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Changes in climate extremes in Central Asia under 1.5° C and 2° C global warming and their impacts on agricultural productions

Xiu Geng (gengx.15b@igsnrr.ac.cn)

Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China

Changes in climate extremes under 1.5° C and 2° C global warming may impact agricultural production across Central Asia. We used the simulated daily data of average temperature, maximum temperature, minimum temperature, and precipitation provided by the Inter-Sectoral Impact Model Intercomparison Project and analyzed the current status and future projected changes of a set of climate extreme indices related to agricultural production under 1.5° C and 2° C global warming. In addition, the possible impacts of climate change on agricultural production in Central Asia were discussed. The results show that the annual mean temperature in Central Asia will increase by 1.48° C and 2.34° C at 1.5° C and 2° C warming levels, respectively, compared to the base period (1986-2005), and the increasing trends are significant at α=0.01 for all grids. Warm days and growing season length will increase. Under the 1.5° C scenario, mean annual total precipitation (PRCPTOT) and heavy precipitation (R95P) will experience an increase of 8.33% and 25.99%, respectively, and the consecutive dry days (CDD) will be reduced by 1.1 days. However, the standardized precipitation evapotranspiration index (SPEI) shows significant drought conditions in most of Central Asia (more than 60%). Under the 2° C scenario, there will be a 3.89% increase in PRCPTOT and a 24.78% increase in R95P. Nevertheless, accompanying the increase in CDD (0.8 day) and the decrease in SPEI, drought condition will be further exacerbated. These results indicate that Central Asia is likely to face more severe ecological problems in the future, which will threat the regional agricultural production. Farmers in the region may lose their income in the near future, and the foreseeable decline in the production of various crops and the continuous increase in the population will aggravate the food security problems. Therefore, adaptation strategies should be implemented immediately to mitigate the negative impacts of climate change on Central Asia’s agriculture.

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Climate change impacts on irrigated crop production in Central Asia

Atabek Umirbekov (umirbekov@iamo.de)

Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle (Saale), Germany

Heterogenous precipitation patterns and arid climate conditions of Central Asia determine dependence of the countries in the region its limited water resources for crop production. Over the past century, the region saw a 4-fold expansion of the irrigated areas and now more than 90% of its endorheic rivers flow is diverted to the agricultural fields. Such distorted water supply-demand balance, combined with annual volatility in the seasonal runoff, makes the irrigated agriculture drought-prone. Climate change will assumingly exacerbate the situation by reducing the runoff and altering seasonal hydrological dynamics in the region`s rivers. This study aims at assessing impacts of climate change and climate variability on crop production on the selected river basins in Central Asia, through establishing a coupled hydrological and crop model. The coupled model allows to compare hydrological responses to long-term climate projections with crop water requirements, and thus, determine seasonal water shortages per each basin. This will also allow to estimate needed improvements in the water use efficiency, optimal crop structure and cropping patterns to cope with the growing water deficit.

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Waterholes as hotspots of greenhouse gas emissions in the tropical savanna of East Africa

Luisa Minich (luisa.minich@gmail.com)

Institute of Geography, Eberhard Karls University Tübingen, Tübingen, Germany

Africa is highly vulnerable to climate change due to its dependency on the agricultural sector and a rapid population growth. Adaptation and mitigation to climate change within the agricultural sector through improved productivity and reduced environmental impacts are indispensable to ensure food security and sustainability. It is necessary to understand reactions of the environment to agricultural processes and the development of greenhouse gases (GHG) within ecosystems. It was hypothesized that waterholes are hotspots of soil GHG emissions due to increased allocation of animal feces because of their function as watering place for livestock and wildlife and higher soil humidity. GHG fluxes around waterholes were compared with fluxes in the savanna grassland of East Africa. The study was performed from mid of April to the beginning of June 2018 on five sampling sites located on farm land southeast of Nairobi, Kenya: three waterholes and two savanna areas. Waterholes could be identified as hotspots of GHG emissions, since mean fluxes of CO_2, CH_4 and N_2O were higher near than far from the waterholes. However, higher GHG fluxes near waterholes were predominantly due to enhanced soil moisture and restricted to a small interface between water and land. The effect of gaseous nitrogen loss through a concentration of feces around waterholes is negligible for the rainy season and expected to increase during the dry season. The seasonal climate affected GHG emissions resulting in higher fluxes in the rainy season. GHG fluxes in the savanna were generally quite variable and influenced by smallest changes of environmental conditions and soil properties.

