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Safeguard for **A**gricultural **V**arieties in **E**urope

The quarterly electronic information service of the SAVE Foundation

SAVE Project Office

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Community Seed Banks: How the North Can Learn from the South

Map of the European Community Seed Banks (http://www.communityseedbanks.org)

"A community seed bank is much more than a bank for money. It is a bank for life-food." (a woman farmer from Zimbabwe).

Community Seed Banks (CSB) exist already for decades in many parts of the world, in various forms and functions. Their main objectives are to address the loss of genetic diversity in agriculture and to improve access to seeds, which are adapted to local conditions and which the market does not adequately provide.

Several case studies and analyses on CSBs have been published worldwide in recent years. Most of these studies focus on examples of countries in the "South," while very little has been reported on the various forms of CSBs in the "West."

As part of the H2020 DIVERSYFOOD project, a workshop on "Community Seed Banks" was held in September 2017 with the support of the ITPGRFA (International Treaty on Plant Genetic Resources for Food and Agriculture) and Bioversity International in Rome. The aim of the workshop was to promote perspectives and experiences between existing seed networks. In the run-up to the workshop, the SAVE partner organization ARCHE NOAH, Austria, carried out a survey of "community seed banks" in the EU countries, the results were presented at the workshop. Among other things, the survey highlights the development of "seed movements" in Europe - beginning in the early 1980s with initiatives such as De Oerakker in the Netherlands, Pro Specie Rara in Switzerland, ARCHE NOAH in Austria, VEN in Germany, SESAM in Sweden or HDRA (now Garden Organic) in the UK.

Private conservationists have always played a major role in these organizations, and many have set up additional centrally managed collections (seed archives, seed libraries). In many cases, the already well-developed Seed Savers Exchange served as role models in the USA and Australia.

Source: Bioversity International (2015): Community Seed Banks, Origins, Evolution and Prospects, Issues in Agricultural Biodiversity

A global movement - deeply rooted

Since about 1995, the number of initiatives has increased significantly, especially in France, Spain, Portugal and Italy. This trend is unbroken until today. Alone in Spain, there are already 38 local "redes de semillas" (seed networks) coordinated through a common platform. Numerous organizations are also active in France and Italy - some of them independent, others networked via umbrella associations. In these initiatives, farms, autonomous seed supply and the adaptation of crops to local conditions play a central role. They clearly differ in structure and objectives from many central and northern European organizations. Seed networks in the Global South served as a model for many initiatives. The exchange with the - often much longer active - Community Seed Banks from countries of the Global South was therefore a core concern of the workshop.

Seed collection VERN, Germany, 2010

Discussions of differences and commonalities, as well as solutions that could be found in different parts of the world to meet the challenges involved, showed the tremendous learning potential for all parties involved, so that these links will continue to grow in the future to promote the vital development and further evolution of existing and new initiatives. The exchange with representatives of internationally active organizations and institutions such as "USC Canada" and "Bioversity International" proved to be valuable as well. These have been active as supporters and moderators of Community Seed Banks for decades, primarily in countries of the Global South, and can therefore draw on a wide range of experience in various management and evolution models.

A look at the map above, which shows some 80 initiatives so far, shows bigger "white spots" in the new Member States - although it is known from personal contacts that highly motivated initiatives are emerging there as well. In the next few years, it will be important to expand networking and cooperation.

Paradigm shift in the seed movement

The results of the survey indicate a certain amount of change in the seed movement. In addition to the conservation of endangered crops and their availability, breeding further development is becoming increasingly important in adapting plants to local climatic and cultural conditions. Dynamic approaches - for example, in combination of conservation activities with participatory peasant plant breeding - were discussed intensively under the slogan "from on farm Conservation to community diversity management".

