LAYMAN REPORT

LIFE AgriAdapt: Sustainable adaptation of typical EU farming systems to climate change

THE LIFE AGRIADAPT PROJECT (LIFE15 CCA/DE/000072) WAS DEVELOPED SIMULTANEOUSLY IN FOUR EUROPEAN COUNTRIES (GERMANY, FRANCE, ESTONIA AND SPAIN) BETWEEN SEPTEMBER 2016 AND APRIL 2020.

WITH THE CONTRIBUTION OF THE FINANCIAL INSTRUMENT LIFE OF THE EUROPEAN UNION

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FUNDACIÓN GLOBAL NATURE

Solagro

01. Climate change, agriculture and sustainable adaptation

Climate change is one of the greatest challenges the world is currently facing and, although some climatic changes may have a positive impact on European agriculture, most will have a negative impact and will affect regions already suffering from environmental degradation. The fact is that extreme weather events throughout Europe have led to fluctuations in the quality and quantity of harvested products, and yield losses have already reached a level that threatens the existence of farmers in Europe. In image 1, the main impacts of climate change per climate risk region in Europe can be seen.

However, it is still possible for agriculture to adapt to these changes. Once the risks for the near future (until 2050) are identified, adaptation measures can be proposed so that farms are able to reduce their vulnerability. These adaptation measures will have to be sustainable, go beyond mere adjustments in current agricultural practices, and will be focused on elements such as soil, water, nutrient, pest, or semi-natural habitats management, among many others. Furthermore, these measures can simultaneously lead to an increased effectiveness, lower costs, new market opportunities and better preparation for future legal requirements... so adaptation is worth the effort!