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Challenges in deriving seasonal glacier mass balances from bistatic TanDEM-X radar data

Bianca Bieß (bianca.biess@gmx.de)

Department of Geography, University of Tübingen, Tübingen, Germany

The potential of the TanDEM-X radar data for the derivation of seasonal glacier mass balances of the Purogangri ice cap in the Tibetan Plateau was evaluated in the context of this research. For the south- and southeastern lowlands, the glaciers in the high mountain regions play a fundamental role as water reservoirs, thus the Tibetan Plateau is also known as the “Asian Water Tower”. Seasonal glacier mass balances can serve as a basis for well-founded discharge measurements, which should allow a more precise estimation of future water availability and agricultural productivity for the Asian countries. The seasonal glacier mass balances were derived by differential interferometry from the bistatic TanDEM-X radar data for four different time periods in the year 2015. On the basis of a statistical analysis based on climate and relief parameters, it became clear that the derived glacier mass balances could not be considered plausible. This was particularly evident from the correlation with the altitude. An increase in mass below the equilibrium line during a simultaneous decrease in mass above the equilibrium line inside the ice cap is not considered feasible. A possible explanation for the implausible results is the variability of the penetration depth of the radar radiation into the glacier surface. It is possible that the detected height and mass balance changes are not due to a real change, but to the variability of the penetration depth between the recording times. However, the methods of remote sensing for the derivation of seasonal glacier mass balances have great potential. Thus, the methodology could be tested with a different data basis (e. g. Sentinel 1C).

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Hydro-Agro modeling to Assess Climate Change Impacts on Agriculture in Morocco

Ihssan El Ouadi (elouadihssan@gmail.com)

The National School of Mines of Rabat, Rabat, Morocco

Agronomic ideas and processes are becoming increasingly integrated with more traditional engineering and hydrologic models of water management problems. This research presents a mathematical model of the Ait Ben Yacoub Region (Morocco), elaborated for the first time, to assess potential effects of climate change on irrigated agriculture and resources water. The novelty of the approach lies in the capacity of this integrated framework to take into consideration agronomic, socioeconomic and hydrologic systems in a spatially-explicit manner covering all dimensions and scales relevant to climate change. This model simulates the behavior of farmers in response to a severe climate change scenario A2 up to 2050 (IPCC). The results of simulation show that climate change will reduce considerably the availability of water resources and will reduce also crop yields (between 2% and 10 %) and increase irrigation water requirements. The resulting changes of water stress, crop yields and crop competitiveness will drive changes of crop land allocations. The cultivated area will decrease significantly by 45 %. The model results demonstrate also that climate change will produce significant reductions of the region's income by 13 % and the small farms will be more vulnerable to this reduction in income. The model and the results constitutes a real tool for preparing actions and strategies to reduce the potential negative impacts of climate change that can be taken by decision makers in the region and nationality.

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Robustness of the link between the precipitation in the North Africa and standard modes of atmospheric variability.

Arab Djebbar (arab.djebbar@uclouvain.be)

Université Catholique de Louvain, Louvain la Neuve, Belgium

The North African region, situated in the shift zone between the wet European mid-latitude and the dry subtropical climate is characterized by ample fluctuations and have a high sensitivity to atmospheric perturbations. The link between winter precipitation variability in this region and atmospheric patterns over the last millennium is assessed here using several different gridded dataset of observations and reanalysis as well as model simulations from the fifth phase of Coupled Model Intercomparison Project (CMIP5) and third phase of the Paleoclimate Modelling Intercomparison Project (PMIP), covering the last millennium. We show that the link between the zonal wind velocity at 850hPa (U850) and winter precipitations is stronger and more robust overtime than the link with some well-known modes of variability, such as the North Atlantic Oscillation, Mediterranean Oscillation and the Western Mediterranean Oscillation. U850 also better explains the interannual changes in winter precipitation variability in North Africa over the last millennium. Both CMIP5 winter precipitation and U850 time-series present a significant decreasing trend, associated with drier condition, starting during the 19th century. Furthermore, both tree rings reconstructed Palmer Drought Severity Index (PDSI) and the one derived from model results display a decreasing trend toward drier conditions over the same period as for precipitations.

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Agricultural Systems in Central Anatolia

Neriman Erdem (nererdem@gmail.com)

Istanbul Technical University, İstanbul, Turkey

The central Anatolian is one of the most important agricultural product lands in Turkey. Especially Konya basin has a significant role in agricultural production. However, the basin is up against remarkable ecological sustainability problems such as management of water resources, the salinity of soil, climate change and aridity. That is why I prefer to study this region and theme. As the first part of my thesis work, I will be searching for the agricultural production methods of Central Anatolia from the past to the present. So, I would like to share with you the outcomes of my study about agricultural past of Central Anatolia. The study will include periods of Neolithic, Early Bronze Age, Roman, Byzantine, Ottoman and modern Turkey. It will be benefited from archeological evidence and historical records. On the advancing parts of the survey, agent-based modeling also going to be applied to get the yield and impacts of different agricultural systems. Thus, differences between several methods and periods will be found out as an achievement of study. Moreover, interconnections will be searching between agriculture and environmental-climatic conditions, cultural adaptations associated with the results of this study.

