

# Who pays for seeds?

Thoughts on financing organic plant breeding

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# Table of Contents

<b>Introduction .....</b>	<b>4</b>
<b>1 The origin of the seed sector.....</b>	<b>5</b>
<b>2 The actors.....</b>	<b>7</b>
2.1 The private sector.....	7
2.2 State institutions.....	7
2.3 Civil society .....	8
<b>3 Non-profit organic plant breeding.....</b>	<b>9</b>
<b>4 Funding possibilities.....</b>	<b>12</b>
4.1 Royalties or “Variety Development Contributions”?.....	12
4.2 Open Source Licenses - a realistic vision?.....	12
4.3 Selling seeds.....	13
4.4 Levy .....	14
4.5 Participation in the value chain.....	15
4.6 The role of foundations .....	15
4.7 Governmental financing.....	16
<b>5 Organizing funding and financing.....</b>	<b>17</b>
<b>6 Conclusions and recommendations. ....</b>	<b>18</b>

## Introduction

Modern agricultural plant breeding has become an industry like any other. Increasing privatization of genetic resources and increasing market concentration of seed companies dominate this development in an extreme fashion. Consequently, important plant breeding tasks are ignored because they run counter to the logic of the market.

Firstly, crop diversity is crucial for agricultural adaptation to climate change and food security. Secondly, it is essential to produce high quality food while reducing the environmental impact. Crop varieties are needed to make better use of local ecology, requiring less chemical input, even if such varieties cannot easily spread beyond the local area. Thirdly, genetic diversity is required to agriculturally manage landscapes in a way that ecosystem services such as clean air, drinking water or recreation potential are maintained.

These aspects are increasingly neglected in private plant breeding, and viewed instead as a public task, which states do not attend to satisfactorily, if at all. Thus, in the last decades, rooted in civil society, a public organic plant-breeding sector has emerged. It has branded this deficit with lobbying and advocacy. Above all, however, it has established an important counterpole through practical breeding work.

Initiated by the biodynamic movement, non-profit plant breeding has become a success story, a small but robust novelty in the seed sector. It is dedicated to the development of crop varieties for organic agriculture and horticulture.

But this non-profit plant breeding sector, which addresses the important tasks currently not taken on by the private breeding sector, is still in its infancy. For its further development not only is a consciousness change in society needed, but also and importantly significant financial resources and stamina. In this paper, we scrutinize the question of how non-profit organic plant breeding could be financed. In consultation with plant breeders and agronomists, we analysed the current state of organic plant breeding and looked for ways to broaden its scope. Our focus is on Germany and Switzerland, where organic plant breeding is highly advanced.

# 1 The origin of the seed sector

Plant breeding is as old as agriculture. Our crops are the result of thousands of years of selection, a human-led evolution. Modern, scientific plant breeding, however, emerged only in the second half of the 19th century. Around 1860, in Germany the heads of major eastern estates were interested in improved crop varieties to make better use of their investment in soil fertility (improved three-field crop rotation).

In a relatively short time, breeding initiatives sprung up everywhere. As early as 1886, a task force of (eastern) German farm managers and agronomists was formed under the umbrella of the newly founded German Agricultural Society<sup>1</sup>. In subsequent years, the foundations were laid for cultivar-proficiency tests, seed inspection bodies and a plant variety register. At the same time, a method for variety recognition and protection through trademarks was established and a seed trade developed.

The contribution of modern plant breeding to agricultural intensification was enormous. A few examples may illustrate this: The new varieties increased, sometimes even multiplied crop yields. Resistance to diseases rose, when they previously had led to total crop failures, and tremendous improvements in quality were achieved. For example, the baking quality of local wheat varieties could be increased and thus imports of cereals for bread reduced; also rapeseed varieties free from erucic acid were bred, obtaining high-quality edible oil from rapeseed. Last but not least, the mechanization of the production was supported, for example through the monogermity of sugar beet.

Thus, plant breeding has greatly contributed to the intensification of agriculture, more so than chemical pesticides and mineral fertilisers. Many authors believe its share in the contribution to productivity growth to be more than 50%<sup>2</sup>. These improvements, however, led to the disappearance of many crops and crop varieties and thus to a severe loss of agricultural biodiversity.

Whilst it was initially farms – either individually or cooperatively – that began plant breeding and selling improved seed, specialized plant breeding companies were established, consisting mainly of small and medium-sized businesses and forming a separate industry. In the 1970s, international chemical companies discovered plant breeding as a highly profitable new business, and started to buy them out.

