Survey on the requirements in organic plant breeding

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In the German speaking countries, an Internet survey was conducted on the requirements in organic plant breeding from the beginning of May until the end of June 2015. The survey was supported by main representatives from the organic branch (Bioland, Naturland, BioSuisse, Demeter, BÖLW) and aimed at gathering up the requirements of the organic industry (incl. breeding, farming, processing and trade sector) when it comes to plant breeding and prioritizing breeding goals and crops to be dealt with. In the survey, participants were not only organic breeders, researchers and representatives of the seed sector but also representatives from all levels of organic production and related sectors (farmers, advisors, processors, wholesalers, retailers, and associations, NGOs) in order to ensure that research in plant breeding will actually improve the marketability of the new varieties.

Methods

The preparation of the questionnaire for the survey was created with the help of the freely accessible Google-App "Forms" and the survey was also performed on the online functionality of this tool. People involved in the organic food industry or directly or indirectly involved in the organic plant breeding through their line of work such as farmers, gardeners, plant breeders, producers of seeds or vegetative propagating material, researchers, representatives of associations or dealers etc. were personally contacted. In addition, the link to the online survey was forwarded to corresponding specialized committees via farming associations, published in bioaktuell.ch and sent to the existing contacts of FiBL networks. The survey focused mainly on Germany and Switzerland. In addition to the questions about the professional background, 10 closed and 4 open questions as regards the substance were asked in survey. After the completion of the survey, the results were downloaded and further analyzed and evaluated with conventional spreadsheet software.

Results and discussion

Satisfactory participation

During the two months a total of 100 participants had completed the questionnaire, 38 from personal contacts of the survey's initiators und 43 after they were informed from colleagues about the questionnaire. The above number of the participants should be considered as satisfactory considering the small amount of people that are involved directly or indirectly with the organic plant breeding.

When asked in which country the participants were mainly active, the majority of the answers with a 47 % were from Germany, closely followed by Switzerland with a 43 %, whereas 3 % of the participants were active in Austria and the rest of the participants under the category „Other" were active in several countries.

Participants with years of experience from different areas of the organic sector

In order to obtain evidence of the technical background of the participants, the participants were asked about their main activity in the field of organic food industry. Table 1 gives an overview of the main fields of activity of the participants. The results show that 35% of the participants were from the primary agricultural production or farmer extension services, 25% from the plant breeding or seed production sector and 22% from the processing, trading or organic farmer's associations sector, followed by another 8% from the sector of education and research. As the figures show, all relevant groups of the organic sector are covered in the survey.

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Table 1: Information on the main areas of activity in organic farming of the participants.

Main activity area of participants	Number
Agricultural/ horticultural production	28
Plant breeding	17
Trade	11
Seed/ transplant production	8
Extension service	7
Farmer's association	7
Research	5
Processing	4
Education	3
Foundation or similar	2
Other	8
Total	**100**

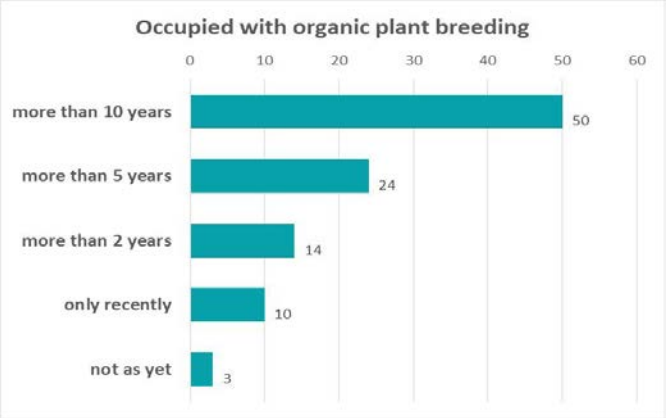

Figure 1: Period of time the participants were involved in organic plant breeding issues.

In order to find out the experience that the participants had with the topic of organic plant breeding, they were asked for how long they have dealt with the issue of organic plant breeding. As Figure 1 shows, the vast majority of the participants was occupied more than 5 years in this specific area. This suggests that the information gathered in this survey was based on appropriate experience.