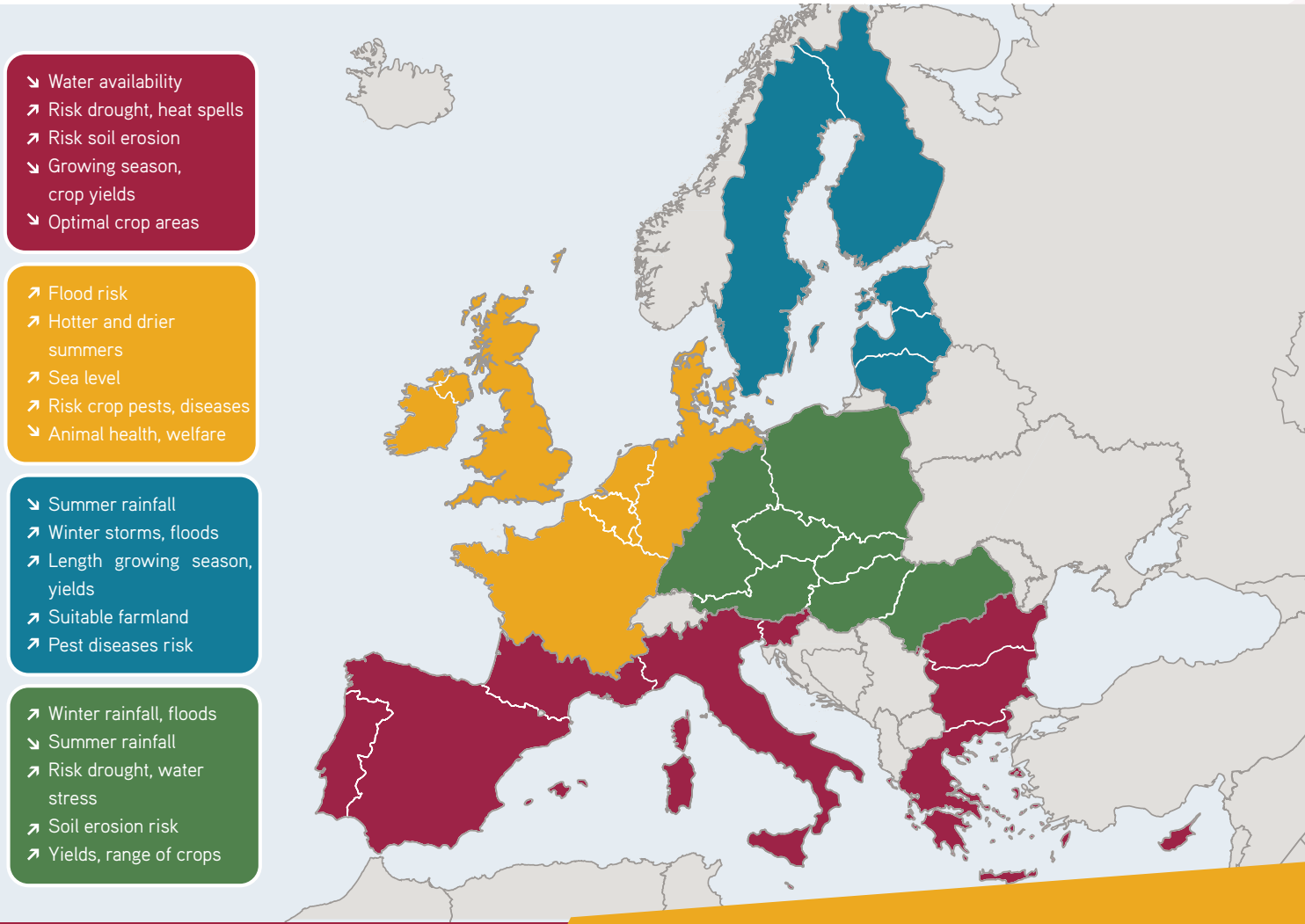

IMAGE 01. The four climate risk regions in the EU and the resulting risks from climate change in each of them. Red: southern climate risk region; yellow: Atlantic climate risk region; green: Continental climate risk region; blue: northern climate risk region. Source: EEA, 2016.

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02. Goals

In order to help overcome the negative effects of climate change, the partners of the LIFE AgriAdapt project have developed a **methodology to assess the climate risk** at farm level using past weather data and climate projections. Once the risks have been identified, **sustainable adaptation measures are proposed and implemented at farm level, in order to increase the resilience of the farm and help to mitigate the impact of the weather-related changes** on livestock, arable land or permanent crops. In addition, this project explores how the implementation of adaptation measures can have further positive effects on nature and the agroecosystem, which represents an added value for the farms.

With AgriAdapt, the partners also aim at achieving **transferable and practical results** and communicate them to farmers, experts and policy makers. To this end, information and teaching materials for agricultural education and training were developed together with experts and specifically passed on to educational institutions, advisory systems, and the EU, national and regional Administrations.

For the results to be representative in every climate risk region in Europe (southern climate risk region, atlantic climate risk region, continental climate risk region and northern climate risk region), the project actions needed to take place in representative countries of each of them. Therefore, **126 farms in Estonia, Germany, France and Spain were included as pilot farms in the project,** covering different farming systems such as arable crops, vineyards, orchards, dairy farms, beef cattle farms, pig fattening farms and sheep farms. Around 75% of the farms are conventional and 25% organic, so that different types of management systems could also be assessed. In image 2, the location of the different pilot farms in Europe can be seen.

IMAGE 02. Distribution of the 126 pilot farms in the LIFE AgriAdapt project. Source: LIFE AgriAdapt

03. Methodology

3.1. Farm vulnerability assessment and tools

What if a methodology supported by an assessment tool were able to look into the recent past (last 30 years), match the low-yield episodes with certain climatic factors and identify the **main Agro-Climatic Indicators affecting crops?** What if that very same tool were able to look into the near future (next 30 years) and, by using climate projections, identify which of those Agro-Climatic Indicators affecting crop yields are going to keep on happening or even increase in the future? In the frame of the LIFE AgriAdapt project, tools that can do this were developed. Thanks to these tools, sustainable adaptation measures are proposed to overcome climate change effects on the farm.