Summary of the results, outlook

CSB initiatives in Europe are diverse and different:

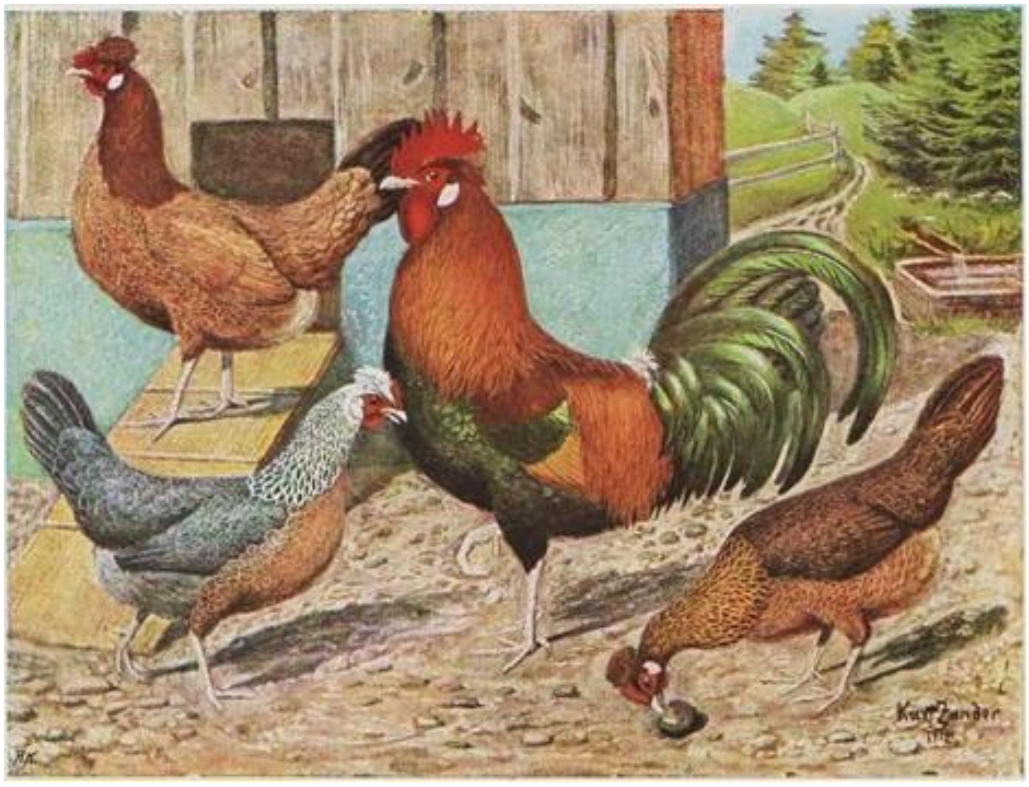
- In number per region
- In their geographical and thematic field of activity
- In age - from 1 to 35
- In their social structures
- 25% are still informal, the others are associations, foundations and cooperatives
- Most are non-profit, some are profit-driven to a small extent
- The number of members ranges between 10 and 10,000 people
- There are big differences in terms of available resources

- There are also differences in the number of stakeholder groups and their priorities
- There are variations in plant species and quantities, because not all trade seeds
- Different methods and structures - not all are organized as seed banks
- Different goals, triggers, role models and approaches

The survey and workshop results only can be partially reproduced here. They will be published as part of the workshop report in the coming months and will be available at www.communityseedbanks.org. Right now, the presentations are uploaded that hint at the diversity of activities and structures within the global "community seed banks".

Sources: www.diversifood.eu
www.bioversityinternational.org/fileadmin/user_upload/Community_Seed_Banks.pdf
www.fao.org/fileadmin/user_upload/faoweb/plant-treaty/docs/BS776e.pdf

Conservation through Use: Poultry Breeds



Variety of Old Styrian chickens. Source: A. Arbeiter (1914): Handbook of breeding poultry for Austria and the Danube countries

Local poultry breeds are the world's most endangered species. Even in Europe, there is currently no sustainable concept to preserve the genetic diversity of the breeds. It is usually the hobby keepers who take care of poultry breeds. Often the look of the animals according to the exhibition standards is more important than egg and meat production. For any agricultural utilization of local poultry breeds, for example in organic agriculture, these aspects of use are enormously important. Dangers due to inbreeding are often only recognized when genetic variability has become dangerously narrow. All these reasons together make many local breeds threatened with extinction today. Modern performance poultry farming is limited to a few breeding lines. Therefore, it is particularly important to preserve the diversity of local breeds for different needs in use and for the future.

On December 2, 2017, experts from Germany, Austria and Switzerland met in Leipzig for a workshop organized by the Federal Ministry of Food and Agriculture and the Federal Agency for Agriculture and Food to discuss possibilities and limits for a more sustainable conservation of our local poultry breeds.