In the 1980s, genetic engineering made patents on plant traits possible, speeding up the process of concentration in the seed sector, in particular in the US<sup>3</sup>. Since Europe still is GMO free with a few exceptions, corporate concentration is slightly less pronounced<sup>4</sup>. Nevertheless, in Germany alone, over the last 15 years, 25% of seed companies were dissolved or were taken over. Today, only 58 independent breeding companies are registered with the Association of German Plant Breeders<sup>5</sup>, and accordingly, the number of companies offering varieties for individual crops has declined sharply. This is especially true for corn, sugar beet, oil fruits and vegetables. A recent study places the EU market share of the five largest vegetable seed companies at 50%<sup>6</sup>, another one even at 95%<sup>7</sup>.

At the same time, the commercial, global seed market has grown rapidly, in the last 30 years, and particularly intensely in the United States. In 2012, global sales reached about 35 billion Euros, and are expected to increase by 37% to 47 billion Euros by 2020. The EU

“The contribution of modern plant breeding to agricultural intensification was enormous. These improvements, however, led to ... a severe loss of agricultural biodiversity.”

is seen as the third largest seed market, following the US and China<sup>8</sup>. Within Europe, France has with 31% the largest share of the market, followed by Germany with 13% and Italy and Spain with 8% and 7%, respectively<sup>9</sup>.

Today, plant breeding is highly profitable, especially in cotton, corn, soy, rape, sugar beets, sunflowers and a range of vegetables. Over the last few decades seed prices have risen sharply overall. They do not reflect actual development costs, but rather what the market allows<sup>10</sup>. For vegetable seeds, a return of 15% per year is not unusual<sup>11</sup>.



## 2 The actors

### 2.1 The private sector

From its beginnings, modern plant breeding has been mainly privately funded. It is based on the sale of (certified) seed. Two mechanisms ensure that this sale will be effected exclusively by the breeding company or on its behalf, and prevent uncontrolled spread of varieties:

- Technical methods such as hybrid breeding, and even more so the creation of CMS hybrids, prevent the cultivation of farm-saved seed, since the original material (the parent lines) are owned by the breeding company and are not generally distributed. Moreover, saving seed on farms can be completely prevented with the induced sterility of seeds (GURT or terminator technology), a biotechnological possibility for the time being prohibited.
- Intellectual property rights on varieties (plant breeders' rights) or on traits of varieties (patents) permit the enforcement and collection of royalties by law.

The perfection of both the technical and legal mechanisms for the enforcement of private property rights continue. Technical control is paving the way: instead of time-consuming and costly lawsuits for the enforcement of legal claims, the more elegant way is to control the access through the use of hybrid plants. The widespread practice of cultivation of farm-saved cereal seed explains the great efforts that are being made to achieve the technically demanding production of hybrids for self-pollinators, such as wheat. These developments profit from significant financial support by the German government and the EU<sup>12</sup>.

Due to these protective mechanisms, private plant breeding has proven to be very innovative in terms of an intensification of industrial agriculture, yet at the price of a lack of sustainability and greatly reduced diversity. Concentration on just a few crops and varieties with large acreage not only reduces biodiversity, but also increases the risk of loss during extreme weather events, plant diseases or pests. The growing corporate concentration strongly enhances this standardization process.

“...private plant breeding has proven to be very innovative ... at the price of a lack of sustainability and greatly reduced diversity.”

### 2.2 State institutions

For many decades, state institutions complemented the private sector, forming a second important pillar of plant breeding in Europe. Today, governmental institutions have largely withdrawn from plant breeding - at least in Germany. They focus almost exclusively on breeding research, especially on issues of plant genetics and biotechnology.

“...crops with small acreage and small markets ... are not bred by the private sector ... they are simply not profitable.”

Nevertheless, state institutions are pushed to address the societally important matters, which the private sector is not willing to do<sup>13</sup>. This includes breeding for the improvement of so-called "minor crops", i.e. crops with small acreage and small markets, crops that are not bred by the private sector. Due to their often regional importance only and their small

distribution minor crops are simply not profitable. On the other hand, however, the yield of these crops could be increased significantly with little breeding effort.

Another important task is the promotion of biodiversity “in-situ” by breeding suitable varieties for sustainable crop rotation systems; for example varieties of legumes (peas, field beans, lupins) can be grown only every 6-8 years because of their high sensitivity to disease.

