SOL MACC

ORGANIC FARMERS COUNTERING CLIMATE CHANGE

DEMONSTRATING STRATEGIES FOR ORGANIC AND LOW-INPUT FARMING TO MITIGATE AND ADAPT TO CLIMATE CHANGE

LAYMAN'S REPORT

Life

INTRODUCTION: FARMING AND CLIMATE CHANGE

Climate change affects our entire planet, including Europe. It is a phenomenon that is closely linked to rising Greenhouse Gas (GHG) emissions and that is already having visible detrimental effects on human activities, such as farming. The climate will keep on changing and temperatures will keep on rising, which leaves us with the questions: how does climate change affect our food supply, how do food systems affect climate change, and what can we do about it?

The impact of climate change on farming: Agriculture is a sector that both contributes to climate change and is deeply impacted by its adverse effects. More frequent heat waves, droughts, heavy precipitation, and increased pest and disease pressure can lead to harvest losses, irredeemable damage to natural resources, and the destruction of farmers' economic viability. Insufficient quantity and quality of food also directly impacts all EU citizens in their role of consumers. It is therefore essential to find solutions that will contribute to greater climate change mitigation and the adaptation capacity of food and farming actors, especially farmers.

The impact of farming on climate change: The European Union (EU) has committed to reduce its GHG emissions by 40% by 2030. Officially, the agriculture sector accounts for around 10% of EU's GHG emissions, mainly from methane of ruminants' digestion, manure management, and nitrous oxide from fertilised soils. In reality, direct and indirect emissions from the farming and food sectors, such as production, processing, distribution, storage, consumption, and food waste, range between 30-50% of global GHG emissions when considering deforestation linked to feed production and imports, or GHG emissions associated with the production of synthetic fertilisers, etc. Thus, it is crucial to consider the wider picture to fully understand the impact of food and farming systems on climate change.

Solutions for climate change mitigation and adaptation for farming: A systemic approach is essential to reducing GHG emissions linked to food production and consumption while ensuring farmers' adaptation and avoiding negative effects of farming, such as biodiversity loss. A systemic approach will also bring us closer to reaching global objectives for a more liveable planet, such as the Sustainable Development Goals (SDGs), especially regarding the restoration of ecosystem services. Long-term strategies are needed to meet EU targets and fulfil the Paris Agreement regarding climate change mitigation. At the same time, EU policies need to support climate-friendly farming systems through a reformed Common Agricultural Policy (CAP) that rewards farmers for providing public goods, such as clean water and healthy soils.

SOLMACC (Strategies for Organic and Low-Input Farming to Mitigate and Adapt to Climate Change) is a project that stemmed from the need to address climate change holistically within the food and farming sectors and to ensure policy support for actors involved. During its five years of implementation, the project demonstrated the great potential of innovative and viable farming practices to contribute to achieving EU's objectives regarding climate change. This report sets out to summarize SOLMACC's activities and results achieved between 2013 and 2018, while inspiring readers to consider the manifold solutions available to tackle climate change in Europe and beyond.

ABOUT SOLMACC: MAINSTREAMING CLIMATE-FRIENDLY FARMING PRACTICES

The SOLMACC project focused on demonstrating that farming practices can contribute to climate change mitigation and adaptation, while being economically viable to the farmer.

Objectives: Between 2013 and 2018, SOLMACC partners from Sweden, Germany, Italy, and Belgium implemented a variety of activities in their countries, and beyond, that aimed to:

- Demonstrate the climate mitigation and adaptation potential of implementing optimised farming practices in combination with organic farming;
- Share knowledge about the benefits and the feasibility of the practices with farmers, advisors and students to help mainstream the practices;
- Advocate for an EU policy framework that supports climate-friendly and environmental measures in the food and farming sectors.

Thus, SOLMACC aimed to contribute to reaching EU's climate change mitigation and adaptation objectives for agriculture.

