Euroseeds contribution to the Farm to Fork strategy

Brussels, 13th March 2020

Seed more than ever is the key input for farmers in Europe and worldwide. It is estimated that more than 50% of all productivity gains are due to improved varieties resulting from sophisticated plant breeding[1]; it is also estimated that this figure will rise to up to 80% in the coming years, not least due to growing restrictions on the use of crop protection products, fertilizers and other inputs.

Next to assuring the much-needed productivity gains that support farmers' income, rural economies and the entire agri-food chain, there are many further challenges affecting European agriculture. Some of them are very well known, such as ensuring food security and healthy diets for a growing global population, reducing food losses and waste, adaptation to and mitigation of climate change, etc. Others are less known but still highly relevant: emerging pests and diseases and pressure on and decline of agricultural land.

Euroseeds believes in the important role of innovation and new technologies in agriculture as the way to provide a more sustainable food production. Companies active in the plant breeding and seed production are amongst the most innovative in Europe. It is due to this impressive track record of continuous innovation that breeders have successfully addressed the challenging and ever-evolving needs of farmers and the rest of the agri-food chain, new consumer preferences and wider societal policy objectives.

Plant breeding benefits the entire agricultural value chain from input suppliers to final consumers. For instance, genetic crop improvements in EU arable farming since the turn of the millennium have generated in the agricultural sector alone an additional social welfare gain of almost EUR 9 billion and have added more than EUR 14 billion to the EU's GDP[2].

New plant varieties are increasing and securing crop yields while reducing the use of plant protection products, fertilizers and other inputs; improving plant qualities. Prolonging the shelf life of fresh produce supports healthier diets and addresses food waste. In short: plant breeding is key to r a sustainable intensification of agriculture that simultaneously protects and preserves scarce natural resources.

Euroseeds therefore is convinced that in order to be successful, an EU Farm to Fork Strategy must place plant breeding, related scientific advances and technological innovations at the very core of its considerations and consequent supportive measures.

[1] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf
[2] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf

Sustainable food production

Europe's seed sector is committed to delivering on the United Nations Sustainable Development Goals (SDGs) by[3]:

- Improving the sustainability of food production, contributing to the new EU Farm to Fork strategy;
- Maintaining and promoting Europe's high food quality and standards;
- Ensuring that the European agri-food sector can remain fair and competitive;
- Contributing to Europe's climate, environmental and biodiversity goals.

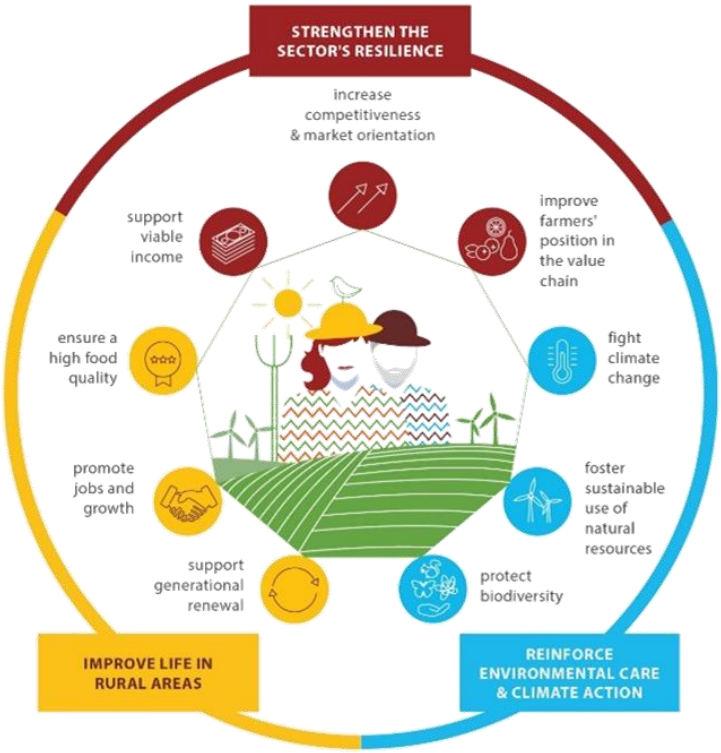
Plant breeding in the EU not only brings about positive economic and social effects, but it also generates substantial environmental effects. It helps save scarce land resources around the globe by generating higher yields per unit of area. This improves the EU agricultural trade balance.