Last but not least, there is an urgent need for education and training of plant breeders. The shortage of plant breeders worldwide is becoming apparent. “The basic education of plant breeders shares many qualities with public goods. Companies will not be able to provide such training, because they are not certain to get a return on such an investment (...). It is impossible to keep the breeder as employee long enough to get this investment back”<sup>14</sup>.


All of these matters have hardly been addressed in agricultural policy making.

### 2.3 Civil society

In the meantime a third sector, civil society, has joined the private and the public sectors in plant breeding. Two groups of civil society actors can be distinguished: one aims to breed varieties suitable for the requirements of organic agriculture and horticulture, while the other is committed to conserving agricultural biodiversity.

The first group of breeders is developing varieties specifically for organic farming. Within the last 30 years about 50 breeding initiatives have been established in Germany and Switzerland. Non-profit associations, cooperatives and foundations, but also social enterprises are involved in breeding and seed production. They are mostly organized into three major networks: grain breeders, vegetable breeders and breeders of speciality crops (fruits, berries, vines).

The second group, agrobiodiversity conservationists address small and amateur horticulturists. While this group plays a large role in the biodiversity debate, it is of less importance for agricultural and horticultural enterprises. In Germany, the *Dreschflegel* and the Association for the Conservation of Crop Diversity (Verein zur Erhaltung der Nutzpflanzenvielfalt, VEN) offer a wide range of rare vegetable varieties. Breeding for conservation is their main objective, but new varieties are also bred occasionally. Apart from well-known vegetables, both associations cover a wide range of crops not appearing in the plant variety register and do thus not fall under the German Seed Marketing Act. *Noah's Ark* (*Arche Noah*) in Austria, *Kokopelli* in France and *Pro Specie Rara* in Switzerland do similar work.



"Within the last 30 years about 50 breeding initiatives have been established in Germany and Switzerland."



### 3 Non-profit organic plant breeding

In Germany and Switzerland, in 2013, organic plant breeding received funds of approximately 2.5 million Euros (see Table 1), with cereals receiving 55% and vegetables 32% of this sum. In comparison with conventional private plant breeding organic non-profit breeding is dwarfed, but increasingly asserts itself in the market with an annual growth rate of more than 10%.

**Table 1: Financing of Organic Plant Breeding 2013 (Germany/Switzerland in Euro)**

	Total	Average/Breeder
Cereals	1.422.167	355.542
Vegetables	833.333	28.736
Other crops	326.500	not known
Total	2.582.000	75.941
Own data (n = 34) from 2013		

**Table 2: Organic cereal breeding (Germany/Switzerland) – Sources of Funding**

Origin	Funding Euro	Funding %	Range %
Royalties (seed sales)	114.426	8,0	0 - 12
Variety development contribution	7.699	0,5	0 - 1
Seed sales	6.143	0,4	0 - 2
Trade and processing	204.418	14,3	0 - 25
Donations from Individuals	123.860	8,7	0 - 15
Foundations	748.082	52,4	35 - 81
Public funding	120.936	8,5	12 - 30
Other	116.604	7,2	0 - 15
Total	1.422.167	100,0	
Own data (n = 4 organisations), from 2013			

The financing of organic breeders differs fundamentally from that of conventional plant breeding (Table 2). Royalty revenues account only for a small percentage, because the acreage of the new organic varieties is relatively small, and potential licensing revenue is hence very low; and on the other hand because some of the breeders principally refuse license fees altogether. A cereal breeder in Switzerland was able to cover 12 percent of his expenses for the development of new wheat varieties from such royalties. For breeders in Germany the proportion is lower, at 3-5%, if not entirely absent. By far the largest portion of funding comes from foundations: on average 52% and in some cases more than 80%.

The financial situation of private conventional and non-profit, organic plant breeding could not be more different: the former is characterized by high returns, and the latter suffers on-going, structural financial shortfalls. This is due largely to the fact that organic plant breeding provides additional services benefiting society as a whole, which can, as such, not be 'sold'. These services are summarized as follows:

“... organic plant breeding provides additional services benefiting society as a whole, which can not be 'sold'.”