Large needs in grain legumes, cabbage vegetables and oilseeds

On the question in which types of crops is the organic plant breeding insufficient, the participants stated that this applies primarily to grain legumes, followed by cabbage vegetables, oilseeds, other vegetables (except those explicitly mentioned), corn and fruit crops (see Figure 2). Already it was found in 2013 in a survey as part of the EU project *Solibam* that especially as far as grain legumes are concerned there is a big need for improved varieties[3]. The efforts that were made so far in organic plant breeding were primarily focused on certain cereals and vegetable species. The initiatives in organic farming when it comes to grain legumes and oilseeds have been limited, although some efforts were recorded in recent years in the case of grain peas and rarely field beans. Legumes are essential to organic farming because of their ability of biological nitrogen-fixing, their high protein content and other essential for the organic system characteristics. The need for new varieties of brassica vegetables is particularly high, because most of the available varieties are F1 hybrids derived from cell fusion, which were excluded in Germany from the organic farming associations.[4] In the ''Other vegetables'' it became clear that until now only a small part of the wide range of vegetables species and types

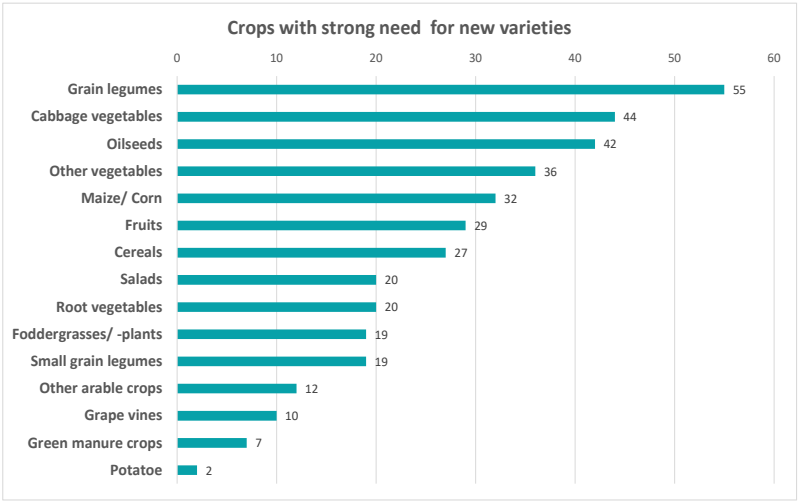

Figure 2: For which crops is currently not enough organic breeding taking place? (max. 5 multiple answers possible)

[3] Solibam (2013) Report on the diversity of low-input and organic systems, the stakeholders' expectations and innovations concerning crop management and breeding for low input/ organic agricultural systems http://www.solibam.eu/modules/wfdownloads/singlefile.php?cid=7&lid=20

[4] BÖLW-Info (2013) CMS-Sorten und Zellfusionstechnik im Öko-Landbau http://www.boelw.de/uploads/media/pdf/Themen/Saatgut/130801_BOELW_Info_CMS_Zuechtungstechnik.pdf

could be addressed by organic breeders. However, it is of importance to understand that this focus on key species was and still is essential because of the very limited financial means to fund organic plant breeding. Despite the fact that as far as maize and fruit crops are concerned, organic breeding initiatives are already existing, varieties derived out of these initiatives are not yet sufficiently present in the market.

Resistance and environmental adaptability are beside reproductive ability and taste important variety characteristics for organic farming

The determination of the variety characteristics on which special emphasis should be given is of crucial importance for the future development of organic breeding. As Figure 3 shows, the most important variety characteristics for future breeding based on the respondents, were disease and pest resistance, environmental adaptability, yield stability, reproduction ability of the seeds, taste and nutritional value. In an analysis of needs that was done in Switzerland in 2005 the lack of disease tolerant varieties was also considered to be a major obstacle in the organic sector[5]. While resistance and environmental (esp. climate) adaptability are currently regarded important in conventional farming too[6], the rest of the above mentioned characteristics are important features especially as far as the organic food industry is concerned. While in conventional farming maximal yields are considered to be important[7], in organic production the yield stability with limited external input is considered to be more important. The organic breeding research is promoted as a trend setting for sustainable food production because of its importance taking into account the future challenges on agriculture like shortage of resource systems, climate change and forecasted price increases of agricultural inputs[8]. The highlighted importance to use farm saved seeds is another aspect comprehensible against the background of value orientation in organic farming[9]. Inner qualities such as taste and nutritional value are considered important identifying features of organic production, thus are also considered to be important features for organic breeding.