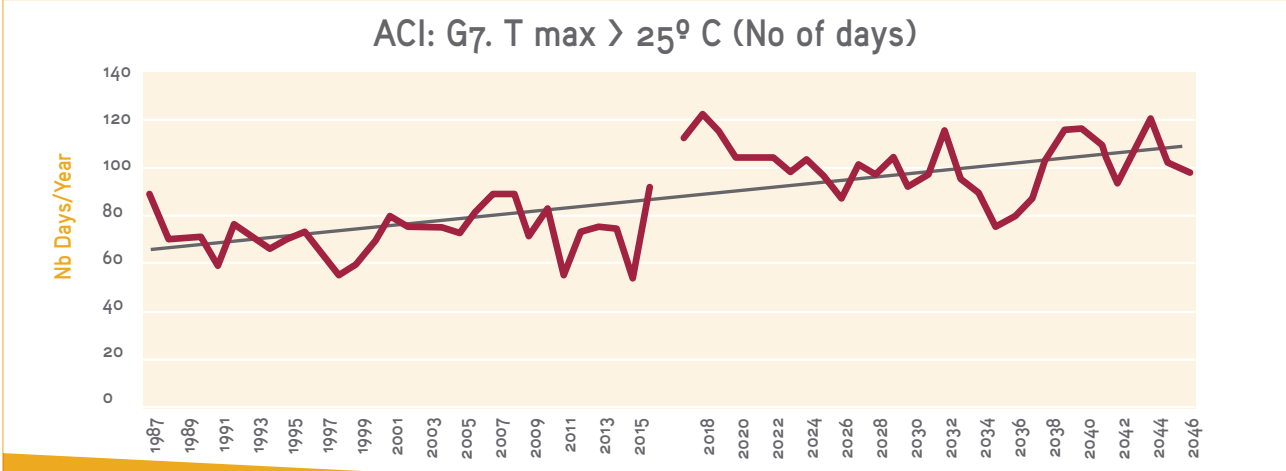


IMAGE 03. Example of ACI projection calculated in a 25x25 km grid through one of the AgriAdapt tools. Source: LIFE AgriAdapt

But what has actually been described above is called a **climate risk assessment**. In the frame of the LIFE AgriAdapt project, they were made for each of the four main climate risk regions in Europe and covered the most important European farming systems, that is, arable farms, livestock farms and permanent crop farms.

Two tools have been developed to perform the climate risk assessment, assess the vulnerability at farm level and propose the sustainable adaptation measures. These are the **ACZ Tool (AgroClimaticZone Tool)** and the **FVT (Farm Vulnerability Tool)**, and together they form the Common Decision Tool. More details can be seen in image 4.

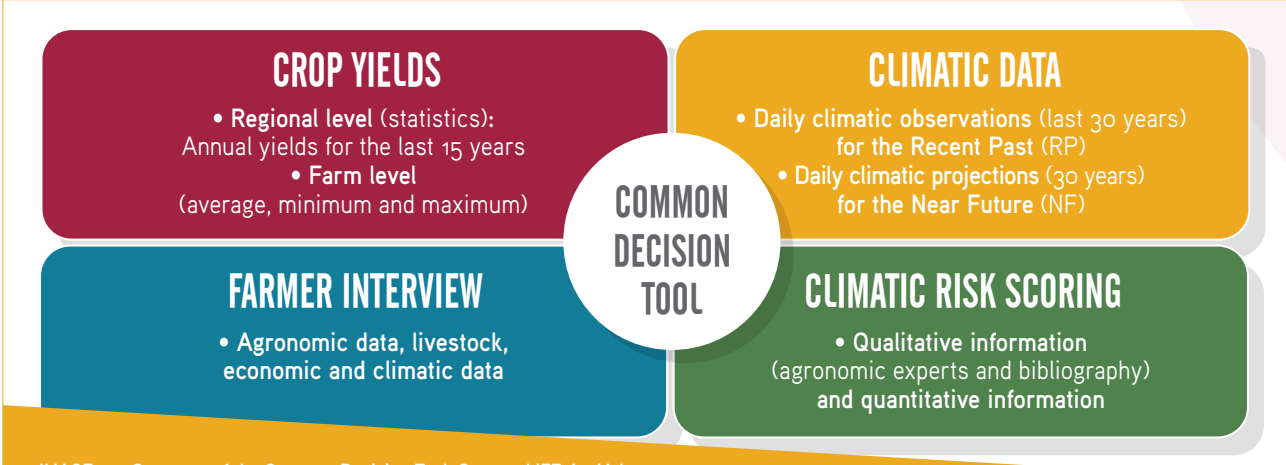


IMAGE 04. Structure of the Common Decision Tool. Source: LIFE AgriAdapt

These tools are also available through a simplified online version called **AgriAdapt Webtool for Adaptation (AWA)**, which helps farmers get some insights into their adaptation possibilities and can be consulted on the following link: AgriAdapt Webtool for Adaptation – AWA. The AgriAdapt Webtool AWA translates existing weather data and climate projections into comprehensible and EU-wide available and usable information for farmers and agricultural stakeholders.