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Effect of clonal selection, climatic conditions and geographical origin on yield, quality and chemical composition of Argan oil

Rachid Ait Hammou (rachidaithammou87@gmail.com)

Faculty of Sciences, Ibn Zohr University, Agadir, Morocco

Argan oil is precious oil with food and cosmetic uses. In recent years, this oil has been subject to an increasing national and international demand. The present work aims at studying the effect of clones and age, year of harvest and geographical origin on Argan oil quality and chemical composition. The results indicate that age does not affect Argan oil quality and fatty acids content. However, clones had a significant effect on fatty acids and tocopherol levels. Saturated and unsaturated fatty acids were highly influenced by the year of harvest and geographical origin, presumably due to climatic conditions. Unsaturated fatty acids varied from 78.28 % to 81.77 %. Depending on clones, total tocopherols varied from 687.40 mg/kg to 1068 mg/kg. This study is useful for the choice of clones with the aim of developing Argan trees orchards destined to oil production.

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Spatial assessment of land fragmentation/land consolidation trends and their impact on farm productivity in Post-Communist Romania

Olimpia Copacenaru (olimpia.copacenaru@drd.unibuc.ro)

University of Bucharest, Faculty of Geography, Doctoral School Simion Mehedinti - Nature and Sustainable Development, Bucharest, Romania

Romania is one of the European countries with the highest potential in agriculture, with more than half of its territory available for agricultural purpose and almost double comparing with the EU average in terms of arable land surface per inhabitant. However, as in most Eastern European post-communist economies, land fragmentation is a common circumstance and, despite the available resources, agriculture in Romania is not yet established as a strong economic branch. According to the National Statistics Institute, in 2015 the agriculture merely contributed 5 % to the national GDP while employing close to 30 % of the country’s workforce. Several socio-economic events in Romania's history still make great influence on the current agricultural development. Following the collapse of the Romanian communist regime in 1989, the country switched to a capitalist system, but still retaining the legacy of former practices in the agricultural development. In the late 1990’s, it was generally acknowledged that many of these were unsustainable with respect to the market demand and the overall environmental impact, thus developing a major obstacle for farm efficiency and land productivity. The aim of this study is to assess land use dynamics and the degree of fragmentation of Romania’s arable land, in relation to farm and labor productivity, as well as a series of socio-economic indicators related to rural development. The change detection analysis was performed based on multi-resolution remotely sensed data, acquired from 1990 until present, by using specific supervised and unsupervised classification and segmentation techniques. Several parameters and fragmentation indices were computed for each individual plot, in order to quantify land use and land cover changes within the selected time frame, thus providing a solid approach and valuable insights on the regional patterns of the land fragmentation and lately, land consolidation process. The results have later been compared to agricultural land productivity indicators, having as main goal the quantification of the impact of the different land use policies and key-agrarian reforms implemented in Romania in the past 30 years. The methodology and results of the study can be used as a solid support for the refinement of the current Common Agricultural Policies and also a feasible tool to investigate further changes in agricultural landscapes.

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The power of European food quality schemes: the strength2food project

Charoula Chousou (xaraxousou@gmail.com)

Aristotle University of Thessaloniki, Thessaloniki, Greece

The European Agricultural Policy tries to make the agri-food chains more competitive through the definition and promotion of food quality schemes. The main purpose of this policy shall emphasize the quality and traditional character of agricultural products. A product labeled as PDO/PGI and TSG is closely related to a specific geographical location and has passed an approval process, whereas the designation of "organic" is used exclusively for products which are produced according to the EU regulations for organic production. However, this policy is not only targeted to achieve greater competitiveness but it can be also considered an important mechanism for rural development. This work focuses on the policy and practical recommendations arising from the Strength2Food research project, that seeks to improve the effectiveness of EU Food Quality Schemes (FQS), Public Sector Food Procurement (PSFP) and stimulate the development of Short Food Supply Chains (SFSC). Specifically, it will be presented a coherent analysis of the effects of EU quality policy and public sector food procurement policies on economic, social and environmental sustainability and on the promotion of a healthy diet. Particular attention will be paid to understand the interactions and crossovers between different FQS/PSFP and SFSC initiatives: for example do organic SFSC generate greater socio-economic and environmental benefits than non-organic SFSC? Thus, the synthesis will assess whether quality initiatives (i.e. PDO, PGI, TSG, organic, SFSC and better PSFP) are mutually reinforcing and under what circumstances.