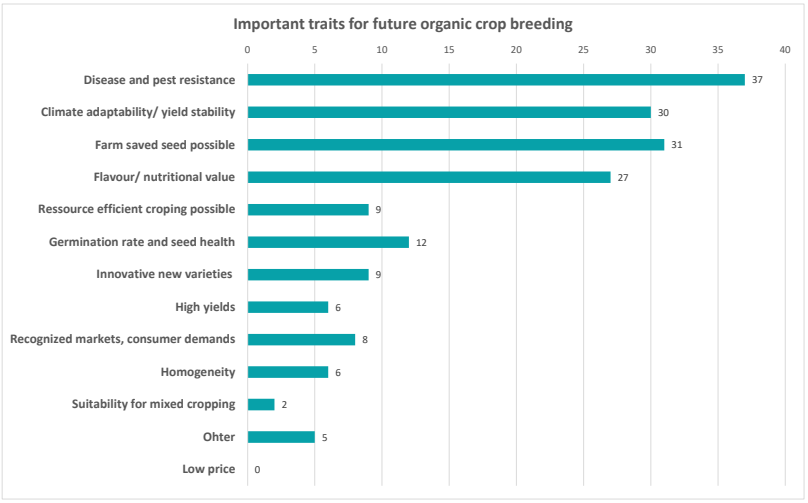

Figure 3: Important traits for future crop breeding (max. 4 multiple answers possible)

In order to differentiate future breeding, the organic breeders need to prioritize in specific crops or crop categories, always taking into account important variety characteristics. Thus the open question "which are the most urging breeding needs in the organic sector" was asked. The purpose of this question was to

[5] Thommen, A. (2015) Sicherstellung von biologischem Saat- und Pflanzgut – Impulse für die biologische Pflanzenzüchtung www.orgprints.org/5939

[6] Walter, A., Grieder, CH., Last, L., Keller, B., Hund, A., Studer, B. (2014) Die Schweizer Pflanzenzüchtung – eine räumliche, zeitliche und thematische Analyse des Umfeldes. Agrarforschung Schweiz 5(9): 366-273 http://www.agrarforschungschweiz.ch/artikel/2014_09_2006.pdf

[7] Noleppa, S., von Witzke, H. (2013) Die gesellschaftliche Bedeutung der Pflanzenzüchtung in Deutschland. HFFA Working Paper 2/2013, http://www.hffa.info/files/gfp_studie_bedeutung_pflanzenzuechtung_in_d.pdf

[8] Rat für nachhaltige Entwicklung (2011) „ Gold-Standard Ökolandbau": Für eine nachhaltige Gestaltung der Agrarwende, Empfehlungen des Rates für Nachhaltige Entwicklung vom 11. Juli 2011 https://www.nachhaltigkeitsrat.de/fileadmin/_migrated/media/RNE_Gold-Standard_Oekolandbau_texte_Nr_40_Juli_2011.pdf

[9] FiBL (2015) Plant Breeding Techniques. An assessment for organic farming (No. 2) https://shop.fibl.org/de/artikel/c/vermehrung/p/1202-plant-breeding.html

specify the main breeding goals of up to five crop species. As expected, the answers to this question were to a great extent diversified. The points that were most frequently mentioned (more than twice) were as follow:

- Disease tolerance or resistance in different crops (tomatoes, potatoes, lettuce, carrots, oats, peas, fruit);
- Breeding of vegetables/ cabbage varieties as open pollinating alternatives to the so-called CMS-Hybrids;
- Breeding of grain legumes/ protein-rich fodder plants (protein content and quality);
- Breeding of oilseeds (rapeseed, sunflower);
- Seed health in cereal;
- Gluten/ baking quality of wheat;
- Uniformity (marketability) in broccoli, cauliflower varieties;
- Taste/ flavor in tomatoes, fruit (apples, pears);
- Nitrogen efficiency/ low input varieties of oilseed rape, cabbage, wheat;
- Weed suppression.

This also shows that the breeding for disease tolerance and the development of non-cell-fusion-derived open pollinating brassica vegetable varieties is of high importance.

Forecasts for the organic market in 20 years and consequences for plant breeding

Due to the fact that breeding operates very predictively and the demand in the market in 15 to 20 years needs to be identified today, the participants were asked to give a prognosis.