Thus, plant breeding minimises the net virtual land imports of the EU, which currently amount to more than 17 million ha[4]. In the absence of plant breeding for major arable crops in the EU in the last 15 years the global agricultural acreage would have to be expanded by more than 19 million ha. Moreover, plant breeding also contributes to reduce greenhouse gas emissions[5].

[3] https://www.euroseeds.eu/app/uploads/2020/01/20.0007-Euroseeds-seed-sector-brochure.pdf
[4] https://www.agrar.hu-berlin.de/de/institut/departments/daoe/ihe/Veroeff/opera-final_report_100505.pdf
[5] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf

- **From compliance to performance**

In line with the Commission's communication and to become the global standard for sustainability, the efforts made by farmers and the seed sector to develop a more sustainable agriculture in Europe need to be properly assess. In this respect, a clear, robust and easy-to-implement framework should be in place. Alignment between the objectives of the Common Agricultural Policy and related industries would maximise the impact and create synergies at European level[6].



In this respect, it is important to define robust criteria and indicators to measure sustainability in all its three dimensions. Due to the wide range of agricultural conditions in Europe (climate, soils, infrastructure, producer organisation, etc.), these criteria should reflect as adapted as possible the different national/regional realities (also in line with the CAP national strategic plans). In any case, we believe that there is no single criterion that could automatically be an indicator of sustainability but rather a set of criteria that would need to be adapted to the different realities.

At the same time, imposing many new indicators would result in higher costs for professional operators, farmers and cooperatives and national authorities, thus resulting in a loss of competitiveness. Therefore, when defining the sustainability criteria/indicators, simplification should be a must and administrative burden should be kept to the minimum possible level, in line with the "one in, one out" instrument[7]).

Plant breeding in general, and the existing system of DUS and VCU already contribute to sustainability. We support the current system and we acknowledge that some improvements could

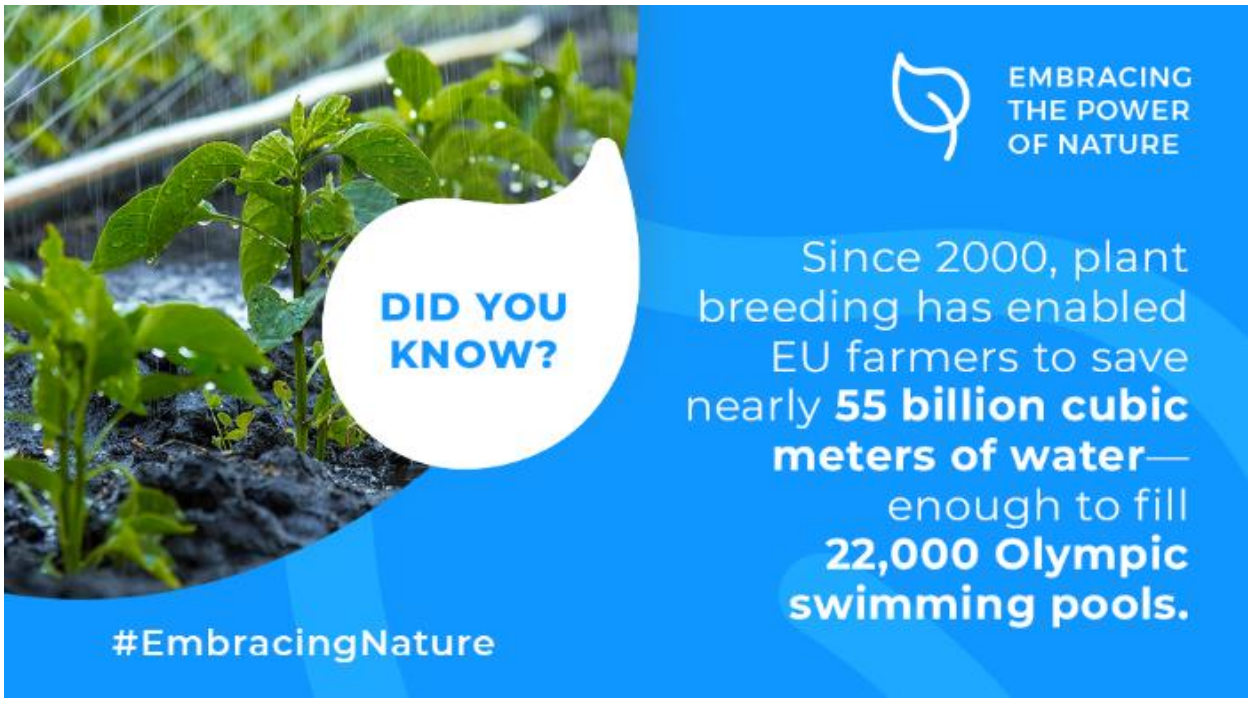
[6] https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-modernising-cap_en.pdf
[7] https://ec.europa.eu/commission/sites/beta-political/files/working-methods-principles_en.pdf