This tool has **three different modules**, and around 300 grid points have already been introduced in order to make the following information available:

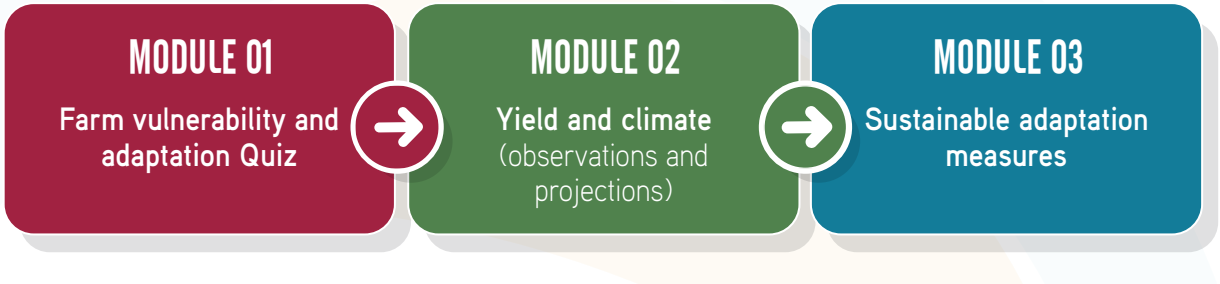


IMAGE 05. The three modules of the AgriAdapt Webtool for Adaptation (AWA). Source: LIFE AgriAdapt

3.2. Transfer and dissemination

In order to ease the capacity building process and facilitate the communication and dissemination of results, a *Farming & Adaptation Manual and a Farming Adaptation Training Pack* have been developed.

In the Manual, the methodology of the project and the tools are introduced, the pilot farms and their adaptation potential are described (along with climate projections), and the reader is guided through all the sustainable adaptation measures together with the case studies of pilot farms. It can be downloaded on the following link: Farming & Adaptation Manual.

The Training Pack includes PowerPoint presentations and supporting Word documents for teachers. This material includes: case studies of representative pilot farms, the project results, and communication materials such as posters or leaflets. It can be downloaded on the following link: Farming Adaptation Training Pack.

In addition, multiple workshops, presentations, conferences and webinars have been of great importance for the dissemination of results. Through them, farmers, cooperatives, technicians, researchers, agri-food companies and labelling organisations, students of agricultural schools, universities and policy makers at EU, national and regional level have been reached. Some of the most important events can be seen in the sections News and Videos of the LIFE AgriAdapt webpage, available on the following links: News – LIFE AgriAdapt; Videos – LIFE AgriAdapt.

IMAGES 06 AND 07. Dissemination of results, both through conferences and workshops on the field. Source: LIFE AgriAdapt

04. Results

The LIFE AgriAdapt project has shown, thanks to the **126 vulnerability assessments and action plans developed in farms** of four different countries in Europe, that sustainable adaptation to climate change is more than feasible in the agrarian sector.

There are more than 270 sustainable adaptation measures that have been identified, classified in terms of their sustainability effects and successfully implemented, which can be consulted in the third module of the AgriAdapt Webtool for Adaptation and on the project website. They tend to be very similar in different regions, with small adjustments depending on the region, farm or farming system concerned. This has allowed the proposal of plenty of sustainable adaptation measures that can be implemented all over Europe, easing the adaptation process and concentrating efforts.

IMAGES 08, 09, 10 and 11. The sustainable adaptation measures have been implemented in different farming systems: arable crops, permanent crops, intensive and extensive livestock farming. Source: LIFE AgriAdapt.

The sustainable adaptation measures tackle seven crucial components for adaptation and sustainability: soil management, nutrient management, water management, pest and disease management, yields and profit, risks and animal comfort. Besides these, there is an eighth component tackled: biodiversity, which is present in each and every one of the other seven components and has not been considered as an isolated factor, but an important element integrated within the rest.

In order to summarize the most implemented measures, some of them are shown in the table below. This table presents the adaptation components of each measure and farming system in which they can be implemented. As can be seen, most of the measures tackle several components and can be implemented in more than one farming system.