As far as the open question about the expected development of the organic market in the next 20 years and the changes in consumer expectations is concerned, the following points were mentioned among others:

- The organic market will continue to grow and organic seed will become obligatory without exceptions
  - → Demand for organic seed will increase
  - → Need for suitable organic varieties will increase
- The organic market is likely to be divided into (i) organic for everybody (supermarket chains) and (ii) bio & regional & fair (direct marketing, local markets, diversity)
  - → Varieties for mass production
  - → Special varieties (niche varieties) according to customer requirements
- Nutrition-related diseases, sensitivities and allergies are ever increasing; therefore, there will be an increased need for improved quality health and taste wise, authentic food consumption, conscious nutrition, whereas the meat consumption will decrease.
  - → High-quality food that nourishes the body, mind and spirit
  - → Varieties with high nutritional value, good compatibility, high internal quality based on the bio-dynamic values.
  - → GMO free regional and seasonal food
- The demand for local produce and fair trade will increase
  - → Locally adapted varieties that can be produced ethically and sustainably
  - → Varieties with very good taste properties and appealing appearance
  - → Conservation of regional diversity
  - → Energy and resource efficient varieties
- Climate change
  - → Robust varieties that can cope with the different conditions (drought, heavy precipitation, heat) and diseases and growth of pests
  - → More winter vegetables
- Customers expect full transparency along the food supply chain

→ Transparency of seed origin, breeding methods

- The growing threat of the seed market and patenting of living organisms
  - → Limited accessibility to genetic resources
  - → Farm savable seeds as an alternative to hybrids
  - → Independent organic breeding
  - → Custom authorization procedure for organic varieties
  - → Decentralized solutions
  - → New approaches in the sector of common good economics

From the above it is clear that the requirements will increase dramatically in the organic plant breeding and that the internal and external quality of food will play in the future an even greater role.

Lack of financial resources and suboptimal political framework are relevant constraints

The participants were asked about the relevant constraints in reaching adequate levels of organic breeding for the above mentioned crops and crop groups, in order to investigate the perceived causes for the deficiencies in the breeding of these varieties.

Figure 4 shows, that the single most important obstacle to the organic breeding is the lack of financial resources. Due to the comparatively small market share for organically bred varieties, the profit from royalties is too low to cover the costs for organic breeding[10,11]. In organic farming this aspect is even more so due to the diverse crop rotation thus creating a need for a much greater range of crops to be dealt with by breeding.
To make matters worse, in the past 20 years more and more publicly funded breeding programs have been abandoned[12] and a strong consolidation with narrow focus on relatively few crops and companies[13,14] took place.

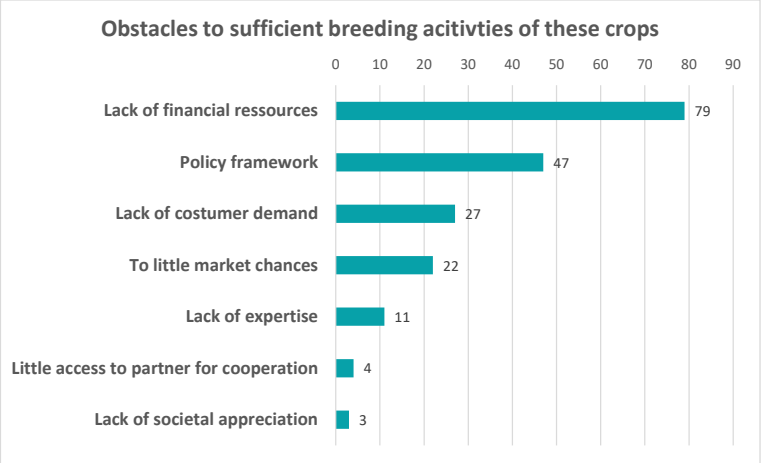

Figure 4: Relevant obstacles to breeding of different crops or crop groups for which deficits have been identified in this study (max. 3 multiple answers possible)

In the second place with almost 50% of the responses the political framework was mentioned, especially as far as the plant variety protection and authorization as well as the associated high costs were concerned. These high costs are also due to the low seed sales (royalties) usually to be covered by donations from individuals. Moreover, the relatively high requirements in terms of uniformity of a variety, next to the high hurdle of VCU (value of cultivation and use) for arable crops, which both are though essential for the protection of plant varieties, play a crucial role. The VCU is by default measured under conventional conditions and is mainly focused on yield. Hence, the tests for VCU under organic conditions created additional costs.

