Editorial

The STARGATE project is celebrating its first newsletter and gives a warm welcome to all of you interested in our efforts and progress! In this first issue you will learn about Climate-Smart Agriculture (CSA) and climate change. Get to know the STARGATERS that will implement the range of STARGATE technologies at a field-level.

Please be our guest and visit the STARGATE project website! Don't forget to follow us on social media and stay up to date on climate-smart agriculture and project developments!

IN THIS ISSUE

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 818187.

What is Climate-Smart Agriculture?

Demand for food is constantly increasing due to a growing global population and changing diets. Production is struggling to cope since crop yields level off in many parts of the world, natural resources such as soils, water and biodiversity are pushed to their limits (World Bank, 2019). The food security challenge is expected to become more difficult over the years, as according to estimates the world population is expected to increase by two billion by 2050.

> World population is expected to reach 9.7 billion in 2050 (UN, 2019)

Food security challenge is intensified by agriculture's vulnerability to climate change. The impacts of climate change negative impacts are already apparent, as extreme weather events and reduced yields and more frequent, affecting both crops and livestock. This means that in order to maintain current yields and the required production yields, substantial investments in adaptation are necessary.

> "Climate-smart agriculture is a means of identifying which production systems and enabling institutions are best suited to respond to the challenges of climate change for specific locations, to maintain and enhance the capacity of agriculture to support food security in a sustainable way." (FAO)

CSA is an approach that attempts to address this challenge by guiding necessary actions that support the development of agricultural systems and ensure food security in a changing climate.

THE 3 PILLARS OF CLIMATE-SMART AGRICULTURE

Productivity

CSA aims to sustainably increase agricultural productivity yields and incomes and as a result, farmers' livelihoods. Climate change is a major threat multiplier for global food security, impacting agricultural productivity and the stability of food production. A key concept related to raising productivity is sustainable intensification.

Adaptation

CSA attempts to reduce the exposure and vulnerability of farmers to short-term risks, strengthening their resilience at the same time by building their capacity to adapt and prosper in the face of shocks and longer-term stresses like shortened seasons and erratic weather patterns. Particular attention is given to protecting the ecosystem services.

Mitigation

Where possible, CSA benefits the reduction and/or removal of greenhouse gas (GHG) emissions. CSA pursues lower emissions for each calorie or kilo of food produced, avoids deforestation from agriculture and identify potential ways for soils and trees to acts as carbon sinks and absorb CO_2 from the atmosphere.

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CSA is not a one-size-fits-all approach (FAO, 2019). CSA provides the means to help stakeholders from local to national and international levels identify agricultural strategies suitable to their local conditions. It isn't distinct from sustainable agriculture but rather it's a way of combining various sustainable methods to tackle the specific climate challenges of a specific farming community.

It initiates by assessing the particular climate risks, using a variety of tools for the assessment of climate risk and vulnerability of a landscape, taking the local ecosystems and the specific crop into account.

> *Climate-smart agriculture is not a one-size-fits-all approach.*

CSA can cover a wide range of sectors, including crops, livestock, forestry and fisheries. Examples include conservation agriculture, agroforestry and weather-based insurance for both crop and livestock production. Critical for its success is an often complex, integrated approach, matching each intervention to local conditions and involving farmers in design and implementation. Identifying the right combination of ways to manage a specific farm's climate challenges and to build resilience to future impacts, is what makes CSA "smart."

KEY CHARACTERISTICS OF CLIMATE-SMART AGRICULTURE

ADDRESSES CLIMATE CHANGE

CSA systematically integrates climate change into the planning and development of sustainable agricultural systems.

INTEGRATES MULTIPLE GOALS AND MANAGES TRADE-OFFS

The CSA expected outcomes are increased productivity, enhanced resilience and reduced emissions. Nonetheless it is often not possible to achieve them all and trade-offs must be made. Trade-offs require the identification of synergies and cost – benefit analysis through participatory approaches.

MAINTAINS ECOSYSTEMS SERVICES

Ecosystems provide farmers with essential services. CSA adopts a landscape approach that builds upon the principles of sustainable agriculture but goes beyond the narrow sectoral approaches that result in uncoordinated and competing land uses, to integrated planning and management.

HAS MULTIPLE ENTRY POINTS

CSA has multiple entry points, ranging from the development of technologies and practices to the elaboration of climate change models and scenarios, information technologies, insurance schemes, value chains and the strengthening of enabling environments.

IS CONTEXT SPECIFIC

The fact that CSA often strives to reach multiple objectives at the at the landscape level, and as a part of different institutional arrangements and political realities makes it particularly difficult to transfer experiences from one context to another.