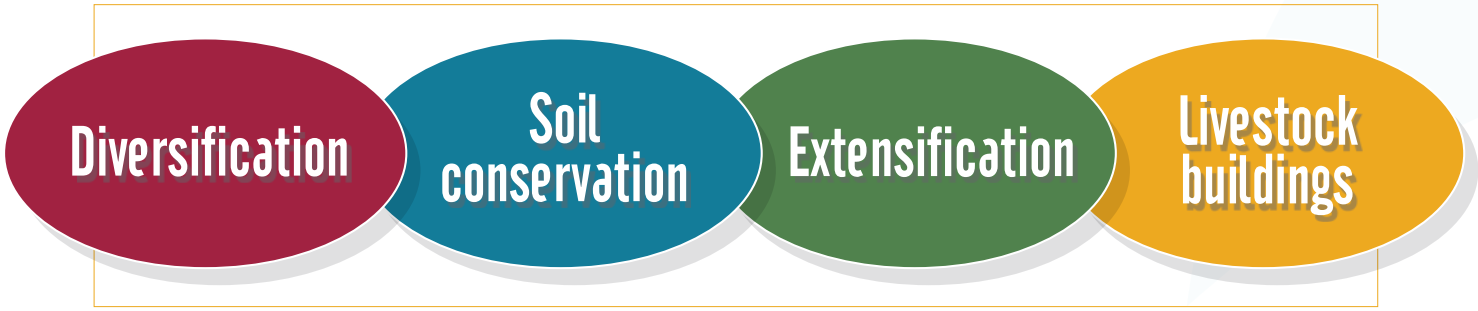
The farming systems in this table are represented:
- Red for arable crops
- Yellow for permanent crops
- Blue for livestock

TABLE 01. Most implemented sustainable adaptation measures, crucial components and farming systems

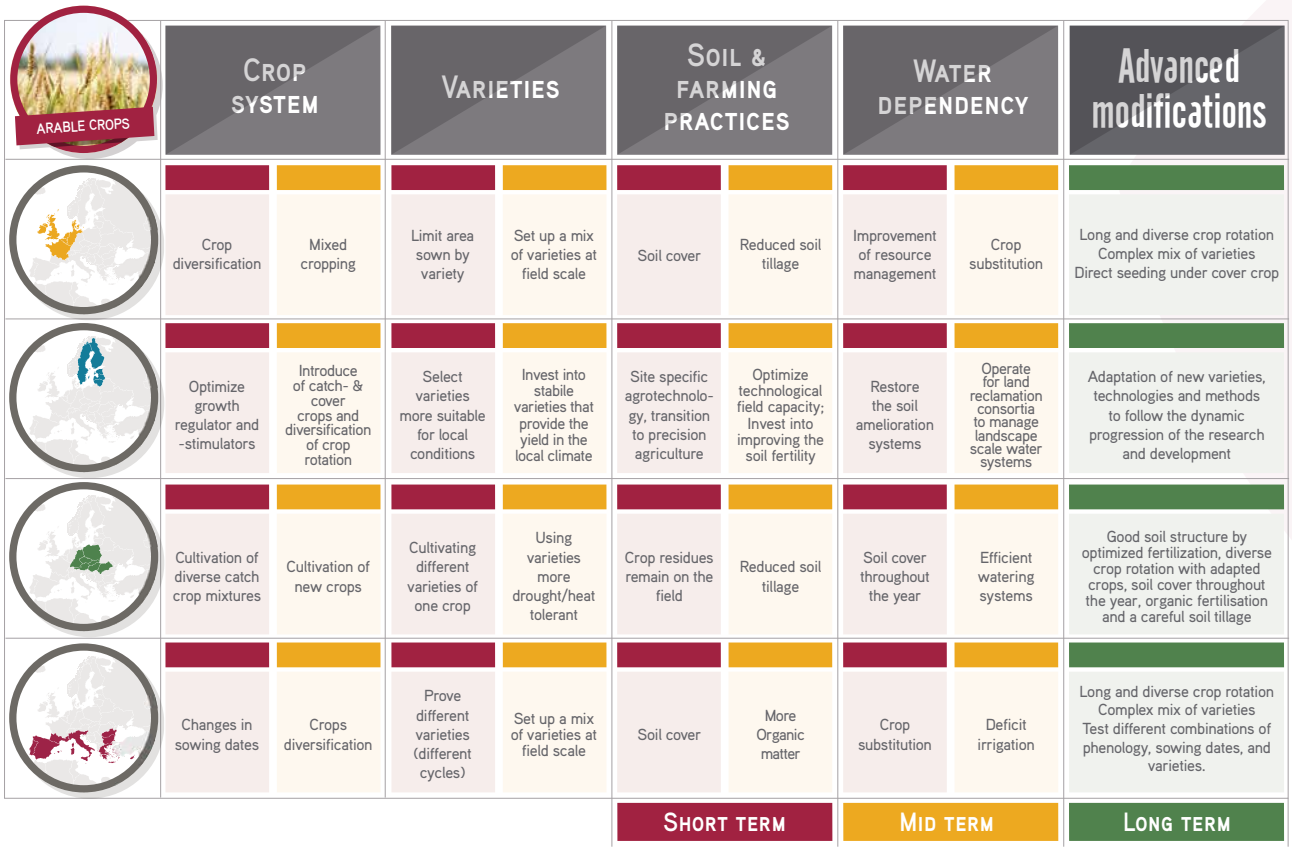
Measures	Soil management	Nutrient management	Water management	Pest and disease management	Yields/ profit	Risks	Animal comfort	Farming system
Diverse crop rotations	■	■	■	■	■	■		● ●
Increase crop diversification	■	■	■	■		■	■	● ● ●
Multifunctional margins with native vegetation, hedgerows, windbreaks and solitary trees	■			■		■	■	● ● ●
Cultivation of new crops and varieties coming from similar climatic areas (e.g. soybeans, sunflower)					■			● ● ●
Use of locally adapted and traditional varieties					■	■		● ● ●
Focus on quality instead of quantity	■	■	■	■	■	■	■	● ● ●
Adaptation of sowing, pruning and harvesting dates			■	■	■	■		● ● ●
Green pruning to balance leaf and fruit surface		■	■	■		■		●
Thinning of fruits/bunches		■	■	■		■		●
Use of catch crops, cover crops, undersowing and ground covers to avoid bare soil	■	■	■	■	■	■		● ● ●
Low tillage	■		■					● ● ●
Increase of organic matter applications	■	■	■	■	■	■		● ● ●
Keyline technique	■		■			■		● ● ●
Efficient irrigation systems			■		■	■		● ● ●
Substitution of irrigated crops			■		■	■		● ●
Use of decision support tools	■	■	■	■	■	■	■	● ● ●
Hail and frost protection (windbreaks, candles)					■	■	■	● ● ●
Taking advantage of new technological improvements	■	■	■	■	■	■	■	● ● ●
Appropriate density of animals in buildings			■	■		■	■	●
Improved cooling systems (open barns, ventilators, shading of barns, shelter for animals outdoors)				■		■	■	●
Increase in fodder storage capacity						■	■	●
Increase in fodder autonomy						■	■	●
Improve accessibility to drinking points			■	■		■	■	●
Improve grazing management to increase quantity and quality of pastures					■	■	■	●
Genetic improvements (crossbreeding, crosspollinating, grafts)					■			● ● ●