Method: To show the impact of climate-friendly farming, a network of twelve demonstration farms was set up in Sweden, Germany, and Italy. The farmers committed to change their practices and worked with scientists (FiBL) and advisors (AIAB, Bioland, and Ekologiska Lantbrukarna) to find the best possible solutions for their farm that would decrease GHG emissions and increase their adaptation potential, while being economically viable. Throughout the project, the farms were monitored by scientists who measured the impact of the applied practices. The generated know-how and findings were periodically shared with key stakeholders through open field days, publications, presentations, workshops, and a variety of online tools. Policy-makers were targeted by IFOAM EU mainly through advocacy meetings and events in Brussels, to convince them to better support climate-friendly farming.

The implemented climate-friendly practices fell under four main categories: nutrient management, crop rotation, tillage management, and agroforestry (see figure 1). They were chosen for their expected positive impact on climate change mitigation and adaptation, their socio-economic viability, and potential co-benefits, such as clean water. As each farm is different and sits within a specific pedo-climatic context, all practices implemented were adapted to local farm conditions. Therefore, 48 different practices were tested on the SOLMACC farms overall.

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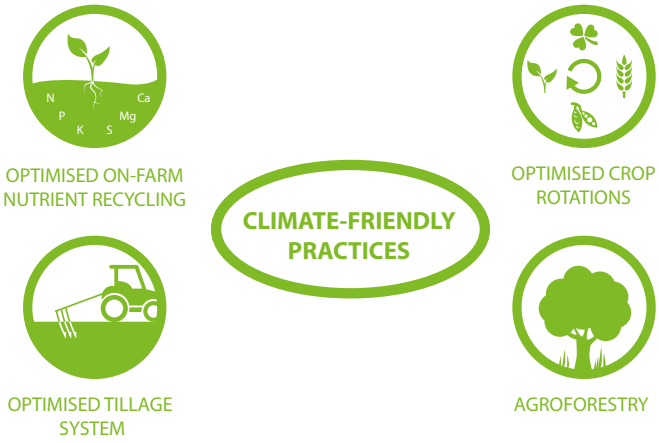
FIGURE 1:

SOLMACC'S CLIMATE-FRIENDLY PRACTICES

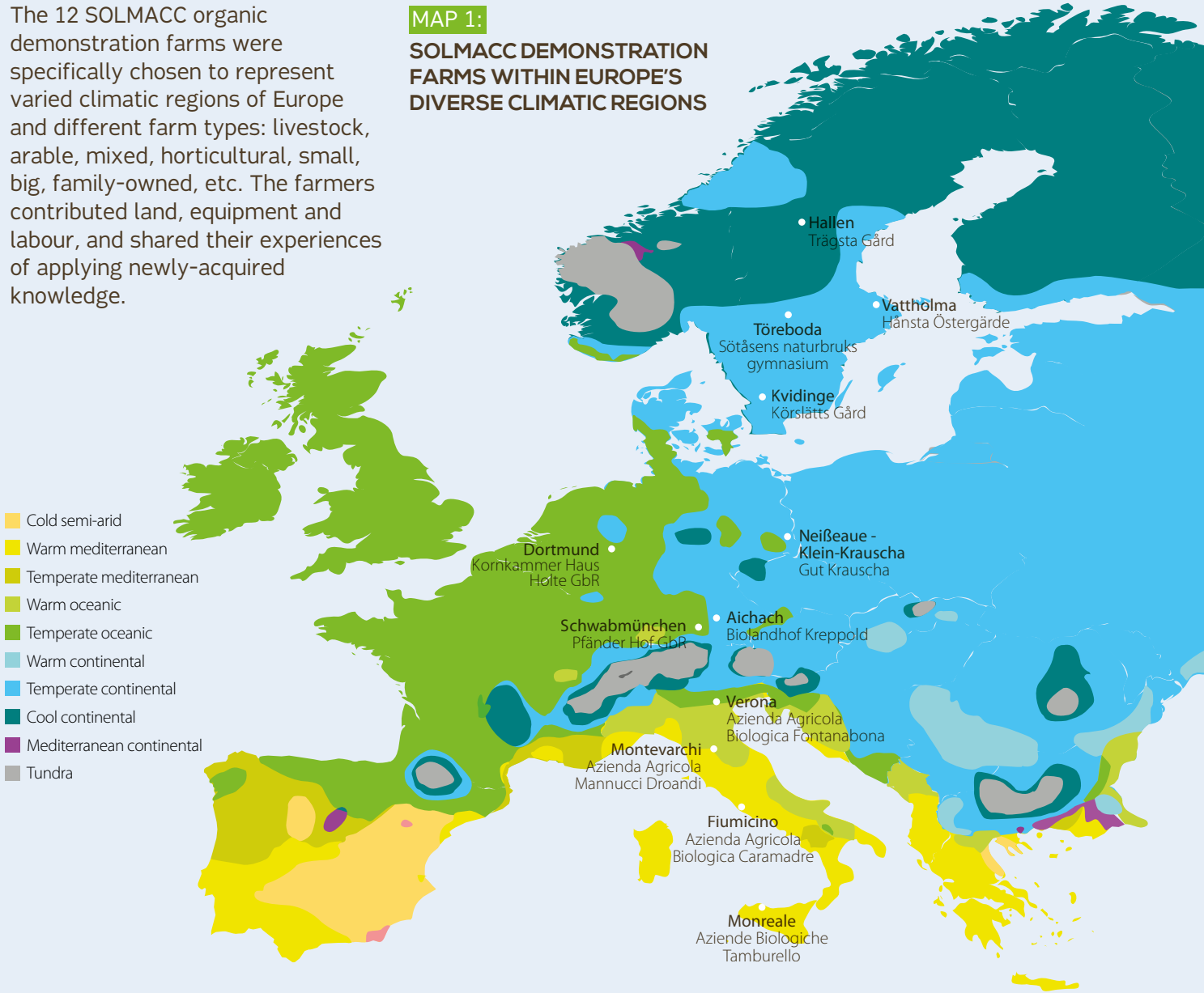


DEMONSTRATING CLIMATE-FRIENDLY PRACTICES ACROSS EUROPE

The 12 SOLMACC organic demonstration farms were specifically chosen to represent varied climatic regions of Europe and different farm types: livestock, arable, mixed, horticultural, small, big, family-owned, etc. The farmers contributed land, equipment and labour, and shared their experiences of applying newly-acquired knowledge.

MAP 1:

SOLMACC DEMONSTRATION FARMS WITHIN EUROPE'S DIVERSE CLIMATIC REGIONS



SWEDISH FARMS

Trägsta Gård farm: mixed production of 140 dairy cows, 260 hectares of arable land, and 20 hectares of grazing land, run by Eva and Torgny Widholm

- Set up a biogas plant to treat animal manure and generate heat and electricity
- Extended the utilisation period of forage legume leys (crops cultivated to improve soil quality) from 4 to 5 years
- Reduced the depth of tillage for most fields
- Managed a silvopastoral system (mixed forest and grazing area) on 15-20 hectares

Hånsta Östergärde farm: mixed production of cattle, sheep, pigs, hens and 170 hectares of cereals, pastures and forest, run by Kjell and Ylva Sjelin

- Used mobile animal shelters on fields, enabling animals to be outdoors all year round, spreading manure directly
- Introduced new type of peas, improving stability within crop rotations
- Reduced tillage by seeding spring and winter cereals at the same time
- Established an alley cropping system (planting rows of trees with wide spacings where a companion crop is grown) and kept pigs in the forest in the summer, helping with forest management

Sötåsen farm: agricultural college with an educational farm, mixed production of dairy cows, sheep and sows with 202 hectares of arable land and 105 hectares of forest, run by Anders Assarsson and students

- Implemented anaerobic fermentation of manure through a biogas plant, generating electricity and heat
- Introduced three years of ley crops in their crop rotation
- Reduced ploughing after harvesting grain legumes and avoided basic tillage for grass clover
- Installed 300 m of windbreak hedges (trees or shrubs planted around fields to protect them from wind and soil erosion)

Körslätts Gård farm: Crop production system on 130 hectares of land and 90 hectares of forest, run by Magnus Bengtsson