ENGAGES WOMEN AND VULNERABLE GROUPS

Vulnerable groups and women are most likely to be affected by climate change. In order to help them build their adaptive capacity to cope with events like droughts and floods, CSA strives to involve all local, regional and national stakeholders in decision-making so as to form the partnerships and alliances needed to enable sustainable development.

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Our project!

Agriculture is certainly the most weather dependent economic sector, and changes in the climatic patterns are strongly affecting it, in terms of productivity, risk management, and environmental preservation. Additionally, current farm practices are producing approximately the 25% of the global greenhouse gas emissions, contributing and further enhancing climate change, retaining a continuous cycle of altering the climate and impacting the food production system.

The STARGATE project aspires to develop a breakthrough, multiscale and holistic **climate-smart agriculture** methodology, capitalizing innovations in the field of microclimate and weather risk management, as well as in the field of landscape design.

It will be based on earth observation, weather/climate intelligence and IoT technologies to support a more effective farm management and related options for adaptation on climatic changes, policy formulation leading to better landscape management, protection against climatic risks and implementation related to mitigation on microclimate changes.

> *STARGATE aims at developing, testing, implementing and showcasing a framework that will improve the resilience of farming systems to variable climatic conditions and extreme weather events, while will deliver scientific sound results to guide policymakers in landscape planning and long-term adaptation of the modern agriculture to climate change.*

STARGATE will identify the vulnerabilities of current farming systems, landscape management, models, methods and practices related to climate change and conduct a thorough requirements' analysis for the CSA on the basis of which it will shape the stakeholder community. Based on this analysis STARGATE will develop the data framework and the climate smart decision support tools, that will be used by farmers and policymakers to manage local and regional microclimate more efficiently.

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STARGATE's overall **objective** is to co-design, co-create and co-validate a multiscale holistic methodology of CSA, that will help farmers and policymakers to achieve short and long-term adaptation to climate change, while the STARGATE innovations in microclimate and weather risk management, and in the field and regional landscape design will promote the resilience of farming systems.

STARGATE will have a noteworthy **impact** on the development of an Agricultural Sector in Europe due to the ground-breaking advancements that will provide decision-makers responsible for managing agri-food systems with a profound knowledge on how to optimize irrigation of fields and crops taking into consideration temperature, precipitation, soil type and crop growth models among other parameters, under future climate transitions.

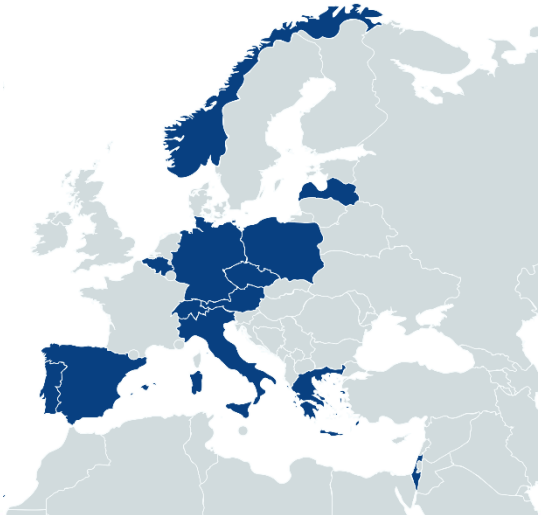
STARGATE will co-produce knowledge by applying action research within sensitive and carefully sorted research sites for pilot exploitation that also represent the Europe's variety of climate conditions. As a cross-disciplinary research with a highly participatory approach, it will involve stakeholders/citizens who are the end-users of the overall agricultural process (farmers, citizens-consumers); decision-makers responsible for the soil and water management of the local/region in each research site/pilot; and all other relevant stakeholders and multiplier organizations of the agri-food sector who can ensure a well standing uptake and implementation of STARGATE results.

STARGATE will work closely with organizations interested in using technology to improve sustainable farming and resource recovery. Its cloud platform will form the convergence location for all 'actors', enabling to involve stakeholders as an integral part of the final outcome so as to:

- ☑ provide input at all stages of the development of the STARGATE platform,
- ☑ promote the use of the platform
- ☑ gather feedback and discuss options to further exploit the results of the project

STARGATE will run for 48 months until September 2023 and involves **26 partners** from **13 countries**:

- Greece
- Czech Republic
- Israel
- Spain
- Latvia
- Switzerland
- Austria
- Italy
- Portugal
- Poland
- Germany
- Norway
- Belgium



The project is coordinated by Professor Dimitrios Moshou of the Centre for Research and Technology-Hellas (CERTH).

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Agriculture and climate change
THE GLOBAL FOOD SECURITY CHALLENGE

Agriculture and climate change are tightly interwoven. The effects of global warming on agriculture and food supply are dire, whilst the world population increase creates a dire need for greater agricultural production yields. The need to change the way agriculture affects the environment, and vice versa is eminent (SCI's Agrisciences Group, 2019).