done through variety testing to foster the introduction of new varieties, better adapted to growing conditions (soil, climate, pests and diseases) and to more sustainable crop management practices[8].

- **Resource efficiency and precision agriculture**

Agriculture has a high dependence on water supplies of good quality. In the EU, the sector accounted for 51% of total water use in 2014, and farming's needs are particularly high in some Member States and regions where there is seasonal scarcity and where the sector's competition with other water users is particularly marked[9].

In this respect, plant breeding in the EU for major arable crops in the last 15 years has contributed to saving scarce water resources in Europe. Without plant breeding 55 billion m^3 of water would be additionally needed[10].



At the same time, nutrients such as nitrogen are essential elements for living organisms, including plants, animals and bacteria. They are used as fertilisers in agriculture to support high yields and quality products. Due to some negative effects derived from the overuse of these resources (water pollution, higher GHG emissions), it is important to consider nitrogen use efficiency of plants within the sustainability criteria.

In this respect, a good example of improved nitrogen use efficiency thanks to breeding is the development of dwarf and semi-dwarf cereal varieties. Moreover, yield stability has increased substantially across environments largely due to the adoption of management-responsive, high-yielding, disease-resistant semi-dwarf wheat cultivars throughout much of the world[11].

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[8] https://www.h2020-invite.eu/
[9] https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/env_background_final_en.pdf
[10] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf
[11] http://www.fao.org/3/y4011e04.htm

Some other possible solutions to improve nutrient efficiency are already in place in the EU by precision agriculture. They include processing techniques, nutrient recycling (e.g. through recycling of manure and crop residues) and fine-tuning the fertilisation of cropland and grassland (including adequate determination of crop needs, the use of new precision fertilisation technologies and improved water and soil management)[12].

Plant health is of particular importance since, unlike other plant products, seed and other reproductive material is used as a planting material for further multiplication. If seed is infected with pests or diseases, these harmful organisms may be introduced to a place of production and spread within the growing crop. This may then need additional applications of plant protection products and can lead to severe yield and quality losses.

Europe's plant breeders and seed producers develop the high-quality seeds that are required for sustainable and competitive farming in Europe. Ensuring that seeds are healthy is the precondition for healthy crops and crucial for food safety and security as well as sustainability, even more so in the context of climate change.

As an example, plant breeding and certified seed are of outmost importance when establishing strategies to control and manage Ergot (*Claviceps* spp.) in cereals and grasses[13]. Ergot is a fungal disease of cereals and grasses which results in lower yields and contamination of harvest by alkaloids, which is of public health concern.