More than 60 participants from the breeders and conservation scene, as well as representatives of state institutions came together and discussed the current situation, conservation measures and uses of local poultry breeds. It was noted, among other things, that a central online herd bookkeeping is necessary.

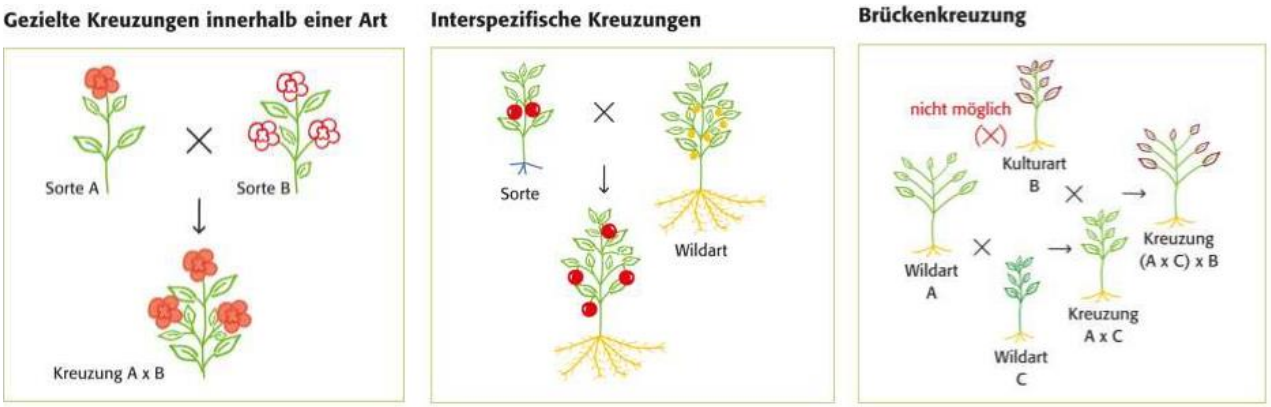
The actions developed in the workshop will make an important contribution to the conservation of genetic diversity and to the achievement of the United Nations Sustainable Development Goals, in particular Objective 2.5 on the conservation and sustainable use of the diversity of genetic resources for food and agriculture. SAVE will continue to provide updates on the conservation of local poultry breeds. Contact: office@save-foundation.net

Modern Breeding I: Respect for the Cell

Source: Pierre Hohmann, FiBL

In addition to the traditional breeding methods, there are more and more variants for plant breeding. Some of them intervene more or less selectively in the genetic material. From the point of view of organic farming, one thing is clear: the cell is the smallest unit and its integrity is non-negotiable.

Using technical means to intervene in the genetic material is a manipulation of genes. This starts with simple point mutations (genome editing), the insertion of a few nucleotides (oligonucleotide-based mutagenesis), the shutting down of genes, the exchange of alleles, the addition of new and alien genes (transgenic) to the gene drive spread single alleles in a few generations to the whole population. In contrast, classical breeding, with the selection of the best individuals within a species, depends on the criteria that a breeder or organization aspires to. The classic intersections within a species are laborious and time-consuming, because it takes a generation to wait to see if the result of a crossing is satisfactory. Even more complex are bridge crossings with incompatible plants over several crops and wild plants to reach the target. In addition, there are backcrosses over several generations, which must be eliminated again. From the point of view of organic farming, however, these methods are the only uncritical possibilities of a kind of property change. However, there are concerns in such processes as the interspecific crossbreeding with wild plants, with which growers increase their gene pool. After all, over the centuries it has been possible to build up a large agricultural diversity. Partly this is brought about with technical procedures that are not allowed in organic farming. In addition, the boundaries of the species are blurred. Mutation induction, TILLING (Targeting Induced Local Lesions in Genomes) and polyploidization are rejected for the following reasons: The applied ionizing radiation and synthetically engineered mutants of mutation induction are not approved in organic farming and induced chromosomal breaks violate the integrity of the genome. In organic farming, the cell is the smallest unit and its integrity must be preserved. TILLING does not preserve this integrity, as the mutation release with chemicals takes place. The problem with TILLING: Even desirable properties can mutate. Also in polyploidization, i.e. the propagation of the same set of chromosomes chemicals are used. Although copies of the same sets of chromosomes can also occur in nature, this is also the critical point. Namely, when tetraploids cross out with diploid plants, infertile offspring arise. It hap-



Different Methods of classic plant breeding. Source: Pierre Hohmann, FiBL

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pens in nature that spontaneous mutations lead to male sterility (CMS). The mass application of hybrid seeds produced by CMS processes makes the further breeding with offspring impossible, which contradicts the basic idea of organic farming.

