrient cycling and local sales (D8.8).

SOLIBAM has been concerned to **regain within-crop diversity** in food systems, also through development of diversified cultivars: new populations from on farm breeding, Composite Cross Populations, synthetic populations based on inter-crossing or associating many parents. Because of their diversity, such populations proved, as

expected, to be more stable and resilient in performance under varying abiotic and biotic conditions. Such crops are likely to be particularly useful for small-scale and organic farmers with their lower dependence on crop inputs. Given the increasing problems of climate change, they are also likely to be of wider value in agriculture generally. Elsewhere, the best way to characterise “**SOLIBAM** farms” (M8.10) could be a common “philosophy” or conception of sustainability. However, the implementation of **SOLIBAM** strategies seems indirectly linked to the type of farming: family farms are more likely to adopt them with regard to capitalist or corporate farms.

Context and goals

As Lang et al. (2009)³ points out “**food policy** is made, not given. It is a social construct, not ordained by a pre-programmed, perpetual or externally affirmed human order”. Therefore, its definition must be the result of negotiation among several different actors, taking into consideration their various interests and relative power relations. It is essential to understand the importance of suitable food policies, implemented at the local, national, regional or sub-regional level, as indispensable tools to promote, protect and sustain diversified agricultural systems, which are socially and ecologically sustainable. The above consideration is of great importance, particularly when we take into account the on-going tendency to let the market deal with agricultural issues, and the ever-increasing weight of international organizations in this field, to the detriment of national/regional sovereignty.

In order to meet this challenge, however, we need to redefine the categories and concepts around which policies are built; indeed, the ones we have today are often devoid of significance, or else they provide only a partial representation of reality. Otherwise, we risk making the same old mistake: leading into oblivion some of the social practices, particularly those weakened by the current neo-liberal policies. Indeed, after having determined that a new approach is necessary to finally overcome the concept of industrial agriculture as a theoretical and practical reference model for food policies, the issue becomes just how to construct this new approach, by coupling science with practice in a reciprocal and fruitful exchange. **SOLIBAM** tried to do exactly this: **setting the foundations from which to start changing the current methodological model, by interfacing science with knowledge.**

Shifting attention from the goal of productivity and the use of yield as a unique indicator of farm efficiency, **to a combination of goals such as productivity, sustainability and quality and a diversity** of possible combination of resources at farm level asks for innovative methods of farm structure analysis. Different technologies are required by organic and low input agriculture and a different model of innovation needs to be developed. The linear model of innovation should be substituted by circular models, in particular in agriculture. No single solution can be found but several options for resource combination at farm level can allow reaching equilibrium among different goals. Human and social capital strongly influence the definition of the best solution at the local level, a specific attention to the farmer should be considered in a micro economic assessment. Starting from the concept of farmers’ autonomy, the general aim of the individual farmer is to reduce dependency from input producers and market prices and to increase dependency and investment in social connection and interaction with nature. **SOLIBAM** innovative strategies looked at this model and the integration of innovative breeding strategies with agronomic methods of farm management can be seen as an example of technologies that help to increase the efficiency of the farmer’s interaction with nature.

Food policies must meet their challenge in the field of regional integration, rather than struggling with international competition. Protecting one’s agriculture – a concept banned from the speech of any politician or expert – is the keyword, with a special attention to attaining coherence among local, national and regional levels.

3 - Lang T., Barling D., Caraher M., (2009). Food Policy. Integrating Health, Environment and Society, Oxford University Press.

Recommendations on Food System

- 1 Support enhancement of farmers' autonomy;
- 2 Encourage diversified food supply systems enhancing a "food culture" within the society, connecting urban people to the reality of food production, its environmental and cultural values;
- 3 Diversify the produce supplied exploring the interest of untapped genetic resources and local cultivars (e.g. a mix of different vegetable crops, meat, flour types, bread, and dairy products);
- 4 Diversify distribution strategies (e.g. farm shops, farmer's markets, box schemes, restaurants and cafes, collection points for consumers and retail);
- 5 Diversify tasks to carry out at the farm (e.g. field operations, processing grain and dairy products, packaging vegetables, transporting products, providing seminars and guided enterprise visits in times of scarce work in the fields);
- 6 Support year round work for full-time employees (including e.g. fair payments, good social environment and opportunities for personal development);
- 7 Enhance use of renewable resources for the production and distribution of food.



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Policy recommendations
to sustain DIVERSITY
STRATEGIES
WITHIN FOOD
SYSTEMS



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Policy recommendations to sustain DIVERSITY STRATEGIES WITHIN FOOD SYSTEMS

Abstract: Based on the hypothesis of “diversity”, **SOLIBAM** has designed and tested innovative strategies to develop specific and novel breeding approaches integrated with management practices to improve the performance, quality, sustainability and stability of crops adapted to organic and low-input systems. **SOLIBAM** identified three key concepts that should form the cornerstones of future agricultural policies: Diversity, Innovation and Locality/Terroir.

In order to elaborate appropriate policies, SOLIBAM developed a series of recommendations, grouped in three main areas: **1** Seed system, **2** Knowledge system, and **3** Food system.

In each area, the recommendations are based on the findings (deliverables, workshops) and the discussions with the **SOLIBAM** partners engaged in participatory research. The targets of these recommendations are at the same time agricultural and research policies, because it became clear during the project that farming systems are open field laboratories, where research and practice should go hand in hand. Moreover, specific recommendations have been suggested to develop indicators to re-elaborate the working approach of research evaluation to support research development in a context of real innovation and trans-disciplinarity.

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