A fundamental part of the research carried out by breeders relates to improved varieties more resistant to pests and diseases. This has been recognised in the general principles of Integrated Pest Management which include, where appropriate, the use of varieties resistant/tolerant to pests and diseases and standard/certified seed and planting material as one of the main ways to prevent and/or suppress harmful organisms[14].

Some examples of bred tolerant/resistant varieties which are currently widely used by EU farmers are:

Crop	**Pest or disease**
Sugar beet	Leaf spot disease caused by *Cercospora beticola* (fungal disease)
Tomato	Tomato spotted wilt virus (TSWV) disease
	Tomato mosaic virus (ToMV) disease
Pepper	Root-knot nematodes (*Meloidogyne* sp.)
	Powdery mildew caused by *Leveillula taurica* (fungal disease)
Cereals	Barley yellow dwarf virus (BYDV) disease
Potatoes	Potato cyst nematodes (*Globodera* spp)

Moreover, research has shown good possibilities for plant breeding innovation in order to develop vine varieties resistant to oidium and downy mildew. This would allow a considerable reduction of fungicide use in Europe and other parts of the world[15].

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[12] https://ec.europa.eu/environment/water/water-nitrates/pdf/Closing_mineral_cycles_final%20report.pdf
[13] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4379517/
[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0128&from=EN
[15] https://geneticliteracyproject.org/2018/12/11/crispr-edited-wine-grapes-could-cut-pesticide-use-in-europe-but-regulatory-hurdles-remain/

Moreover, depending on the persistence and risk of certain pests and diseases, seed treatment also offers the possibility, according to the principles of Integrated Pest Management, to apply reduced doses of plant protection products in an efficient way.

- **Organic farming**

Between 2010-17 there was a dramatic increase in the amount of EU agricultural land dedicated to organic farming. The total amount of EU farmland devoted to organic product stood at 7%, representing a 70% rise from 2009. This reflects the size of the EU market, with almost €34.3 billion in retail sales of organic products in 2017. This growing domestic consumption is complimented by a robust import sector[16]. Despite the growing acreage of organic farming, yield on most organic farms is smaller than its conventional counterparts (ranging between 40% to 85% of yields in conventional farming [17]).

Over the medium term, challenges for conversion to organic farming, as well as further developments in environmentally friendly alternatives for conventional farming, could, however, slow down the growth of organic production[18]. In any case, in order to increase EU organic production and reduce imports, higher yields would be needed in order to meet the EU's sustainability goals (see also section on Climate neutrality/ambition) and the EU growing demand of organic products.

Euroseeds' represented companies are the biggest suppliers of seeds for organic farming[19]. Breeding companies have been able to provide enough high-quality seed for the growing demand of seeds for organic farming. As expected, the type of plant reproductive material provided has evolved over the years to adapt to the increased demand of seeds propagated under certified organic conditions and this trend is expected to continue.

As already pointed out by the Commission, Euroseeds considers that all types of farming and related industries should contribute to the Farm to Fork strategy (including, compliance to performance criteria) [20]. This is especially important in order to share the efforts evenly amongst EU farmers.

- **Affordable healthy food**

In line with the Farm to Fork communication, Euroseeds considers that food security, safety and affordability need to be kept at the heart of the discussion: enough healthy and nutritious food has to be available for EU consumers at an affordable price.

In the EU, 8% of citizens cannot afford a quality meal each day –which means the current system is letting down some 40 million people. At the same time, over half of the adult population is overweight and we waste over 20% of all food we produce in the EU each year[21].