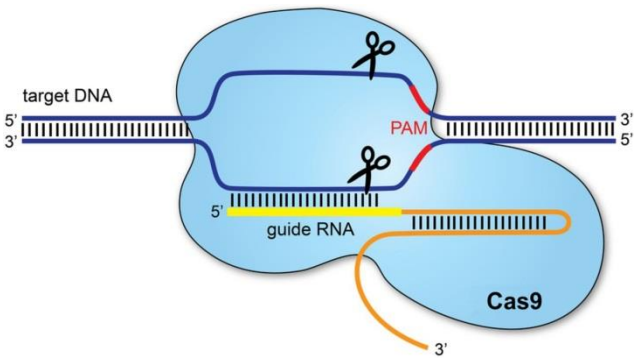
Change genes with gold dust

At the level of cells and tissue, there are many methods of property change. For example, the ovarian and embryo culture. They are often used for the cross-breeding of resistances of close relatives. By eliminating crossbreeding barriers, they are as undesirable in organic farming as the production of double haploid plants (DH, duplication of chromosomes of parents with only one set of chromosomes), which speeds up the breeding process but prevents the natural recombination of genes, as well as the protoplast fusion associated with the production of interspecific hybrids crosses crossing barriers and disregards the integrity of the cells. The same critical points apply to cytoplasmic fusion. Added to this are the almost classical genetic modification techniques with which foreign genetic material was introduced into the target plant through an injury to the cell walls. The injury is achieved with "classic warfare". And with gold dust, which is dipped in the desired new genetic material and then shot with a kind of cannon on the cells of the target plant. The development of the gene scissors CRISPR is a new process that revolutionizes the genetic research. Thanks to CRISPR, the genetic material can be cut at any point along the strand and changed with the help of Cas9 with new information. It is a process that takes place in the test tube and makes the gene changes much faster and cheaper. Because of the huge economic potential, we devote a second article to this technology.

Modern Breeding II: The new Eldorado

The development of the gene scissors, the so-called CRISPR / Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats)-method, once again puts the manipulation of genomes in the limelight. The new method accelerates and reduces changes to the DNA. Above all, agriculture is often cited as one of the first areas of application.

Only a few years ago there was a genetic engineering process developed that has revolutionary potential. The development of the CRISPR / Cas9 method makes even military and intelligence services hopes and worries alike. The French geneticist Emmanuelle Charpentier and the American biochemist Jennifer Doudna developed a method of genetic modification, which the journal Science celebrated in 2015 as the breakthrough of the year. The right track was discovered in the analysis of the immune system of bacteria that have been defending themselves against invading viruses for billions of years with the help of so-called gene scissors. When bacteria are attacked by viruses, they usually die. The survivors of a particular bacterium carry the viral DNA further and integrate it into a kind of archive called CRISPR. When the same virus type attacks again, the bacterium makes a copy of the viral DNA and produces a protein called Cas9. This Cas9 now compares the existing virus pattern inside the bacterium and where a corresponding intruder is found, Cas9 cuts the virus DNA and makes it ineffective. This ability to cut certain sequences takes advantage of the new technology. The control requires a tracer RNA and a CRISPR RNA. At the same time, Cas9 must be activated in the target DNA to allow for coming together with new information.