[10] Kotschi, J. & Wirz, J. (2015) Who pays for seeds? Thoughts on financing organic plant breeding, http://www.agrecol.de/files/Kotschi_&_Wirz%20Engl_12_05_15.pdf
[11] Messmer, M., Wilbois, K.P. (2015) Was ist und gute Züchtung wert? Ökologie & Landbau 02/2015 http://orgprints.org/28486/1/messmer-wilbois-2015-OEL-174-p21-23.pdf
[12] Van Elsen, A., Gotor, A.A., di Vicente, C., Traon, d., Gennatas, J., Amat, L. Negri, V., Chable, V. (2013): Plant breeding for an EU bio-based economy. The potential of public sector and public/private partnerships. JRC Science and Policy Reports. http://prodinra.inra.fr/ft?id=685503F3-69F5-4401-B9A3-560751F30945
[13] BLW (2015) Strategie Pflanzenzüchtung 2050 https://www.blw.admin.ch/blw/de/home/services/medienmitteilungen.msg-id-63607.html.
[14] EvB (2014) Saatgut – Bedrohte Vielfalt im Spannungsfeld der Interessen. https://www.evb.ch/fileadmin/files/documents/Saatgut/Doku_Saatgut_D_Web.pdf

In Germany however, as far as cereals are concerned, it is possible since autumn 2012 to opt for an organic VCU test with no additional costs. These VCU tests are carried out in collaboration with the organic farms and the Federal States (Öko-Landessortenversuche) and are considered by the organic sector as a very positive development which should be further implemented to other crops as well. Most recently in Austria, pea varieties can be tested specifically under conditions of mixed cropping. In Switzerland it is possible to register so-called „niche varieties" in the local market without official homogeneity or VCU testing. In this case, the applied fees are reduced. Such models could be of value in Germany too.

Furthermore, in Germany, the Federal Plant Variety Office is already implementing the temporary EU test marketing of „heterogeneous material of wheat, barley, oats and maize". This test is specifically intended for varieties which do not fulfill the DUS Criteria (Distinct, Uniform und Stable) and for which a higher genetic diversity and thus greater flexibility and adaptability are desired[15]. This preliminary experiment would be important to be extended and expanded to other crops too, based on the current level of experience. Generally, organic breeders advocate the revision of the EU seed law towards more flexible and market - oriented solutions[16].

Organic plant breeding as a task for society as a whole

In organic farming, plant breeding is often perceived due its positive impact on biodiversity[17,18] as a task for society as a whole, which should not be primarily profitable, but should be oriented towards strengthening common goods. This is contrary to the currently predominant organization of plant breeding which is based on a profit-oriented industry, run by private breeding companies and which through patents is increasingly limiting the exchange of genetic resources. These profit-oriented plant breeding associated requirements such as orientating on top varieties with a high regional distribution, are considered critical in organic farming, since they decrease the locally adaptable varieties for organic agriculture and subsequently contribute to the further narrowing of the genetic diversity. Based on the above, the participants were able to state their preference for the organization of organic plant breeding. As shown in Figure 5, a large majority prefers that organic plant breeding is run by private, non-profit breeding organizations or initiatives. This should be viewed based on the background of organic plant breeding that has kept independent and decentralized through the creation of alternatives to the trend to commercial monopolizing[19]. Second ranked preference was breeding by state run research institutes. As low as in sixth position in the ranking came the currently prevailing model of private, commercially orientated breeding in companies together with organic plant breeding at Universities. However, in Germany and also in Switzerland in the past 20 years the publicly funded plant breeding has been reduced more and more. One example is the abandonment of the government funded breeding program "Agroscope" for spelt, maize, triticale and vegetables. In Baden-Württemberg the State Plant Breeding Institute (LSA) and the Bavarian State Research Institute for Agriculture (LfL) in Weihenstephan still undertake breeding efforts in pre-breeding. But even within the LSA the breeding program

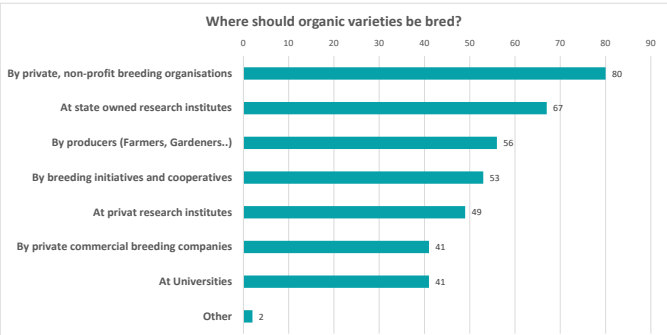

Figure 5: Where shall organic breeding take place? (multiple multiple answers possible)