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[16] https://ec.europa.eu/info/news/organics-sector-rise-both-domestic-production-and-imports-see-large-increases-2019-mar-07_en
[17] https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/market-brief-organic-farming-in-the-eu_mar2019_en.pdf
[18] https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agricultural-outlook-2019-report_en.pdf
[19] https://www.liveseed.eu/wp-content/uploads/2017/10/LIVESEED_general_presentation.pdf
[20] https://science.sciencemag.org/content/360/6392/987
[21] https://www.europarl.europa.eu/resources/library/media/20190927RES62429/20190927RES62429.pdf

Higher yields per unit of arable land increase the supply of primary agricultural products on international markets. An additional 47 million tons of grains and 7 million tons of oilseeds can currently be produced in the EU with plant breeding for these crops in the last 15 years. This contributes to stabilising markets, reducing price volatility, and increasing potential world food supply[22].

Research and development in plant breeding are major drivers for the creation of improved plant varieties. They better meet consumer demands and address some of the key challenges we face in our diets. Breeders have made an enormous contribution to the availability of healthy and nutritious produce, making it available all year around, and with a longer shelf-life.

Some examples of healthier foods produced by breeding are:

- Plants with higher nutritional content, like broccoli with increased antioxidants;
- Plants with reduced toxins and allergens like gluten-free wheat;
- Wide choice of convenient and tasty food alternatives like cauliflower, kale, cabbage, Brussels sprouts, broccoli etc.
- More convenient snack vegetables and fruits like seedless watermelons, baby cucumbers, grape tomatoes.
- Improved oil composition in oilseed rape to make the oil healthier and stable for frying
- Improved baking quality in wheat

[22] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf

In addition to those products already in the market, plant breeding innovation could make a substantial contribution to food loss and waste by solving concrete problems such as disease resistance of crops to avoid pre-harvest losses or browning of fruits and vegetables to improve shelf life.

- **Bioeconomy and circular economy**

In order to achieve the EU goals on bioeconomy, sufficient European biomass needs to be available for all types of productions (Food, Feed, Fuel, Fibre, Flower and Fun). The offer of biomass needs to respond to both, industry expectations (quality and quantity) and citizens demands (production methods and environmental footprint, among others). In this context, plant breeding innovations are the starting point for sustainable (not only to increase) yields but also to obtain targeted plant varieties with new or improved traits that fit to the specific application. New and improved crops are also investigated for new applications.

Moreover, plant breeding and related seed innovation will provide the base for the continued development, production and use of more bio-based products and processes for a greener European economy. The future bioeconomy can provide a major socioeconomic contribution and its benefits will improve public health environmental sustainability and the productivity of industrial processes.

The bioeconomy's success will, however, strongly depend on continued and targeted plant science research together with partners from the value chain to deliver biomass from European sources and the development of new seed innovations that provide the genetic foundation for new business models.

This has been the case, for instance, for potatoes or oil crops, which provide a food output as well as value-added outputs for industrial purposes or feed. There is a large-scale output of products targeting different markets and research on bioeconomy should also focus on bringing value to this agro-diversity.

Biodiversity

The genetic diversity of crop plants is the foundation for the sustainable development of new varieties for present and future challenges. Plant breeders have been relying on genetic diversity for centuries to develop new varieties better adapted to agricultural practices, environmental stress conditions and new consumer requirements. In this respect, more than 42,000 different varieties are available to European farmers today, and more than 3,500 new varieties are registered in the catalogue every year[23].

Moreover, farmers play a key role in the conservation and sustainable use of plant genetic resources for food and agriculture. The most efficient way for genetic resources to remain in existence is by making use of such genetic diversity[24].