**(1) Varieties for organic farming.** Locally adapted organic varieties are a key component of organic and biodynamic food production systems. They allow the producer to use existing soil fertility more effectively, for example the seasonal differences in the availability of nitrogen in the soil. Given their resistances to diseases and tolerances for environmental conditions, these varieties ensure a production largely independent of external input. The absence of chemical plant protection contributes to the delivery of residue-free and high quality food.

**(2) Ecosystem services.** Organic varieties promote organic farming and thereby the ecologically appropriate cultivation of landscapes. Breeding efforts in crops with low economic importance, such as peas and field beans, support crop rotations. The exclusion of synthetic herbicides, pesticides and synthetic nitrogen ensures groundwater of a high quality. The accumulation of soil organic matter (carbon sequestration) is an important contribution to the reduction of anthropogenic effects on climate change. These are just a few examples of ecosystem services in which organic plant breeding is essentially involved in improving the preconditions for organic farming. In this way, organic varieties also respect the precautionary principle, as defined by the European Commission<sup>15</sup>, and contribute to the sustainability of agriculture and food production as a whole.

**(3) Agricultural biodiversity.** Another benefit provided by organic plant breeding is the enhancement and development of agricultural biodiversity. Organic plant breeding promotes genetic diversity of individual crops – for instance through the development of cross composite varieties<sup>16</sup>. Many different crops enter these breeding programmes - including those of negligible importance. It contributes to the diversity of ecosystems, and strengthens the “fourth level of biodiversity”, the functional diversity regulating the interactions within and between the other three levels. The agricultural diversity promoted by organic farming does not only support the conservation of cultivated landscapes, but also achieves food security and adaptation of agriculture to climate change. The EU, with its Common Agricultural Policy (CAP), as well as its member states has recognized that the conservation of crops and crop varieties is a societal task. From this perspective, it is only logical to consider subsidies for independent, non-profit plant breeding initiatives with funding from European and national programs for research in agricultural biodiversity.

**(4) Dignity and integrity of the plant.** Of great importance in organic plant breeding is a benefit that can be referred to as “idealistic” and “non-material”. This implies a support for breeding initiatives, which aim to comprehend cultivation and food qualities of a crop holistically, by considering the “essence” of any given plant. Secondly, breeding techniques which violate the integrity of the plant are avoided<sup>17</sup>. These include cell fusion, protoplast fusion and other methods of genetic engineering<sup>18</sup>. The refusal of these methods is not justifiable scientifically, but the public supports it for ethical reasons. Thirdly, all organic plant breeding is realized under organic conditions. That is, the specific characteristics of organic and/or biodynamic production are taken into account throughout the breeding process, integrating the interaction of crop and environment. Overall, the attempt to approach the development of crops holistically constitutes the foundation for agro-ecological optimization leading to the above-mentioned ecosystem services, as well as to the improvement of agricultural biodiversity.

Many arguments thus support the classification of organic plant breeding as an important common good, and to be financed as such.




## 4 Funding possibilities

### 4.1 Royalties or “Variety Development Contributions”?

Making use of plant variety protection is standard practice for private plant breeders, and revenues from royalties constitute the basis of their income. Amongst organic plant breeders, plant variety protection and license fees are controversially discussed.

The proponents (mostly cereal breeders) argue that the registration of varieties in the name of the breeder remunerates their creative labour. Income from royalties is seen as essential for their livelihoods and to ensure the continuation of breeding, even if this revenue covers only a part of the breeding costs. This is compatible with the non-profit approach, as breeders can license their rights to the charitable organization for which they work. Royalty payments on farm-saved seeds, fiercely debated in Germany for many years, are endorsed by many organic cereal breeders. A Swiss breeder has calculated that the proportion of farm-saved organic seeds cultivated in Germany is five times greater than that of purchased seeds. An awareness raising campaign about the importance of royalty payments on farm-saved seed for future breeding work could persuade producers to contribute.

The opponents (mostly vegetable breeders) view royalties as 'a hangover from the past', a compulsory levy, which does often not stand in any direct proportion to the cost of production, but is based on what is actually enforceable in the market. In this view, royalties do not do justice to the concerns and objectives of organic plant breeding. Even the term “license” is perceived as sending the wrong message. Breeding should be based on challenges faced, and not 'return on investment'. To this end, agricultural producers would need to assume their part in the responsibility for financing plant breeding. Fixed compulsory levies are seen as inappropriate to this end and instead a “variety development contribution” is envisaged.



“Breeding should be based on challenges faced, and not 'return on investment'.”