Population increase is a determining factor that must be immediately taken into consideration in order to gain a clearer picture. The world population is rapidly increasing, whilst at the same time, crop yields, mainly grain and corn, could decrease by 50 per cent over the next 35 years because of altered climatic conditions.

Population growth, along with rising incomes in developing countries (which cause dietary changes such as eating more protein and meat) are driving up global food demand. Food demand is expected to increase anywhere between 59% to 98% by 2050 (Valin et al, 2013). This will shape agricultural markets in ways we have not seen before. Farmers worldwide will need to increase crop production, either by increasing the amount of agricultural land to grow crops or by enhancing productivity on existing agricultural lands through fertilizer and irrigation and adopting new methods and technological solutions.

It is clear that the world will need to produce more food and that key resources are limited. Agriculture will have higher impacts on the environment and the climate. Moreover, climate change affects — and will continue to affect — how much food can be produced and where.

> ""Climate change is acting as a brake. We need yields to grow to meet growing demand, but already climate change is slowing those yields," Michael Oppenheimer (IPPC report).

Increases in temperature and carbon dioxide (CO_2) can increase some crop yields in some places. In order to realize these benefits, nutrient levels, soil moisture, water availability, and other conditions must also be met. Changes in the frequency and severity of droughts and floods could pose challenges for farmers and ranchers and threaten food safety. Meanwhile, warmer water temperatures are likely to cause the habitat ranges of many species to shift, which could disrupt ecosystems. Overall, climate change could make it more difficult to grow crops and raise animals in the same ways and same places as we have done in the past.

The effects of climate change also need to be considered along with other evolving factors that affect agricultural production, such as changes in farming practices and technology.

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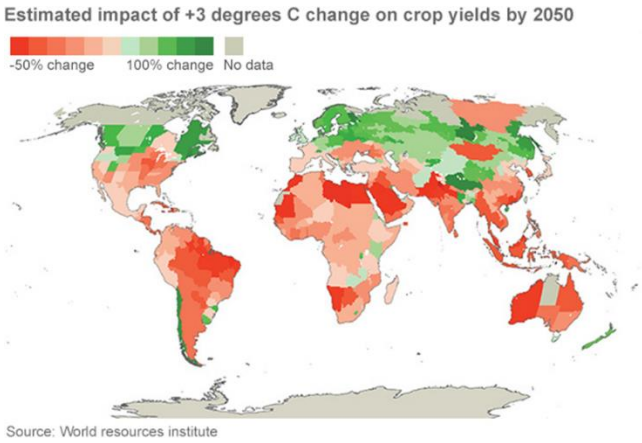
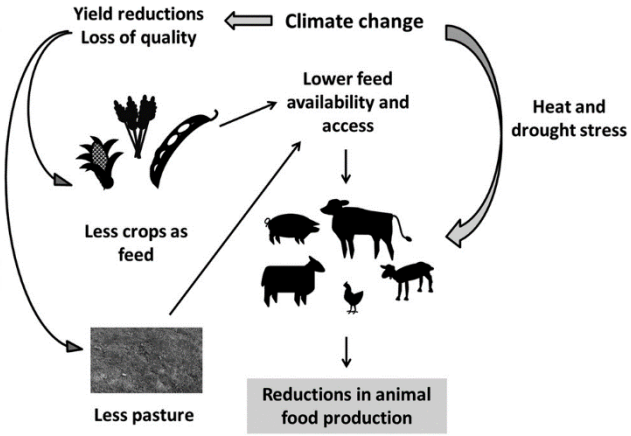
> Agricultural activities are directly responsible for 17% of total greenhouse gas emissions

Modern agriculture, food production and distribution are major contributors of greenhouse gases. Agricultural activities are directly responsible for 17% of total greenhouse gas emissions, and an additional 7-14% through land use changes (OECD, 2016). In addition, reductions of "living carbon potential" have resulted from deforestation, biodiversity loss, accelerated soil erosion, loss of soil organic matter, salinisation of soils etc as a consequence of intensive agricultural practices.





In conclusion we can observe a vicious cycle that makes agriculture both a victim (given the negative effects of global warming on food supply) and a perpetrator (one of the main causes of climate change).

Agriculture both contributes to climate change and is affected by climate change. There is a dire need to reduce global greenhouse-gas emissions from agriculture and adapt its food-production system to cope with climate change. But climate change is only one of many pressures on agriculture. Faced with growing demand and competition for resources, the global food production and consumption need to be seen in a broader context, linking agriculture, energy, and food security.

Recent research and innovative approaches that integrate climate change science with agricultural production provide a road map for improving food security while adapting to and mitigating the effects of climate change. CSA is the main approach that helps to effectively support agriculture and ensure food security in a changing climate.