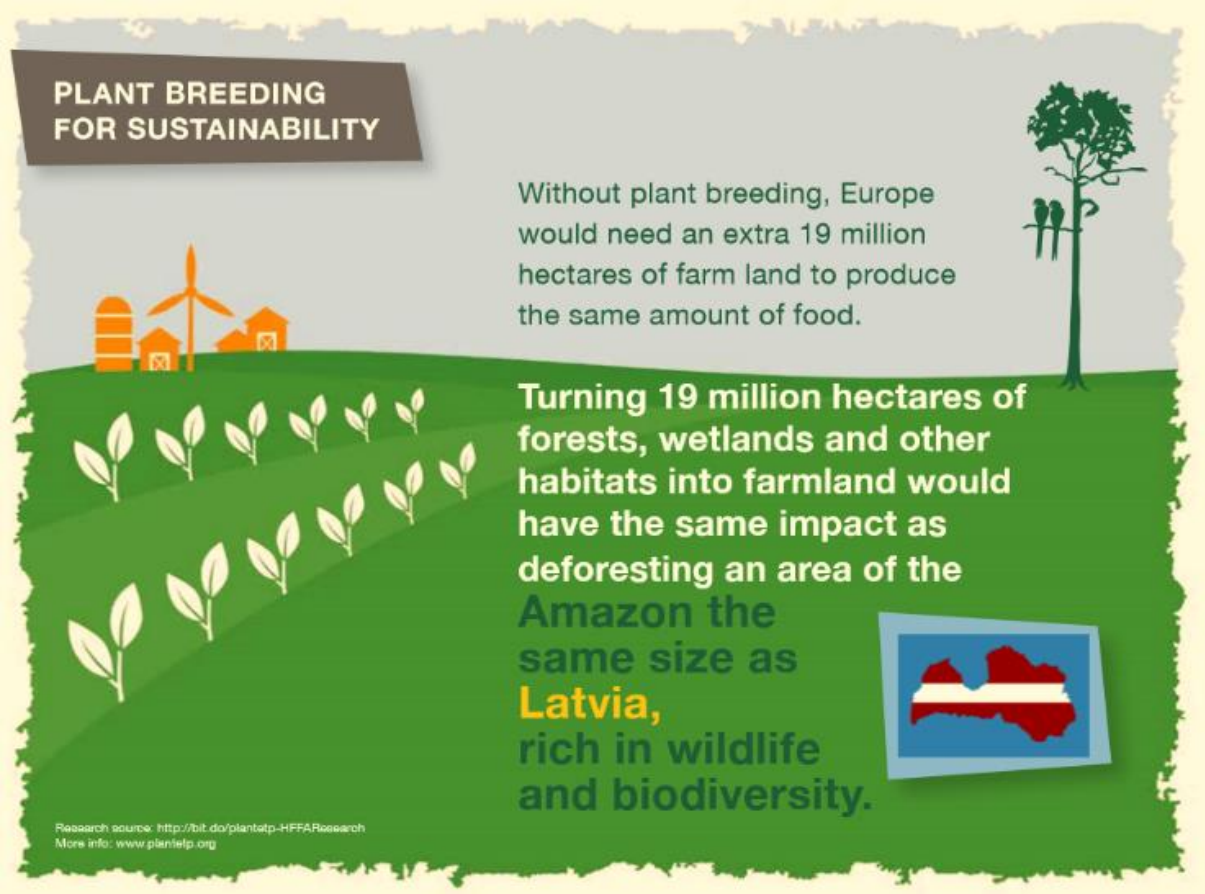
But plant breeding also helps maintaining and creating new biodiversity by using existing and developing new plant genetic resources. These plant genetic resources not only constitute an

[23] https://cpvo.europa.eu/sites/default/files/documents/cpvo_annual_report_2018.pdf
[24] http://www.fao.org/3/a-i0510e.pdf

important part of the rich biodiversity of our planet; they are also an essential basis for seed innovation.

Further international alignment (Cartagena Protocol on Biosafety, Nagoya Protocol on Access and Benefit-sharing and International Treaty on Plant Genetic Resources in Agriculture) is required in to order to allow breeders to access a broader genetic pool and to develop the varieties that are required. Genetic resource conservation is of high importance for plant breeding and companies engage in this work in various ways, through private sector initiatives and also through public-private partnerships[25].

Breeders have provided the necessary tools to adapt certain crops to very diverse climatic conditions, thus allowing farmers successfully grow them from Southern to Northern Europe. By increasing crop alternatives into the crop rotation system, agriculture generates both economic value and agricultural diversity.