Experience has shown that it is not enough to appeal to voluntary variety development contributions. Indeed, it is necessary to define these in negotiation with seed multipliers and users. The importance of this kind of support must be clarified through an intense dialogue, and should result in binding contracts. Such a variety development contribution will probably always remain only one building block amongst many in financing organic plant breeding. In addition its administrative burden is high.

### 4.2 Open Source Licenses - a realistic vision?

Are seeds a public good and should individual seed varieties be protected by Open Source Licenses? This question is also discussed amongst organic plant breeders. Open Source Licenses are meant to protect a good against privatization and secure that it is accessible by anyone wanting to use it. Today, Creative Commons Licenses are widely applied to works of art, literature and science, all areas subject to copyright. Whether Open Source Licenses can be applied to seeds, usually subject to seed laws (or patents) rather than copyright, remains to be clarified.

For a possible Open Source License on seeds protecting the commons, two concepts are key: *copyleft* and *copyfarleft*. *Copyleft* guarantees the free use of seeds. This means:

- Varieties may be used by anyone,
- The user is allowed to change / develop the varieties,
- The user may multiply varieties and pass them on to others,
- Any new variety developed from the variety under *copyleft* would be subject to the same rules (the "viral" clause).

In opposition to a use of *copyleft* in plant breeding, some breeders argue that the individual performance of each breeder has to be remunerated, to underwrite their livelihood and enable them to provide this service in the future.

In this context, the *copyfarleft* clause, developed by Dmytri Kleiner (2007), offers other possibilities<sup>19</sup>. In a slightly modified form, *copyfarleft* would allow breeders who promote commons through their work, to charge a fee or demand a variety development contribution. This applies to cooperatives, foundations and associations, i.e. charitable and non-profit entities that do not perpetuate or promote private property. The *copyleft* principle would apply to all other bodies. Such a license would allow a non-profit breeding organization to provide common goods, and at the same time collect royalties.

Such an Open Source License for varieties would constitute an alternative to plant variety protection. It is contested whether the breeders' exemption (i.e., the use of registered varieties for research and breeding without authorization from the variety owner) consequently would be restricted. What is certain, however, is that through such licenses, a seed commons would be created which would be inaccessible for private plant breeding. Such restriction is controversially discussed among organic plant breeders.

Opponents argue that such a license actually restricts breeders' privilege. If *copyleft* varieties are used in crossings for the development of new varieties by commercial breeders, the resulting new varieties also have to be distributed under the same *copyleft* conditions. This is unattractive to private companies financed by means of commercial licenses and royalties. In addition, overall breeding progress would be limited because most of the breeders would not be able to use the *copylefted* material for these reasons.

“Open Source Licensing represents a future potential guaranteeing the protection of non-profit breeding and increasing the common pool of plant genetic resources.”

For proponents, on the other hand, Open Source Licensing represents a future potential guaranteeing the protection of non-profit breeding and increasing the common pool of plant genetic resources. The feasibility of this approach is appraised in the research project “Seeds as Commons”.

### 4.3 Selling seeds

Seed sales play different roles in the breeding of different crops. This holds for conventional as well as for organic plant breeding. For cereals, seed multiplication and distribution are tasks often outsourced to other organizations. Organic plant breeders generate their mostly very modest revenues through royalties or variety development contributions (see above).

In the case of vegetables, seeds and harvested crops are not identical and the production of seed is generally more complex. This is why horticulturists rely on purchased seed every year, and why the question of the farm-saved seed does not arise. Conventional private

vegetable breeders can therefore finance their breeding work exclusively through the sale of seeds. For organic breeders, however, it is a rather mixed picture. In two cases studied, plant breeding is incorporated into the companies, which are also engaged in multiplication and sale of seeds. One of these organizations is able to fully finance its breeding work through its commercial income, while the other one is only able to finance up to 50%<sup>20</sup>. A third case, the association *Kultursaat* (CultureSeed) - which unites 38 vegetable breeders - transfers seed of their newly bred varieties to the company Bingenheimer Saatgut, which takes care of seed multiplication and sales, and channels voluntary variety development contributions back to the breeders. The more popular an organic vegetable variety is, the higher the return. Overall, however, these funds constitute merely an additional income, amounting to about 10 to 15% of the breeders' total budget.

"For organic breeders ... it is a rather mixed picture."

#### 4.4 Levy

In almost all organic farming associations the possibility of raising a levy in support of organic plant breeding is being discussed.