05. General Proposals

After three years of assessments, adaptation action plans and their implementation on pilot farms, the partners of the LIFE AgriAdapt project have identified the key adaptation proposals per farming system. The focus of the measures should be on the following four topics:



The adaptation measures may have different applications depending on the climate risk region, but the general proposals can be seen in the following graphics:



GRAPHIC 01. Key sustainable adaptation measures for arable crops

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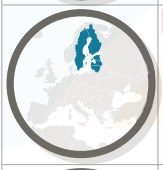
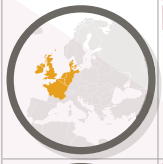
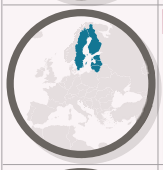
GRAPHIC 02. Key sustainable adaptation measures for livestock

	Fodder system & concentrates		Herd management		Animal welfare		Water dependency		Advanced modifications
	Build up a fodder safety stock in a favorable year	Increase the number of fodder components	Adapt the feeding distribution period	Avoid heat peaks for calving	Using ventilation fans, sprayers, sprinklers	Creating and facilitating natural shade	Increase efficiency of irrigation equipment	Reduce the proportion of corn silage	Reduce the number of cows Develop a fodder system based on minimum 4 components Rotational grazing Building adapted to heat waves
	Increase diversity of fodder crops	Increase fodder storage capacity	Adjust grazing management	Biosecurity measures	Shelters for grazing animals	Installing cooling systems	Sprays for cooling	Drought resistant crops (corn for silage)	Restoring the drainage systems Backup power generators
	Legumes in grassland	Fodder stocks and portioning	Higher share of mineral feed	Passive barn cooling	Sufficient drinking troughs	Roof greening and sprinkling	Water sprays for cooling		New barn adapted to heat waves
	Native seeds sowing (extensive livestock)	Rotational grazing (extensive livestock)	Transhuman-ce (extensive livestock)	Regeneration of trees in agroforestry systems. (extensive livestock)	Ventilation systems in barn and milking parlour (dairy)	Fodder production autonomy though diversification and other techniques (dairy)	Water sprays for cooling animals (dairy)	Grain production autonomy (dairy)	Keyline design (extensive livestock)
					Short term		Mid term		Long term