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Conferences & Events

AGRO CLIMA WATER CONFERENCE

July 15-17, 2020
Chania, Greece

The Agro Clima Water project conference will be held on the 15-17 July 2020 at Chania, Crete. The project's main objective is to promote water efficiency and support the shift towards climate resilient agriculture in Mediterranean countries [link].

ISCRAES 2020

November 3-6, 2020
Dublin, Ireland

The International Symposium on Climate-Resilient Agri-Environmental Systems (IS-CRAES) will be held at the University College Dublin. The theme of the symposium is "Contributing to the United Nations Sustainable Development Goals (UN-SDGs) through the Development of Climate-Resilient Agri-Environmental Systems" [link].

2ND ANNUAL AGRITECH AND CLIMATE SMART AGRICULTURE CONFERENCE

Krakow, Poland
November 24-25, 2020

The 2nd Annual Agritech and Climate-Smart Agriculture Conference 2020, will take place in Krakow, Poland on the 24 – 25 of November 2020. The conference offers a meeting place for top manufacturers, researchers, academics, decision-makers and business professionals [link].

EMS ANNUAL MEETING 2020

Bratislava, Slovakia
September 7-10, 2020

The European Meteorological Society Annual Meeting 2020 will be held from 7 to 11 September 2020 at the University of Economics, Bratislava, Slovakia. The Annual Meetings of the EMS aim at fostering exchange and cross-fertilization of ideas in the meteorological, climatological, and related communities [link].

HAICTA 2020

Thessaloniki, Greece
September 24-27, 2020

The 9th International Conference on Information and Communication Technologies in Agriculture, Food & Environment is organized by the Hellenic Association for Information and Communication Technologies in Agriculture, Food and Environment (HAICTA) in cooperation with a number of Universities and Institutes. HAICTA 2020 aims to bring together professionals, experts and researchers working on ICT in Agriculture, Food and Environment. It additionally aims to emphasize on the applicability of ICT solutions to real industry cases and the respective challenges [link].

Please note that due to the coronavirus all events may be subject to cancellations or rescheduling.

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Tech-news2know

According to Ample Market Research, the **Climate-Smart Agriculture Market** has witnessed continuous growth in the past few years and is projected to grow even further until 2025.

As leading companies, Ample Market Research, highlights Deere & Company, Trimble, Inc., Raven Industries, Inc., AgJunction, Inc., AGCO Corporation, The Climate Corporation, AG Leader Technology, Precision Planting, Inc., SST Development Group, Inc., Topcon Positioning Systems, Inc., Semiosbio Technologies, Inc., DeLaval Corporation, GEA Group AG and BouMatic, LLC.

Airbus and **Agri Technovation** joined forces to support farmers; Agri Technovation has announced the integration of Airbus' Verde crop analytics tool with its digital platform MYFARMWEB.

Arable Labs is a data company that powers better decisions in agriculture. Arable's Mark 2 is a crop and weather-sensing device that measures over 40 elements of the crop system in one simple, compact, and reliable device. It installs in minutes and requires near-zero maintenance. It can stand up to the toughest conditions on the farm and also creates a platform in the field to connect and power other sensors that simplifies the farmer's operation by keeping all their data in one place.

Sencrop has announced the acquisition of sensor specialist Visio-Green, creating what's claimed to be Europe's largest real-time farm weather network.

Innovative sensor system signals a new age of water management as cutting edge technology from **Myriota** and **Goanna Ag** is unlocking the power of remote monitoring at a price point and scale never seen before. Goanna Ag has partnered with Myriota to create a suite of products that can be installed and monitored from anywhere on the planet. Goanna Ag's new GoSense range allows farmers to continually monitor widely distributed water assets and set up instant, real-time information and alerts. The GoRain and GoTank products track rainfall and water tank levels accurately, with recordings from these products able to be viewed easily via the Goanna Ag app.

With a long battery life and integrated Myriota satellite connectivity, users can receive regular updates after a storm or rain event. Units include 3 years of connectivity, data management and app access as standard. Future iterations of the GoSense range will see Goanna Ag integrate smart functionality, including point specific weather forecasting, aggregated and granular rainfall mapping, and an initial on-the-go yield forecaster for dryland cropping.

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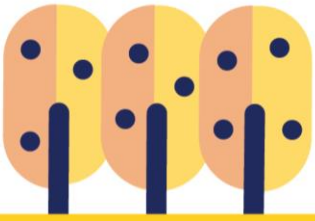
Project Partners

The longstanding activity of STARGATE partners in a very wide and diverse community is one of the key features of the project and a pillar of its success. Each partner is bringing to the project an extensive 'local & beyond' network of stakeholders providing a solid base upon which STARGATE can build a substantial base of local actors, enablers of project outputs.



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