*Demeter* Germany has developed an agreement in collaboration with food producers, processors and retailers, allowing the increase of membership fees of all three groups to levy contribution to breeding. Similar models are discussed in *Bioland* and *Naturland*.

In Switzerland, farmers pay a contribution of CHF 20 (approx. EUR 19.10) per hectare of wheat from organic breeding initiatives to the association *Bio Suisse*, enabling the latter to support organic breeding with an annual 50,000 - 100,000 CHF.

"In Switzerland, farmers pay a contribution of CHF 20 (approx. EUR 19.10) per hectare of wheat from organic breeding initiatives to the association Bio Suisse."

Another possibility for raising a levy was investigated in a study commissioned by *Bioland*<sup>21</sup>. Organic farming regulations dictate the use of organic seed. Exemptions allow the use of conventional seed when organically produced seed and seedlings are not available. To date, conventionally bred, untreated vegetable seeds and potatoes are still often used. Even if organic seeds are available, conventional seeds are used because they are cheaper. With a view to levelling the playing field, a levy for organic farms that do not use organically produced seeds was considered. The levy would correspond to the price difference between conventional seed and organic seed and could support organic breeding. Calculations have shown that such a levy could generate some six million Euros<sup>22</sup>, about six times the revenue of the Seed Fund (*Saatgutfonds*) of the Future Foundation Agriculture (*Zukunftsstiftung Landwirtschaft*, see below).

The study shows that a levy is technically and legally feasible, but uncertainty remains whether it would be enforceable in the EU and its member states. Moreover, prices for conventional seed could rise as a result of this measure, greatly reducing the levy. Despite the improbability of implementing a levy, the idea could be used as a lobby argument during the revision of the EU Regulation on organic farming, to legally enforce the mandatory use of organic seed whenever available.

## 4.5 Participation in the value chain

Awareness is growing that organic plant breeding provides overall social and environmental benefits and that it cannot finance itself<sup>23, 24</sup>. Therefore, investigations are unfolding to determine how not only growers, but also processors, traders and consumers may contribute and support organic plant breeding:

- A first alliance between trade and breeding was established in 2007. Retailers organized under the umbrella of the association *Naturata International - Acting Together* and the association *Kultursaat* started the project FAIR BREEDING. Retailers who join the initiative channel 0.3% of net sales of organic vegetables and fruit to organic plant breeding initiatives, over a period of ten years.
- Another model is being tested in Switzerland. The Sustainability Fund of the supermarket-chain COOP is cooperating with individual organic plant breeders as equal project partners. Round-table discussions on breeding objectives, on bakers' standards regarding cereal quality, and on the expectations of consumers are taking place. The financial support offered is future-oriented, rather than performance-based, that is, it is not bound to acreage or quantities.
- Another cooperative project was set up by the *Software Foundation* in collaboration with the *Federal Association Natural Food Natural Products* in the form of a public-private partnership (PPP). The aim here is to contribute a small portion (0.015%) of the sales of organic fruit and vegetables to breeding initiatives. Crucial is, however, that trade and breeding co-design a collective process.
- The Local Varieties Project of the *Keyserlingk Institute* on Lake Constance regularly brings together breeders, farmers, millers and bakers for discussion of outstanding issues regarding production quantities, varieties and quality. 10 cents of each loaf sold and made with flour milled from the local varieties flow back to the breeding initiative.
- In Switzerland, a group of companies is moving towards contract research: since sunflowers for the production of oleic acid for use in cosmetics are currently only available as hybrids, a breeder was commissioned to develop an open-pollinating variety. The companies are committed to financing this task long-term, permitting breeders to better plan their budget.

The examples are numerous. They share a common trend: retailers, processors and consumers involved in the projects want to act less as donors, but rather as co-creators, sharing responsibilities in the process. Some companies indeed see their commitment as an investment. The proceeds of the value chain are still low in all cases, but the initiatives have great potential and send a positive signal to other companies.

"Retailers, processors and consumers involved in the projects want to act less as donors, but rather as co-creators, sharing responsibilities in the process."

## 4.6 The role of foundations

Foundations play a major role in financing non-profit organic plant breeding. According to our own research, they provide on average over 50%, and occasionally up to 80% of

financing in Germany and Switzerland. Assuming that these breeding initiatives represent a societal task - and therefore ought to be non-commercially organized - donations from funds follows the same logic.