[15] BSA (2015) Bekanntmachung Nr. 11/15 des Bundessortenamtes über die Zulassung von Populationen und das Inverkehrbringen von Saatgut von Populationen der Arten Hafer, Gerste, Weizen und Mais https://www.bundessortenamt.de/internet30/fileadmin/Files/PDF/Bekanntm/BNr_1115.pdf

[16] ECO-PB (2012) Position Paper of organic breeders in Europe concerning EU seed law revision process http://www.eco-pb.org/fileadmin/ecopb/documents/ECOPB_Position_EUSeedLawRevision_120530.pdf

[17] Kotschi, J., Wirz, J., Hurter, U., Kunz, K. Saatgut als Gemeingut – Grundlagen und Werkzeuge der Umsetzung http://www.sektion-landwirtschaft.org/Saatgut-als-Gemeingut.6628.0.html

[18] Kotschi, J., Minkmar, L. (2015) Liberating seeds with open source licenses. Agrocol http://www.agrecol.de/files/Kotschi+Minkmar_Liberating_Seeds.pdf

[19] Wilbois, K.P., Wenzel, K. (2011) Ökologisch-partizipative Pflanzenzüchtung, FiBL Broschüre https://shop.fibl.org/fileadmin/documents/shop/1563-oekolog-partizipativ-pflanzenzuechtung.pdf

of forage grasses was terminated, whereas the LFL abandoned the pea breeding program. Parts of pea germplasm could be taken over by the organic breeding initiative Getreidezüchtung Peter Kunz e.V..

Traditional breeding methods supplemented by modern diagnostic methods are means of choice in organic plant breeding

The value-based system of organic farming as well as the breeding techniques and methods are just as important as the financial organization of breeding. For example the use of genetic engineering in organic farming is prohibited by law. Moreover, in the standards and regulations of organic farming, the GMO ban is process-oriented. Therefore, some of the breeding techniques and products thereof are rejected from the use in organic, although not classified as GMO based on the current law, but are methodologically associated with genetic engineering. Examples of these are the so-called CMS hybrids, to which a cytoplasmic male sterility was transferred by cell fusion[20]. In the area of breeding techniques and methods, the great majority advocates a restriction to traditional or classical methods of breeding (see Fig. 6).
A good third of the respondents agreed with the use of molecular biological methods, but only on the assumption that they were assessed positively with regard to the principles of the organic system. Only a quarter of respondents agreed to allow all available breeding techniques and methods which are not covered by genetic engineering legislation to be used for the breeding of varieties for organic farming. It should be noted that "Breeding for organic farming" is broader than the process-oriented organic breeding[21] as defined in the IFOAM standards or by *bioverita*[22] or in the Demeter[23] and Bioland[24] standards on which organic plant breeding can be certified.

It should also be noted that the definition of genetic engineering in the EU Directive is quite strict and comprehensive, and may include many new molecular biological breeding methods, but the interpretation of the definition is still under discussion. Based on this background, the answers cannot be clearly assessed because the reference framework is still unclear. This is currently a critical issue, as many plant breeding techniques are developed in conventional breeding, using genetic engineering methods and are therefore rejected by the organic system[25], although there is an uncertainty concerning the interpretation of future genetic engineering legislation.

Among other methods "biodynamic methods" (eurhythmy, subtle methods, formative forces, innovations) were mentioned four times. Furthermore, methods such as "search for old varieties" and "selection on the farm or in practice" as well as "methods according to association standards" and "transparency of the methods used" were mentioned.

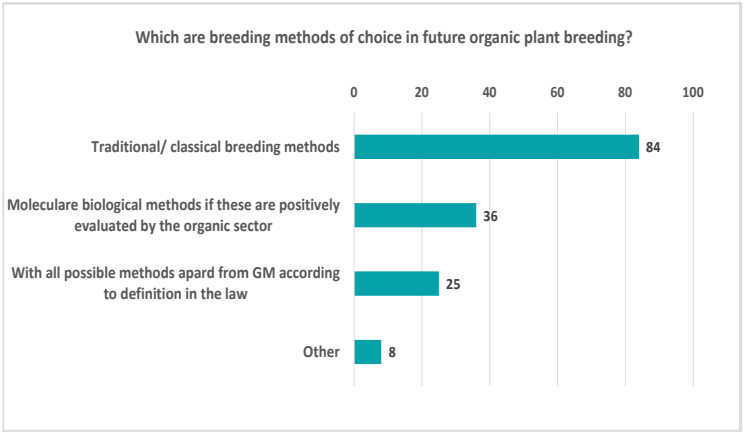

Figure 6: Which methodes of breeding shall be deployed in organic plant breeding? (multiple answers possible)