- Introduced new winter crop to be able apply their chicken manure directly in the autumn (as opposed to storing it until spring, which leads to the release of greater methane and nitrous oxide)
- Increased grain legume production of lupin and field beans as protein for human consumption
- Reduced depth of tillage for all arable crops
- Managed an existing 600 m long riparian buffer zone (vegetated area near a stream that helps to protect it from adjacent agricultural land use, provides shade, and controls erosion)

GERMAN FARMS

Kornkammer Bioland farm: production of cereals, red clover, legumes, and potatoes on 229 hectares, and 21 hectares of permanent grassland and hedges, run by Dirk Liedman & Bernhard Pawliczek

- Established a cooperation with a biogas plant producer
- Introduced leguminous crops in place of maize on 23% of arable land
- Instituted a no-tillage system for red clover, winter wheat, and spelt, and reduced tillage for oats
- Planted 3 hectares of hedges and tree strips and cultivated 1 hectare of forest

Gut Krauscha Bioland farm: mixed production of 70 cows and 300 hectares of cereals, clover grass, legumes, permanent grassland and hedges, run by Hans-Joachim Mautschke

- Composted farmyard manure that was spread on most of the arable fields
- Introduced grain legumes and extended clover ley cultivation to 2 years
- Applied a no-tillage system for clover and lupine and reduced depth of tillage for winter wheat and rye
- Planted 11 hectares of hedges and tree strips and used part of the wood for house heating, substituting fossil fuels

Kreppold Bioland farm: mixed production of cows and 120 hectares of legumes, cereals, vegetables, grassland and forest, run by Johannes Kreppold

- Composted farmyard manure using an innovative anaerobic treatment
- Started producing grain legumes on 21% of the arable area
- Reduced depth of tillage for nearly all arable crops
- Planted 1 hectare of hedges and used part of the wood for house heating, substituting fossil fuels

Pfänder Bioland farm: production of vegetables, clover grass and cereals on 54 hectares, and 4.5 hectares of permanent grasslands, forests and hedges,run by Johannes and Florian Pfänder

- Produced green compost from on-farm sources (forage legumes, straw etc.) and used it as fertiliser for all fields
- Introduced leguminous crops in place of maize on 25% of arable land
- No-tillage approach for some crop cultures (winter wheat, oats, and spelt)
- Planted 0.6 hectare of hedges and tree strips and cultivated 1 hectare of forest, using part of the wood for house heating, substituting fossil fuels

ITALIAN FARMS

Agricola Fontanabona farm: production of kiwis on 4 hectares and horticultural products on 3 hectares, run by Paolo Fontanabona

- Composted farmyard manure from a nearby farm together with mushroom bed residues through biodynamic management of compost piles
- Introduced legume cultivation inside greenhouses and substituted permanent grassland with green manure (plants that have been left on a field decompose and improve soil quality) in the kiwi orchards
- Reduced depth of tillage for all crops
- Planted 0.21 hectares of boundary hedges and established 4.3 hectares of fruit orchards

Mannucci Droandi farm: production of olive oil and wine, with 31 hectares of vineyards and olive groves surrounded by dense oak and chestnut woodland, run by the Mannucci Droandi family

- Produced compost from residues of wine production and wine trees branches
- Introduced green manure with seeding on 31 hectares of land
- Reduced almost all ploughing activities, cultivating permanent grass cover instead
- Diversified and planted new boundary trees

Caramadre farm: 22.5 hectares of fruit and vegetable production with 2 hectares of greenhouses, run by Claudio Caramadre

- Applied green manure on one field, helping to prepare the soil
- Introduced leguminous crops on some fields and in the greenhouses
- Reduced depth of tillage significantly for all crops (up to 10 cm in depth)
- Managed existing pines and eucalyptus trees

Tamburello farm: 60 hectares of vineyards, olive groves and cereals and photovoltaic system covering 90% of the farm's energy needs, run by the Tamburello family

- Introduced the use of green manure, shredded 1 to 2 times a year
- Cultivated 15 hectares of green forage manure consisting of legumes and grasses
- Reduced depth of tillage in the olive groves
- Managed existing 5 333 vines and 333 olive trees grown on the farm