As a matter of fact, the amount of land used for agricultural purposes in the EU is shrinking, as a result of increasing urbanisation in Europe. In this situation, plant breeding innovation plays a crucial role in helping to increase yields, thereby reducing the need to dedicate yet more land to agricultural production and in turn, saving habitats and preserving biodiversity.

[25] https://www.euroseeds.eu/seeding-benefits/

Without genetic crop improvements in the EU in the last 15 years, global biodiversity equivalent to 6.6 million ha of Brazilian rainforest or 9.4 million ha of Indonesian rainforest would have been lost[26].

This becomes especially relevant after the Amazon wildfire crisis and the resolution from the European Parliament on Climate and environmental emergency[27].

The IPCC has alerted that for agricultural ecosystems, there is evidence that some crops species and varieties currently grown in a particular area may not be able to adapt quickly enough to the changes. Because different species will react differently, the complex interactions among species will be disrupted, potentially affecting ecosystem services such as pollination and the control of crop pests by natural predators[28].

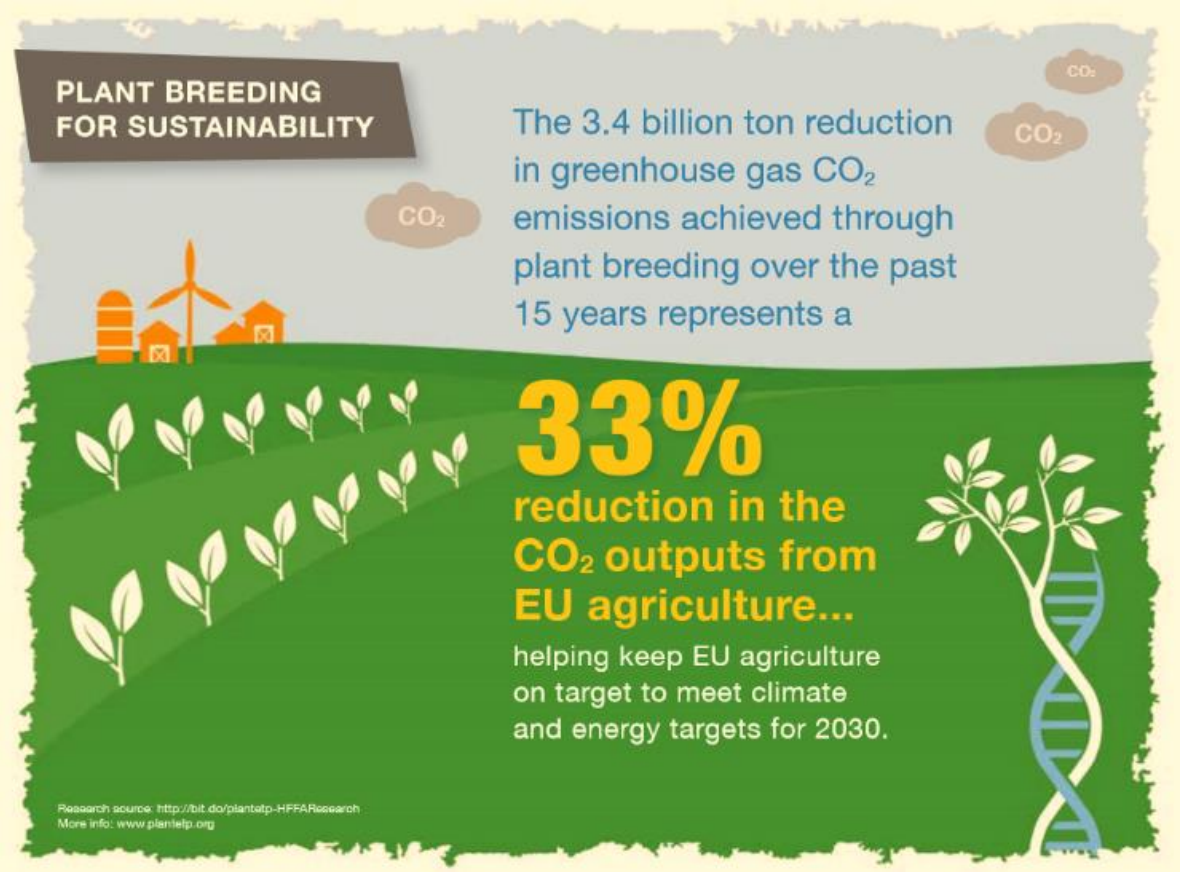
In this respect, innovation in plant breeding would help reducing the time to develop more adapted varieties and replying quicker to climate change.