A particular aspect of breeding techniques and methods are diagnostic methods, e.g. marker-assisted selection which does not enter into the breeding

[20] Messmer, M., Wilbois, K.-P., Baier, Ch., Schäfer F., Arncken, Ch., Drexler, D., Hildermann, I. (2015) Plant Breeding Techniques - An assessment for organic farming (Dossier No. 2) FiBL
https://shop.fibl.org/de/artikel/c/vermehrung/p/1202-plant-breeding.html
[21] ECO-PB (2013) Position Paper on Organic Plant Breedinghttp://www.eco-pb.org/fileadmin/ecopb/documents/ecopb_PostitionPaperOrganicPlantBreeding.pdf
[22] Bioverita e.V., www.bioverita.ch
[23] http://www.demeter.de/sites/default/files/richtlinien/Pflanzenzuechtung_gesamt.pdf
[24] http://www.bioland.de/fileadmin/dateien/HP_Dokumente/Richtlinien/Bioland-Richtlinien_14_Maerz_2016.pdf
[25] BÖLW (2015) Positionspaper zu neuen Züchtungstechniken
http://www.boelw.de/fileadmin/Dokumentation/151102_BOELW_Position_neue_Zuechtungstechniken.pdf

cycle and does not alter the genetic substance, but only support the breeding work as an analytical tool. Since these purely diagnostic methods are based on molecular biology, the participants should indicate whether or not these can be used in organic plant breeding. At 61%, the majority advocated the use of such diagnostic methods in organic plant breeding. Only a quarter (26%) objected it, while 13% of the participants had no opinion.

Organic breeding should be holistic

The question of which characteristic aspects are of particular importance for organic plant breeding has been answered (with none multiple answers) by the majority with "holistic" (see Fig. 7). This shows that organic plant breeding should not focus on single varietal characteristics, technical aspects or the like, but rather should take into account all relevant aspects in the sense of a holistic breeding approach.

The holistic approach of organic plant breeding is also stipulated in the guidelines of the International umbrella organization IFOAM[26]. "Efficiency" and "creativity" in breeding were selected less often. Among other things, a combination of the following aspects was mentioned three times: "Alternative to Mainstream", "Usability, Focus, Seriousness, Honesty and Truthfulness".

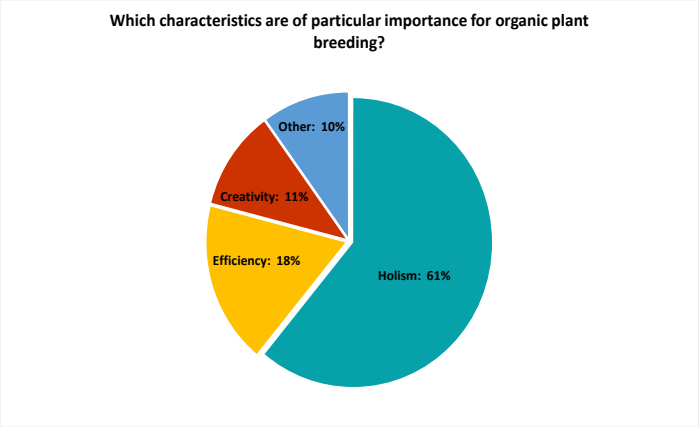

Figure 7: Which characteristics are of particular importance for organic plant breeding? (no multiple answers possible)

In the first place of the replies to the question of how creativity could be fostered, were the following: financial freedom, the inter- and transdisciplinary exchange of actors (breeders, universities, the value chain), artistic courses, training of "young breeders", anchoring in the grassroots and promoting the farmers' and gardeners' own seed production, as well as the establishment of more freedom and the modification also of the legal framework.