Gene scissors CRSP/Cas9; source: http://ep.bmj.com

Fast genetic changes

The simplicity of this new DNA revolution is giving investors a gold rush mood. Compared to the existing gene technology, the gene-snipping is more accurate and simpler, and the costs for targeted changes to the genome are reduced by 99 percent. The ability to cut out a sequence from the double helix and replace it with a new code makes the gene scissors a gene editor. The development of new medicines, the breeding of plants and animals, but also the change of the human genome are in the business plan of more and more start-up companies. Charpentier and Doudna also already have four companies active in research and application in medicine and agriculture with CRISPR-Cas9. At the same time, they also have a few patents. CRISPR-CAS9 is the result of 25 years of development, involving many scientific teams. Therefore, a violent legal dispute has erupted around sub-patents, an unmistakable sign that the parties are sensing a billion-dollar business. In the program "Die DNA-Revolution", broadcast recently by Deutschlandfunk, Megan Hochstrasser, who was also involved

in the development of the "gene scissors" at the "Innovative Genomics Institute" in Berkeley, California, said: "For CRISPR / Cas9, Agriculture is already an important application area" As an example, she cites the complicated genome of wheat. With the gene scissors genetic changes can now be achieved in a year, which previously took 50 years with traditional crossing programs. That's why companies like Monsanto would already be developing sequencers, machines that decode the genetic blueprint of a plant in a matter of days, providing the basis for changing the genome with the simplified technology. In other words: The cost-effective and rapid genetic analysis and the new manipulation technique have made interventions in the genome a low-threshold process. As if they were discussing a new app on the phone, Monsanto representatives speak of "traits", traits that they can now integrate with plants at will. The imagination knows no limit. Insect killing, possibly caused by the Monsanto product glyphosate, could lead to harvest losses if plants are not pollinated. Therefore, they are now researching tomatoes that no longer require pollination. To create confusion, the agricultural industry is changing the terminology. The concept of genetic engineering, which has been disavowed by most citizens, will be replaced by "New Breeding Technology". Of course, this vague description also applies to genetic engineering itself. For the opponents of this technology, there is still far too little research into how CRISPR affects the metabolism and behaviour of an organism and thus the ecosystem.

The trail of money

Anyone interested can order kits for $75 to $ 1,500 at www.the-odin.com. So, he or she has the lab in hand to get into gene editing. In hobby cellars, a scene has evolved from biologists, artists and information scientists, which are summarized under the term bio-hacker. The gene scissors are for them a tool with which they just dye a coli bacterium blue, or change the brewer's yeast so that it meets the favourite taste of the Hacker. These are gimmicks. It becomes more serious when genetic changes are made with terrorist or commercial intentions. Good business can be made with the corresponding patents.

Source: http://www.transgen.de/

A group of Argentine scientists are eagerly awaiting the birth of seven calves in February 2018, which were produced using the CRISPR technique, the ability to produce the protein beta-lactoglobulin was taken. This protein in the milk often leads to intolerances. In addition, scientists worldwide are working to modify porcine organs by turning off rejection reactions so that they are suitable for transplantation into human bodies: pigs as an organ supermarket. A veritable race has been created with the support of public funds. The development of wheat, soybeans and other crops that resist drought, pests and disease and are even more productive is one of the goals of CRISPR agricultural users. Genetic polledness in cattle is another example that shows how animal and plant breeding becomes a business for multinational agribusinesses. The threat to traditional breeders with patent protection everywhere runs counter to the trend towards regional and climate-adapted breeds and varieties. Important breeding criteria of the agro-industrial producers are plants and animals, which, in addition to their yield, are ideal for an efficient production process and fulfil as far as possible 100 percent standard specifications. In February, the Research Institute of Organic Agriculture (FIBL) organized a roundtable on "Assessing New Genetic Breeding Methods". The participants agreed that the changes made to the genome of plants are, in principle, only the symptoms of poor agricultural practice, such as monocultures and close crop rotations to combat.