	Field		Farm		Soil & farming practices		Water dependency		Advanced modifications
	Leaf management	Modification of pruning	Adapt oenological practices	Try new varieties	Organic matter	Soil cover	Improvement of resource management	Supplemen-tary Irrigation	Reorganize plantations Change altitude Modification of PDO specification
	Leaf management	Modification of pruning	Using info services for pest monitoring	Varieties more suitable for local conditions	Organic matter	Soil cover	Restore soil amelioration systems	Supplemen-tary irrigation	Restoring drainage systems, Using hail nets and/or winter covers to minimize crop damage
		Adaptation of the site to ensure outflow of cold air	Using agricultural info services (especially pest control)	Insurances for extreme weather events	Organic matter	Shallow soil tillering	Soil cover	Using adapted varieties	Diverse and adapted varieties, good soil structure by organic fertilizer, effective hail protection (hail nets); cultivating different sites (also in cooler areas)
	Leaf and grape management	Focus on high quality grapes instead of high yield	Focus on traditional varieties	Try new varieties from warmer climates	Organic matter	Soil cover	Irrigation efficiency	Supplemen-tary irrigation	Vine format and/or orientation Explore rootstock/varieties combinations Expand to cooler areas Winemaking techniques
					Short term		Mid term		Long term

GRAPHIC 03. Key sustainable adaptation measures for permanent crops

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06. Contribution to European legislation and the agrarian sector

During the project, the partners organized several meetings in Brussels (with the European Commission, the Joint Research Centre and with Members of the European Parliament). They also worked with policy makers at national and regional level, with the aim of proposing sustainable adaptation measures at farm level. There have also been fruitful exchanges with entities such as the Food and Agriculture Organization of the United Nations (FAO), and the European Earth Observation Programme "Copernicus".

One of the key policies the project wanted to tackle was the Common Agricultural Policy (CAP), which was being reformed during the execution period of the project. Throughout its history, the CAP has been characterized for tackling numerous environmental challenges of the European Union. In fact, since 2010, the CAP has been designed to face climate change at the same time it tackled other economical and regional challenges. The new CAP post 2021 offers the possibility to include measures for adaptation to climate change in the first and second pillars, measures that will help farmers to reduce their vulnerability.

Looking at the impacts of climate change, the agrarian sector is one of the most affected, but it can be also a very powerful instrument to face climate change. Therefore, many of the sustainable adaptation measures proposed for the CAP are also mitigation measures, such as the improvement of the carbon storing capacity of the soil or the reduction of energy or fertilizer consumption. Promoting and funding sustainable adaptation strategies and measures supports the required shift of European agriculture to more sustainable production systems with large positive effects on biodiversity, climate, soil, water, food security and stable income for farmers.