MEASURING IMPACT

A strong collaboration was established between the SOLMACC farmers, local advisors and scientists. Together they gathered data to measure the impact of implementing the new optimised practices in relation to climate change mitigation, adaptation and the economic viability for the farmers. The results from the scientific monitoring are summarised below:

CLIMATE CHANGE MITIGATION IMPACT

- Optimising on-farm nutrient recycling practices helped to close nutrient cycles and reduce GHG emissions, such as methane. Composting farmyard and green manure helped to reduce GHG emission compared to keeping a manure or residue pile. Biogas plants produced alternative energy and heat sources, and biogas slurries (a nutrient-rich by-product of anaerobic digestion produced by a biogas plant) were used as fertiliser on arable fields. Mobile livestock systems were constructed and helped to reduce GHG emissions from feed transportation.
- Changing crop rotation practices led to increased stabilisation of soil fertility, nitrogen fixation, and carbon sequestration. It was also found that energy and fossil fuel consumption can be decreased by changing crops and machinery used.
- Adopting different forms of tillage systems and changing the type of machinery can reduce fossil fuel consumption and help promote healthy soils.
- Agroforestry elements such as boundary hedges, buffer stripes, alley cropping and silvopasture have a high potential to sequester atmospheric carbon, while the wood can be used for heating purposes, replacing fossil fuels. These systems also provide valuable ecosystem services.

CLIMATE CHANGE ADAPTATION IMPACT

- Composting helped to stabilise and, in some cases, increase crop yields while improving soil quality. This contributes to farmers' resilience against both excess of and lack of water as better soils can absorb higher amounts of water without causing surface run off.
- Introducing leguminous crops also helped to stabilise or improve yields. In addition, the SOLMACC project found that the impact of cultivating legumes is higher on farms that had little or no legumes beforehand.
- No decrease in crop yields was observed from implementing reduced tillage practices.
- The various agroforestry practices mostly led to stable yields, but the impact on soil is unclear as it was difficult for the farmers to evaluate the effects on soil parameters.

ECONOMIC VIABILITY

- The practices were found to be economically viable for the farmers as the costs for implementing new practices did not increase in most cases and yields either remained stable or improved.
- Operational costs, e.g. diesel, energy consumption, were mostly maintained or reduced (except for composting, as this required machinery investment costs).
- Costs related to inputs, e.g. seeds, irrigation, and livestock feed, remained mostly unchanged due to the collaborative selection process of practices between farmers, advisors and scientists.
- Labour costs somewhat decreased due to the change in tillage management but increased with the agroforestry practices.

Image 1

Scientist taking soil samples at the beginning of the project

EXCHANGING KNOWLEDGE

24 OPEN FIELD DAYS

18 LECTURES FOR STUDENTS

15 PRESENTATIONS AT INTERNATIONAL CONFERENCES, FAIRS, AND WORKSHOPS

9 NEWSLETTERS, EACH ONE SENT TO MORE THAN **3200** PEOPLE

ONLINE TOOLBOX WITH INFORMATION MATERIAL DEVELOPED IN **4** LANGUAGES
(www.solmacc.eu/toolbox)

EU-LEVEL CONFERENCE WITH OVER **76** PARTICIPANTS FROM **13** COUNTRIES

4 VIDEOS ON PRACTICES IMPLEMENTED
(www.solmacc.Eu/toolbox/videos)

7 PUBLICATIONS AIMED AT STUDENTS, FARMERS, ADVISORS, POLICY-MAKERS AND ALL OTHER INTERESTED PUBLIC
(www.solmacc.eu/toolbox/resources).

POLICY ENGAGEMENT

The lack of political and policy support for farmers implementing climate-friendly practices is one of the key challenges in mainstreaming a more climate-friendly way of farming in Europe. This was confirmed by farmers involved in a questionnaire regarding such challenges developed by Lin Bautze[1]. Therefore, feeding into the ongoing policy debate around tackling climate change within the food and farming sectors was central to SOLMACC activities. A seminar on greater climate sustainability within the Common Agricultural Policy (CAP) was organized in Brussels, bringing together officials of the European Commission, Members of the European Parliament, and civil society representatives. National and European-level policy-makers were also targeted through individual advocacy meetings and bigger events, such as conferences and fairs. Moreover, policy recommendations to ensure a more climate-friendly food and farming sector were developed through an expert workshop and consultations with farmers from around Europe. These recommendations were shared with policy actors and the wider public.