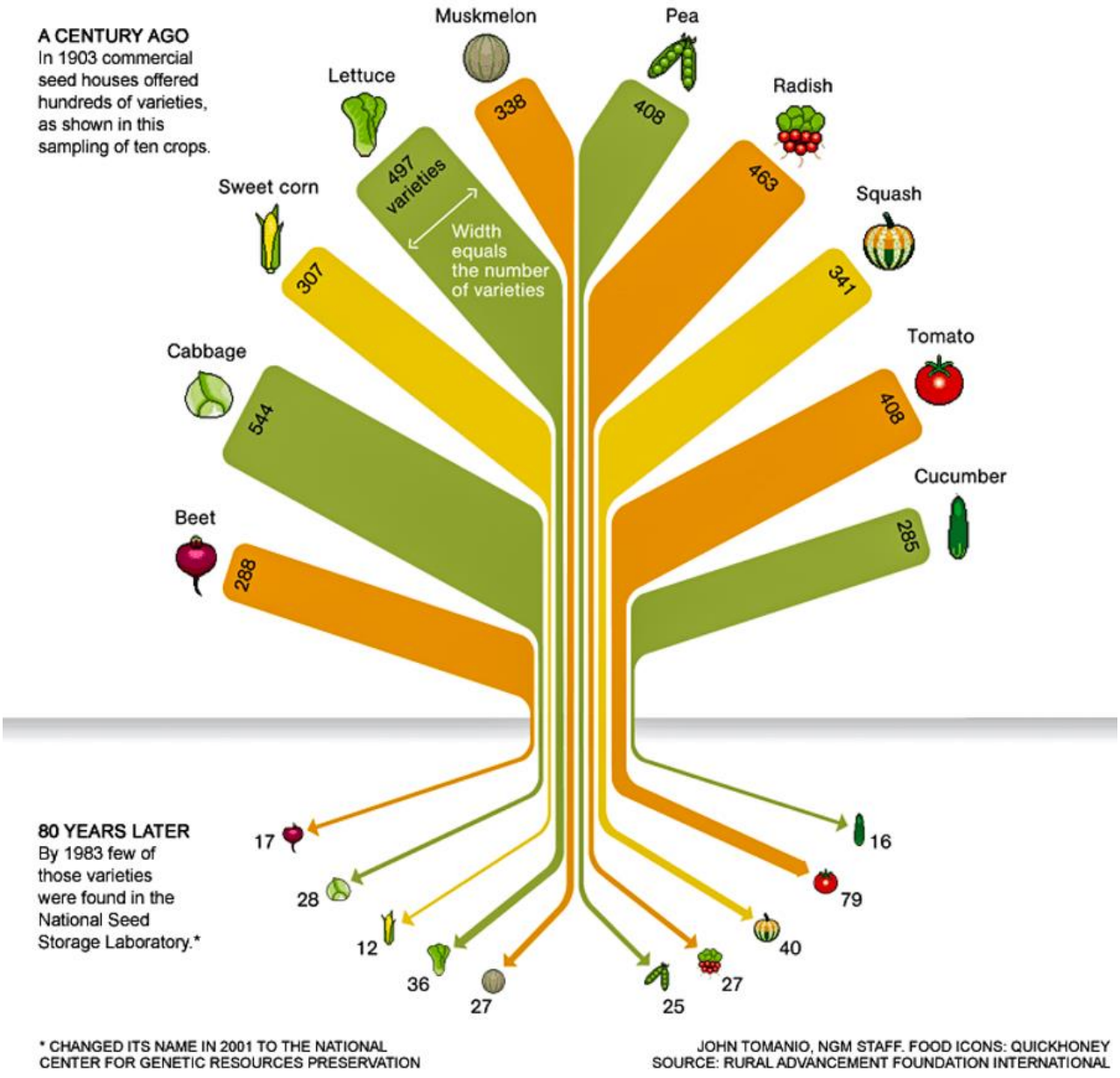
Deep ethical questions

The use of CRISPR is a case for ethics committees. In China, and apparently also in the USA, researchers are already intervening in the human genome. Emmanuelle Chapantier is alarmed: She told the Deutschlandfunk radio: "We need to agree on global rules because of the potential risk involved in improving humans." "It might be difficult to control certain applications when they are used privately. Moreover, it is not clear what side effects the mutation changes trigger and what feedback there is." In May 2017, scientists at the Columbia University Medical Center warned about so-called off-target effects. The gene scissors cut not only at the desired location in the genome, but also at other DNA sites. CRISPR can thus trigger hundreds of unplanned mutations, ie DNA changes, in the genome.

Despite these concerns, technology is advancing so fast that the debate over its benefits and possible regulations is lagging behind. A debate about this technology is urgently needed. And on a philosophical, ethical and political level. The question must be clarified, where to draw

boundaries and how their compliance is controlled. The ideas are far apart. For CRISPR's followers, their mass dissemination is the best protection against abuse. For others, even for intelligence agencies, it is a highly dangerous situation if everyone with a bit of understanding with the genome of living things can play God. In organic farming, the ethically sensitive question about this technology has been answered from the very beginning: In biotechnology, no methods are used which intervene below the cell as the smallest replicable unit. The integrity of the cell is respected.