Nevertheless, a sponsorship by funds from foundations is not without problems, as both sides pursue different objectives. Foundations almost always aim to provide “help for self-help”, and after successful start-up funding turn to new and different tasks. Non-profit plant breeding, on the other hand, requires long-term commitment in funding. The development of a variety usually takes 10-15 years, and breeding is always an on-going process.

“The development of a variety usually takes 10-15 years, and breeding is always an on-going process.”

In addition, the high administrative burden of using charitable funds creates difficulties for breeders. Acquisition of funds, the writing of funding applications, interim and final reports are often out of proportion with regard to the amounts received, and take a lot of time that is consequently lost for actual breeding work. Particularly those with the greatest experience in breeding often spend most of their time on such tasks and have to leave the actual breeding to less experienced staff. This is of course also due to the size of the breeding companies: the average annual budget of the 40 vegetable breeders amounts to 22,000 Euros, and that of the four cereal breeders 288,000 Euros. The low budgets of some vegetable breeders can be explained by the fact that they are involved in horticultural enterprises that cross-subsidise breeding activities.

In summary, it remains a challenge to improve the cooperation between foundations and plant breeding initiatives.

#### 4.7 Governmental financing

In all EU countries the problem of dwindling agricultural biodiversity is recognized, and discourses on the intention to halt this erosion are on the agenda. But so far, hardly any significant efforts have been made to provide financial assistance. In 2012, the Swiss Federal Council made a statement<sup>25</sup> on a postulate of National Councillor Maya Graf, which essentially contained the following points:

"Large sums are invested in biotechnology research to promote private sector plant breeding, whereas organic plant breeding comes away empty-handed."

- Breeding a new variety of any of the most important agricultural crops costs an average of CHF 750,000<sup>26,27</sup>.
- For each crop, there should be available three locally adapted, competitive varieties.
- These varieties should be able to compete with new foreign varieties, i.e. every three years a new variety should be made available.
- Since currently research programmes for 20 different crops in Switzerland are in place, the annual investment would amount to CHF 15 million.
- This does not include other costs such as basic seed production and marketing.

As Maya Graf rightly notes<sup>28</sup>, these 15 million are hardly significant, given the annual subsidization of Swiss agriculture of CHF 3.6 billion. However, it is certainly worthy of note, they would massively relieve the financial and thus existential situation of non-profit organic plant breeding. But the postulate was rejected by the Federal Council due to budget cuts. Nevertheless, it would be desirable if similar initiatives were also taken in other countries' parliaments. They serve to raise awareness in politics as well as in the wider society.



## 5 Organizing funding and financing

Non-profit organic plant breeding is - as already shown - a serious public duty. Some breeders and several organisations have made great pioneering achievements and laid the foundations for a new sector. But to do justice to the magnitude of the task, single initiatives are not enough. It is necessary to think in a larger organisational context, because:

- The fund-raising potential of individual breeding initiatives is limited, in terms of available time as well as the ability to raise large sums.
- In order to increase financial resources for plant breeding through private and public funding, intensive information campaigns and political lobbying are required. Both are very labour-intensive tasks that can be addressed only by a larger organization, and in conjunction with existing initiatives.
- Individual initiatives can be better coordinated through an overarching organization, collectively determining breeding focus, crops and objectives. In this way, limited financial resources can be used more efficiently.

For these reasons, the *Seed Fund (Saatgutfonds)* of *Future Foundation Agriculture (Zukunftsstiftung Landwirtschaft)* was established in 1996. This fund is not based on income from interest, but is fed by numerous donors; it has been promoting non-profit organic plant breeding in Germany and Switzerland since then, and has so far been very successful. The budget has grown steadily over the years and is now about 1 million Euros annually, a considerable sum without which organic plant breeding in the German-speaking world would not be conceivable. The work of the Seed Fund shows that intensive public relations, lobbying, fund-raising and disbursing of funds for breeding is much more effective if done by an umbrella organization, rather than individual breeding initiatives.

The Seed Fund in Germany is unique in its efforts and similar allied organisations elsewhere would likely be beneficial. Further, questions arise how such funding coordination could be conceptualised across countries and raised to the European level. The establishment of a centralized European Seed Fund for all EU member states – based, for example, in Brussels – does not seem promising, as in most countries such approaches are still lacking.