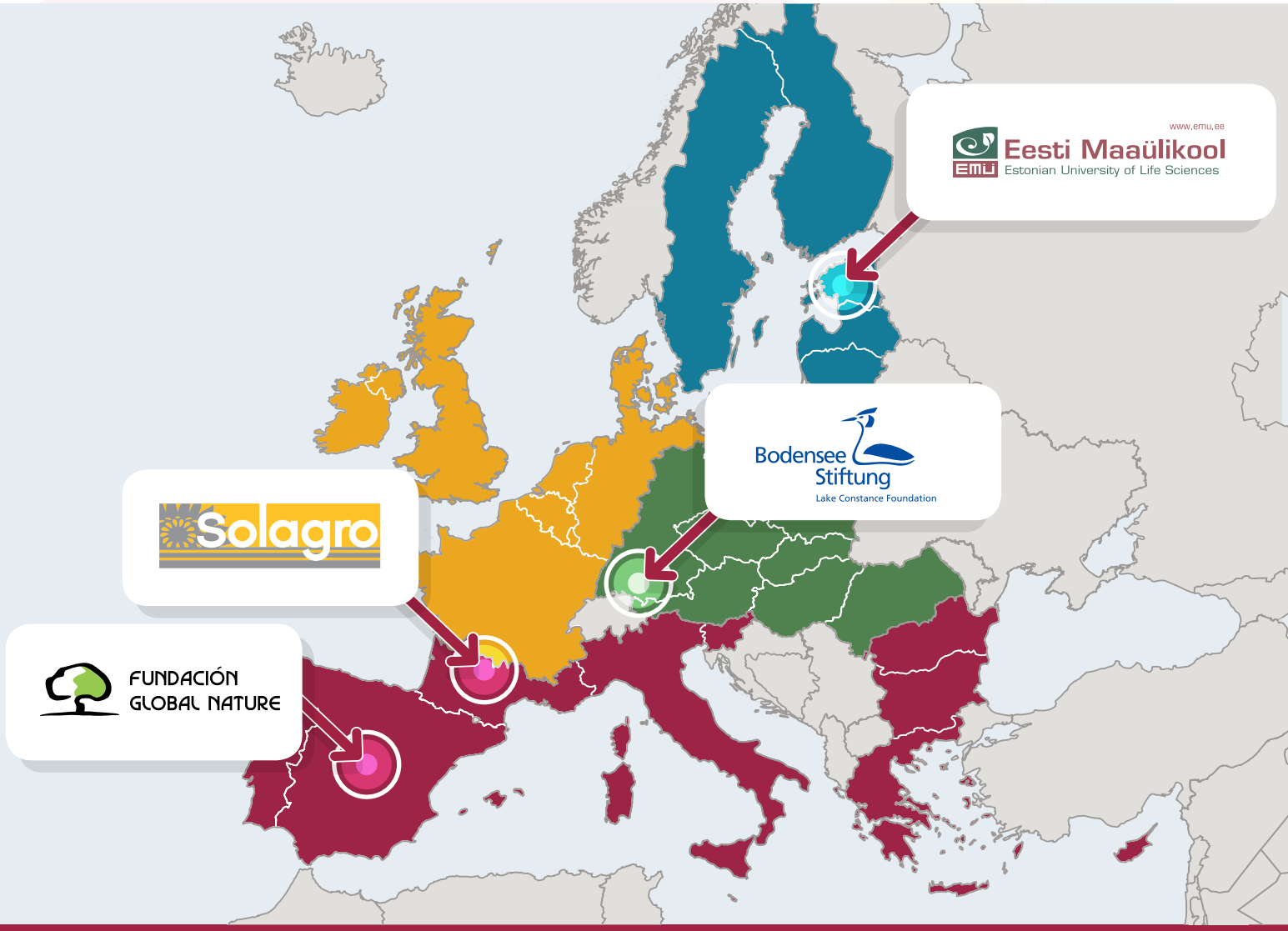
Nevertheless, the LIFE AgriAdapt project has not only focused on reaching policy makers. Raising awareness among farmers, cooperatives, technicians, the agri-food industry, food labels or students, and sharing with them the best adaptation solutions for their production systems and regions, has turned out to be of great importance. Since they are actually the ones bringing the solutions to the fields, AgriAdapt has devoted a great deal of its dissemination activities for them in the form of workshops, training sessions, seminars or webinars.

AGRIADAPT IN NUMBERS

- **Webpage:** www.agriadapt.eu
- **Budget:** 2,158,937.00 € (60% co-financed by the EU)
- **Execution period:** from September 2016 till April 2020
- **Number of pilot farms involved:** 126
- **Number of training sessions/workshops with farmers:** 57
- **Number of training sessions/meetings with farming trainers:** 63
- **Number of people trained:** approx. 1,753
- **Number of entities reached:** approx. 650
- **Number of downloads of the Farming Adaptation Training Pack:** approx. 1,498
- **Number of meetings with European and national policy makers:** 20
- **Number of events attended at national and international level:** approx. 173
- **Number of visits to the webpage:** approx. 218,230
- **Number of downloads of the documents:** approx. 1,641
- **Number of academic articles:** 7
- **Number of news published:** approx. 241 in 5 different languages

07. Project partners

The project was coordinated by the Lake Constance Foundation, a German foundation working for a sustainable economy in the region of the Lake Constance (Germany) and beyond. Other organizations, public and private, with a wide experience in agriculture and climate change have also participated as partners. In France, Solagro is a national reference in the promotion of sustainable agriculture, energy saving as well as renewable energies and the management of natural resources since its creation in 1981. In Spain, Fundación Global Nature, a foundation which actively worked during the last 26 years in the protection of the environment and the promotion of sustainable agricultural practices. And finally, the Estonian University for Life Sciences, which is the only university in Estonia whose priorities in academic and research activities focus on the sustainable development of natural resources and the preservation of heritage and habitat.



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