Climate neutrality/ambition

Agriculture is also a significant driver of GHG emissions through land use and land use change - inside and outside the EU (in the latter case, mainly owing to feed imports)–as well as through energy consumption.

As climate evolves over time, "the most important climate change adaptation tools for crop production are thus breeding and cultivar delivery systems that rapidly and continuously develop new varieties and replace old ones[29].

[26] http://www.plantetp.org/system/files/publications/files/hffa_research_paper_03_16_final_unprotected.pdf
[27] https://www.europarl.europa.eu/doceo/document/TA-9-2019-0078_EN.pdf
[28] http://www.fao.org/3/a-i6583e.pdf
[29] https://wrr-food.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf



GHG emissions on a per hectare basis underestimate the impact of expanding low-yield agriculture on overall GHG emissions as it requires farmland expansion[30]. GHG emissions should be assessed per unit of output.

Apart from GHG emissions, agriculture's other contribution to climate change and its mitigation is carbon sequestration (and the loss of this). Any serious assessment must account for the deforestation that may occur as a result of expanding arable and pastureland under the scenario of lower EU production (forests are usually greater carbon sinks than agricultural lands).

Zero pollution (excess of nutrients, microplastics)

It is estimated that 275 hectares of agricultural land are destroyed every day in the European Union[31] equalling 17 agricultural holdings of EU average size[32]. This loss is higher if we consider that in many other cases, soils are also degrading in Europe. Good quality soil is essential to agriculture and sustainable food production systems, and as such good quality soil is vital to the future of food and farming.

[30] https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/medium-term-outlook-2018-report_en.pdf
[31] https://ec.europa.eu/info/news/preserving-our-soil-protect-our-food-2018-dec-05_en
[32] https://ec.europa.eu/eurostat/statistics-explained/index.php/Farm_structure_statistics

Soil is the support system for nutrients, microorganism communities, water, and organic matter, which are all essential for food production. Furthermore, it plays an important role in making crops and food systems more resilient or mitigating climate change by conserving soil carbon.

Research on well performing crop varieties which provide additional environmental benefits such as better interaction with the soil microbiota or that help to keep organic matter in soil are some of the challenges for the sector on soil and biodiversity.

In this respect, seed treatment is an essential part of the precision farming techniques, aiming at applying the accurate quantity of plant protection products (be they chemical or biological), fertilisers or biostimulants to the development of the plant. These seed technologies help to reduce water contamination by run-off or drift. Research on how to increase sustainability in seed protection, e.g. more biodegradable and bio-based microplastics, biocontrol products or biostimulants, will benefit the seed sector, farmers and the environment.

Conclusion

To conclude, and as we have shown, plant breeding makes and will continue making an important contribution towards sustainability in agriculture and in the entire agri-food chain. As new challenges arise, breeders adapt their breeding programmes to respond to them.

However, by introducing new objectives in the breeding programmes, these become more complex and lengthier. In order to solve such complexity and still be able to respond in time to farmers' needs, consumers' demands and expectations of society as a whole, innovation and new technologies are needed.

Research and innovation outcomes, promoted by the EU, should be properly backed up by other relevant EU policies. This would allow farmers to implement innovation at farm level, which is the real indicator for successful innovation in agriculture. This process has to be accompanied by a consistent regulatory framework that allows such innovations to reach the farmer field and the market.

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