The state and the value chain are to participate in financing breeding

The organic plant breeding is currently predominantly funded from private means such as donations. Due to the still limited dissemination of organic varieties, refinancing of the necessary organic breeding programs from royalties is not possible. This means that organic plant breeding will not be able to carry the costs by its own resources in the medium term. In many cases, this is not at all a matter of concern to overarching considerations, since plant breeding is regarded as a social task which cannot be accomplished by profitable companies (see above).

Accordingly, participants were asked how an organic plant breeding can be funded or who should participate in the financing. The overwhelming majority sees a financing obligation of the state, in the sense that plant breeding is considered to be a social responsibility and the society has to pay for it (see Fig. 8).

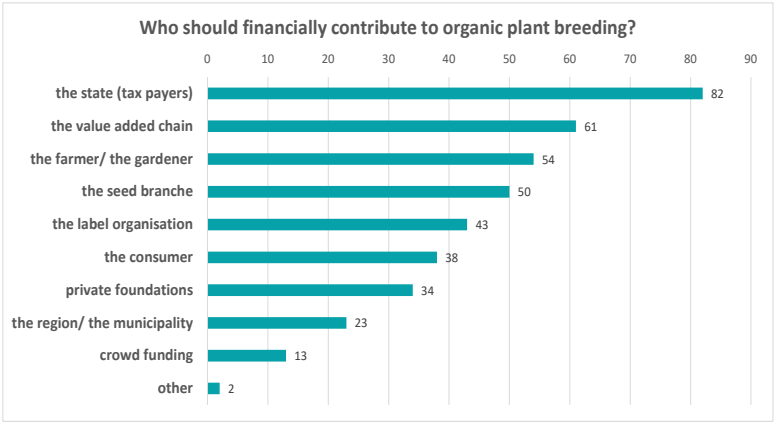

Abbildung 8: Who should financially contribute to organic plant breeding? (multiple answers possible)

However, it is also interesting to note that the value chain and not just the farmer as the primary seed user should

[26] IFOAM The Ifoam norms for oganic production and processing Version 2014 http://www.ifoam.bio/sites/default/files/ifoam_norms_version_july_2014.pdf

be involved in the financing of organic plant breeding. The replies made it clear that the share of the value added by organic varieties should not only be generated at the production level, but at all levels of the value-added chain and thus to the entire profitable value chain.

High willingness to make a financial contribution to organic-breeding

Due to the fact that the current organic plant breeding is funded mainly by private donations, we wanted to query the willingness of the participants or their organizations for financing organic plant breeding. 36% of the interviewees would in any case participate in the financing of organic breeding; a further 17% would participate, provided that the varieties were freely available as a "common property". In addition, 12% of the participants would be willing to participate in breeding funding if they could allocate their funding to selected breeding programs.

10% of the respondents are either breeders themselves or participate as propagators in the breeding costs. From the respondents 1% cannot provide funding for organic breeding for organizational reasons, whereas only 1% cannot imagine making a financial contribution to organic plant breeding and a further 5% would not be willing to participate. Finally, 10% of the respondents did not feel able to provide a definitive answer to participation in the financing of breeding.

Comments, ideas and suggestions

In this survey, the possibility was also given to write comments or suggestions in the “further comments” section. Bellow, we will take a closer look at the most relevant and objectively oriented comments from our point of view. These comments can be roughly allocated to five different areas: funding, breeding techniques and methods, legal aspects, principle considerations and general comments on the survey:

> ***Financing:*** Without sustainable financing possibilities it would be impossible to implement the necessary future organic plant breeding.

> ***Breeding techniques and methods***: Here, it is pointed out that plant breeding deals with living beings whose integrity must be respected and who need to be treated differently as machines. Furthermore organic plant breeding always takes place in the field and does not need any laboratory methods, since it contains far more than just the restrictions in breeding techniques and methods.

> Legal aspects: It was emphasized that patents on varieties in general should definitely be banned. In the "DUS" criteria (distinctiveness, uniformity and stability), the criterion of uniformity should only refer to functionally relevant criteria, such as, for example, simultaneous maturation, in order to avoid the predominance of hybrids.

> Principal considerations: In this survey the importance to think and implement organic plant breeding as a whole has been emphasized. In addition, much more public relations works should be done focusing on organic plant breeding and its necessity, whereas international cooperation in this field should also be encouraged.

> ***General comments on the survey:*** Overall, the survey was welcomed. It was occasionally mentioned that other questions should have been asked, or that individual areas should have been dealt with in more detail. Some were of the opinion that the question of diagnostic methods for supporting plant breeding could have been omitted.

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