OVERVIEW OF KEY POLICY RECOMMENDATIONS DEVELOPED THROUGH SOLMACC:

- Set up long-term national and regional plans, both for 2030 and 2050, for climate action in the agriculture sector, in line with international agreements such as the Paris Agreement and the SDGs.
- Use the CAP to encourage the uptake of climate relevant measures by farmers and move away from the "food security" narrative. The principle of public money for public goods in the CAP would allow farmers to take up climate-friendly measures and to reduce other environmental impacts in a more integrated way.
- Aim to reach sustainable levels of livestock production, reduce livestock feed imports and encourage grazing on well-managed grasslands.
- Demand side measures, such as action on food waste and the promotion of more sustainable diets and reduced consumption of animal products.
- The EU should engage in a food system transition and move agriculture towards agroecological approaches such as organic farming. A flagship research programme on agroecology must provide funds for an optimal assessment of multi-functional farming systems, for scaling up the best agroecological systems and integrating them into a coherent supply and value chain.

Image 2

Seminar in Brussels on tackling climate change with the CAP

[1] The SOLMACC project benefited from the PhD thesis of Lin Bautze who developed a questionnaire to better understand the reasons why more farmers are not farming in a more climate-friendly way. The answers received from the 12 SOLMACC farmers and 206 additional farmers from Germany and Switzerland provided a valuable insight into obstacles that need to be addressed in order to mainstream climate-friendly practices. Responders mainly identified to following challenges: lack of time for implementation, poor customer awareness of benefits, lack of access to information, lack of political support, financial obstacles and lack of role models.

CONCLUSION

The SOLMACC project has demonstrated that many different options exist to reduce greenhouse gas (GHG) emissions on the farm-level while at the same time contributing to farmers' adaptation capacity and economic stability. The practices available depend on the farm structure, but also on the production system, soil type, climatic context and on the financial capacity of each farmer. Farmers need greater access to information to become aware of win-win situations and learn how they can decrease GHG emissions while adapting to the inevitable impact of climate change and increasing their commercial revenues at the same time. Here, farm advisory services are key to enable knowledge transfer between the scientific understanding of mitigation potential and farm practices.

The SOLMACC project has also highlighted that mainstreaming climate-friendly farming practices requires role models for other farmers and consumers in a society that needs to rapidly transition towards a sustainable future. The farmers involved in the project have demonstrated that there is high motivation to transform current agricultural practices and to test new innovative ones. They have also shown that it is possible to move towards a holistic farming system that integrates climate change mitigation and adaptation benefits and helps farmers to stabilise or even increase crop yields while protecting our valuable ecosystems services.

Furthermore, it is clear that if we want to achieve climate change mitigation goals in line with the recently ratified Paris Agreement further efforts from all stakeholders are required. This specifically means that farmers cannot be left alone with the burden of climate change mitigation and adaptation. Farmers need to be supported financially by policy instruments such as the Common Agricultural Policy (CAP), but also by us, the consumers. This can be done by purchasing organic products that are grown locally, or by directly getting in contact with farmers leading in climate-friendly and resilient agriculture. Alternative economic models can be helpful, such as community supported agriculture (CSA), as they help farmers to connect with consumers and to communicate the many benefits of their practices. When we, consumers, are more aware of these benefits, most of us are willing to pay extra for products produced in a climate-friendly way – as opposed to buying cheaper food that comes at a hidden cost.

Finally, to ensure that climate-friendly farming is picked up widely throughout Europe and beyond, it is crucial to dedicate further funding for projects that communicate and disseminate existing knowledge, support the creation of new knowledge, and allow for an exchange of information. In this way, the EU will be closer to reaching its objectives on climate change mitigation and adaptation and ensuring a livable planet for future generations.

GET IN TOUCH

SOLMACC: Strategies for Organic and Low-input Farming to Mitigate and Adapt to Climate Change
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