The European Consortium for Organic Plant Breeding (ECO-PB), together with IFOAM Europe, are taking steps towards a better coordination of existing breeding initiatives, increased proportion of organic seed, promotion and development of organic plant breeding in Europe, as well as political lobbying for an improved legal framework. ECO-PB was founded in 2001 and has now 12 full members and 20 associate members. This could become, in the long term, a European organization taking care of public relations and funding as well.



"The Seed Fund in Germany is unique."

## 6 Conclusions and recommendations

A new sector in plant breeding has emerged. In addition to private plant breeding and governmental organizations, independent, non-profit organic plant breeding is asserting itself as a third actor in the field. Civil society - associations, foundations and informal networks - has taken on the task of developing suitable crop varieties for organic agriculture and horticulture.

With a lot of creativity and pioneering spirit, new forms of financing were found for this work, and the new sub-sector of “non-profit organic plant breeding” has grown steadily. Nevertheless, it is chronically underfunded and still dwarfed by the size of its tasks and challenges..

After laying the foundations, the challenge is now to further strengthen non-profit plant breeding, especially through social and financial networking, so that organic seeds can compete in the market.

### In summary


(1) Organic plant breeding is of common interest and requires long-term funding. It is a common good with socio-environmental benefits greater than are mirrored by the modest royalties of its market value.

(2) There is no silver bullet for a funding strategy of organic plant breeding; the success lies in the mix. The various forms of funding all have their place: donations, public funding, variety development contributions, and participation of everyone in the value chain (processors, retailers, consumers). The combination of these measures is likely to be most successful.

(3) Royalties should not be foregone as long as better models are not in place. However, a variety development contribution is closer than royalties to the objectives of organic plant breeding – for the future and common good. However, such a variety development contribution should be seen as a binding donation, resulting from intensive communication processes between breeders and seed-users. Variety development contribution could (potentially) replace royalties entirely.

(4) Cooperation with foundations should be strengthened and expanded wherever possible. Sufficient donation funds exist. Important is not only to find other sponsors, but also to mobilize a larger share of funds for plant breeding overall. It would also be useful to establish a new foundation, whose explicit mission is the sustainable funding of non-profit organic plant breeding. In this way, the conflict of interest between charitable foundations on the one hand (start-up funding and short-term support) and plant breeding on the other (long-term funding needs) could be resolved.


(5) At present, the allocation of public funds to promote organic plant breeding is negligible. Large sums are invested in biotechnology research to promote private sector plant breeding, whereas organic plant breeding comes away empty-handed. Public funding bodies must therefore be made more aware of their responsibilities to support the non-profit sector. Wherever possible, civil society must develop better lobbying and advocacy. So far, it has concentrated its efforts on the presentation of problems and deficiencies of plant



"There is no single magic solution to the funding and financing of organic plant breeding, it's in the right mix."

breeding in general. However, the variety of services provided by breeding initiatives - improvement of agricultural biodiversity, water and air quality – makes it relevant to seek funding not only from agricultural departments, but also biodiversity programs and environmental agencies. The conservation, preservation and development of country-specific crops and crop varieties, which is legally enshrined in some constitutions, could be financed from funds directed at the preservation of cultural heritage. The value, success and potential benefits of non-profit organic plant breeding could be more effectively used in lobbying and advocacy.

(6) Public awareness about the importance of plant breeding should be dramatically enhanced. It is literally in everybody's best interest to develop an awareness of the foundational role that seeds play in health and nutrition. Since this topic is not always easy to communicate, new forms of communication should be sought. Hitherto, only breeders have been pushing for organically bred plant varieties, now consumers should start pulling retailers to further develop the market.



"It is literally in everybody's best interest to develop an awareness of the foundational role that seeds play in health and nutrition."

(7) An increased separation of fund raising and breeding work should be aimed for – in terms of personnel as well as organization. The *Seed Fund* of the *Future Foundation Agriculture* proves the positive potential of this separation. The writing of funding applications - to foundations or individuals - is laborious, time consuming and requires a different set of skills than plant breeding. Since many breeding initiatives are too small to hire personnel for fund-raising, outsourcing this task would be worth considering.

(8) Communication and lobbying are also a European task. Existing initiatives should be networked and joint actions and lobbying in Brussels and multi-lingually in the wider EU should be expanded, without compromising the independence of individual actors. The European Consortium for Organic Plant Breeding could be a first step towards the organization of funding at the European level.

## Citations and annotations

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