And our old local breeds and varieties? They are still a source of diversity for a vibrant agriculture that suits the environment, not the other way around. For organic farming, local varieties are becoming increasingly important as they are not cell-manipulated resources.



Loss of Diversity in agriculture. Source: https://theplaidzebra.com

Fundus Agri-Cultura Alpina

"We are satisfied and carry on."

With more than 500 contributions written by 75 volunteers, www.fundus-agricultura.wiki, the online encyclopedia on traditional agricultural knowledge in the Alpine region, concludes the three-year project phase. Project manager Waltraud Kugler from SAVE Foundation draws a positive conclusion. Now it goes on with a further substantive deepening and the ongoing expansion in all alpine languages.

The Alpine area is a unique treasure chest. But this treasure can not be lifted or unlocked so easily. We are talking about traditional agricultural knowledge, an intangible cultural heritage, which in many cases has only been transmitted orally. It can not be estimated how much of this treasure has been lost forever in the process of agricultural modernization: extinct livestock breeds, vanished plant varieties, forgotten cultural techniques and abandoned customs.

To lift and preserve this treasure, the project Fundus Agricultura Alpina, launched three years ago, has set itself the task. And just because it is an intangible cultural heritage, it was natural to choose the Internet as a treasure chest. And because it's not just about science, but also about the expertise of people who took in and passed on the knowledge of their forefathers and mothers, it was obvious to follow the Wikipedia principle:

Every knowledgeable layman is invited to join www.fundus-agricultura.wiki.

With the support of various sponsors, the technical development of the platform were created with the launch of the project and persuasive workshops, mailings and many personal contacts, to engage volunteers to write artcles in this online encyclopedia. It was far more difficult than expected, the circle of those interested is huge and limited at the same time. Because the number of those who are actively involved in a wide range of projects is much more manageable. And so a first base of entries was written by a small circle of editors to make the whole project clearer. Gradually, this writing community grew to currently 75 people. Some wrote only one article, others wrote several dozen articles. More than 500 entries have been created. They cover a wide range in the four categories Animals, Plants, Cultural Techniques and Customs. One can read about the Rhaetian Gray Cattle and the swallow-bellied wooly pig, from the Cadi-rye and the Kochbirne, from the cultural technique of fruit tree-cutting or the forest pasture and from Customs such as the Christmas apple and the “Sauschädelstehlen”.

The goal of 2000 entries could not be achieved within the set period of three years. It was too high, and it was probably because the claim to make a substantiated contribution to topics, but requires a lot of expertise and writing skills. But a good basis is now laid, sums up project manager Waltraud Kugler of the SAVE Foundation. "We can be satisfied. We can build on 75 editors. "It is very gratifying that some entries were written in other languages of the Alps already. The SAVE Foundation will continue to support and promote www.fundus-agricultura.wiki in the coming years. Currently, the focus is on deepening, expanding and translating the contributions into the other languages of the platform, French, Italian, Slovenian and English, in the foreground. Further information: office@save-foundation.net.

Health Management and Disease Protection for Endangered Breeds of Farm Animals

The outbreak of an infectious disease poses a serious threat to the conservation of endangered breeds. Due to the global trade in animals and animal products, diseases occurr in areas that have never been affected before. Farmers, veterinarians and public authorities face major challenges to protect the farms and keep their livestock healthy. The official regulations on notifiable diseases include exemptions from immediate eradication for clinically and serologically uninfected animals kept in high performance establishments or scientific facilities such as zoos or on farms with rare breeds. Although EU legislation, and indeed that of some European countries, does provide for compartmentalization of local livestock breeds, there is currently no farm that is protected from official control in the event of an infectious animal disease. The farms have to pass through an accreditation system long before the emergency occurs. Among other things, the farmers must guarantee an immediate and safe quarantine. The animals are monitored, biosecurity and quarantine are controlled. If there is no doubt about the absence of a disease on the farm, the animals will be kept from culling and the breeding unit will be preserved.

The SAVE partner organization in Germany, the Society for the Conservation of Old and Endangered Domestic Breeds, GEH, is developing a cataloge of measures in a model project for the protection of livestock in the case of epidemics and is examining the application on specific farms. The project is supported by the National Program of the Commission for Animal Genetic Resources of the German Ministry of Agriculture.

The project modules

1. Health status and advice on farms
A health and hygiene questionnaire informs about the general needs and requirements of the farm. Visits to interested farms provide information on health, hygiene and disease protection according to species and breed. Local veterinarians and government health services are involved in the counseling process. After analysis and assessment of the situation, suitable candidates will be selected for the application of an exclusive status in the event of an outbreak.

2. Information for Farmers
To raise awareness, information material for farmers on prophylaxis, hygiene, health management and breeding management of various animal species is being developed, supplemented by lectures on breeding and conservation initiatives.

3. Pilot operations with exclusion status
Another main theme of the project is the support for breeders. To this end, relevant institutions (district veterinary offices, public health services, task forces and others) will be integrated to investigate the specific requirements of a farm so that its status is achieved and the necessary conditions created.

„Disease Management for Rare Breeds“
International Workshop 9. – 10. January 2018, Germany
The GEH invites to a workshop in the Hessian state domain Frankenhausen, where first results of the project and experiences in other countries will be discussed. Possibilities, in EU countries to establish model farms for a compartmentalization, should also be discussed.
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Email: info@g-e-h.de, Web: www.g-e-h.de

Contacting and researching, for example, in zoos and scientific institutions at home and abroad will uncover the European situation and promote comparable foreign accreditation processes under European disease control legislation.

Information and documentation
A workshop for farmers, public authorities and scientists on the exchange of experience and skills will end the project and inform both agriculture and the interested public. The project results will be documented and published.

Developing tools to advise farms that value the status of protection is particularly important. The aim of this project is to clarify an application procedure and the necessary implementation steps so that endangered breeds can be protected in the case of epidemics.

Newsflash

Culture plants magazine

The second series of publications on cultivated plants in Switzerland is completed with the booklets on rye, oats and buckwheat. But not only for conservers and interested in Switzerland is this series of great value. The comprehensive description of the species and partly their varieties is just as exciting for all those interested in diversity as well as in their history and development.

The series includes
- Oats (L'avoine)
- Buckwheat; (Le sarrasin)
- Rye; (Le seigle)
- Poppy; (Le Pavot)
- Fava bean; (La feve commune des champs)

All publications of the informative publication series "Cultivated Plants" are available as pdf in German and French language or can be ordered as printed booklets via the Association for Alpine Cultivated Plants:
http://berggetreide.ch/Geschichte_Kulturpflanzen.html

Local farmers producing food for nurseries and primary schools in Ljubljana

When public institutions such as primary schools and nurseries purchase food, they can shorten the distance between farmers and urban consumers. The Municipality of Ljubljana, Slovenia, wants to promote buying food from local farmers. Vesna Erhart, external expert for the Sector for Rural Development at the Department of Environmental Protection of the municipality, says:

"The circa 800 farms around Ljubljana are small to medium-sized. This implies that, to meet its food needs, a school has to buy produce from a range of small farmers, which in turn brings along a logistical challenge. Bigger farms can provide what schools need, like peeled potatoes and cleaned and cut salad greens.

Therefore, they are the frontrunners in working with the procurement tenders." Erhart's main task is to connect small and medium-sized farms with the persons in charge of buying food at nurseries and primary schools. Celebrity television cook Primož Dolničar , and Danijel Habjan, a cook from the local primary school in Stranje, prepared dishes made from local and seasonal food. Erhart: "When seeing the ingredients, the participating school employees were sceptical at first." The tasting was followed by a food market. Farmers, including those from smaller farms, shared what they can produce in different seasons, and school employees placed orders. "Once the small-scale farms have made their first arrangements with the schools, these smaller farms may produce more and eventually apply for the larger and more complex procurement tenders", says Erhart.

To prepare the tenders, schools can get the help of the procurement department of the Municipality of Ljubljana. Erhart is happy with the achievements: "We are proud that we can enable primary schools and nurseries to buy food from even the smallest farmers, and that quality meals are served." Source: https://ec.europa.eu/eip/agriculture/