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A participatory system dynamics approach addressing climate change adaption in the agricultural sector in the Lüneburg Heath

Sabine Egerer (Sabine.Egerer@hzg.de)

Climate Service Center Germany (GERICS), Uni Hamburg, Hamburg, Germany

Our study focuses on adaption to climate change in the agricultural sector, specifically on the adaption to drought events, in the Lüneburg Heath, Germany. Today’s problems in the Mediterranean region might be tomorrow‘s problems in central Europe and Germany, as water scarcity and extreme weather events, such as the drought in 2018, impose increasing pressure on the agricultural system and demand adaption to the changing conditions. Thus, it is beneficial and necessary to learn from more southern regions. To address these challenges, we aim at developing a system dynamics model that combines physical, economic, social and political aspects of agriculture in the Lüneburg Heath. Within a participatory modeling approach, not only farmers, but various actors linked to the agricultural sector are involved in the model-building process in form of interviews and group model building. Thereby, the needs and requests of the different actors are taken into account and informal knowledge can be incorporated into the model. We present the qualitative model that resulted from interviews with 20 stakeholders and a group model building workshop. The model depicts the agricultural system of the region including climate, hydrology, plant growth, economy and politics. Following the spirit of Donella Meadows in a structured manner, we propose leverage points of the system as well as adaptation strategies that have the potential to increase the resilience to climatic, ecological, economic and social challenges in the future. Furthermore, we show which actors might have the power to implement these measures to adapt.

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Agricultural policy of Morocco

Kaouter Essakkat (essakkatkaoutar@gmail.com)

Mediterranean Agronomic Institute of Chania (CIHEAM), Chania, Greece

This study aims to highlight the main agricultural policy in Morocco and gives an insight into the factors behind its stable growth while facing many challenges such as climate change. It also presents the building blocks of 'Green Morocco', the strategy that was implemented by Morocco to upgrade its agricultural sector. Findings of this research show that no prosperity is achieved unless the strategical foundations of 'Green Morocco' are applied.

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The state of agricultural landscapes in the Mediterranean - Investigating the abandonment of smallholder agriculture on terraced landscapes in southeastern Spain

Katharina Heider (info@katharina-heider.de)

University of Hamburg, Hamburg, Germany

Terraces and traditional irrigation technologies are an important part of Mediterranean cultural landscapes. These landscapes represent the outcome of a continuous co-evolution of human and environment, which resulted in a stable and resilient system. Due to their existence over centuries supporting biodiversity, traditional agrarian land-use practices of the Mediterranean represent a good case for studying rural sustainable development. These sustainable practices of the past can help to find sustainable pathways and transitions for agriculture in the future in a changing climate. Yet, abandonment and fallow of terraces are widespread in the Mediterranean region. These lead to a higher run-off, a higher risk of erosion, less water accumulation in the ground, and endanger the conservation of cultural landscapes. In the past, farmers used traditional irrigation technologies like water wheels (spn. norias) to transport water on the various heights of terraces. The low-intensity and low-impact technology produces low emissions and characterizes the landscape of the Valley of Ricote until today. However, most of the norias are not in use for irrigation nowadays.

This leads to the following research questions:

1. How were traditional landscape elements (i.e. terraces and norias) distributed in the past?

2. What is their condition today?

3. What are the reasons for abandonment and decay?

4. How to support the conservation of these cultural landscapes and the use of traditional landscape elements?

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Cartography of olive trees in the delegation Zarzis (governorate of Medenine-Tunisia) by Landsat 8 OLI: Impact of climate change

Achraf Katar (katar.achraf.ing@gmail.com)

Faculty of Sciences of Tunis, University of Tunis El Manar -Tunis, Tunisia

Land Use/Land Cover Change (LUCC) is recognized as a crucial driver of environmental change on all spatiotemporal scales. Zarzis region is reputed for its olive groves, vital for its socio-economic development and because of severe climatic factors, it has a vulnerable ecosystem. Our study focuses on the monitoring of land use dynamics underpinning climate change and on the spatiotemporal assessment of the vigor of olive groves. Analysis of Landsat 5 TM image acquired in 2007 and Landsat 8 OLI image acquired in 2014 was performed under IDRISI software, by a remote sensing-based Land Change Modeler (LCM) method. Our results have shown a clear improvement in the vigor of the olive trees, mainly attributed to an increase in rainfall during the years 2010 and 2012. We have identified areas where land degradation has been attenuated both with Tabias, as a soil and water harvesting technique and with alley cropping between olive trees, as a promising recent agronomic practice. This analytical study is relevant for sustainable development.

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Future projections of climatic indices relevant to agriculture in the Aegean region

Gianna Kitsara (gkitsara@noa.gr)

National Observatory of Athens, Athens, Greece

The Aegean islands are characterized by strong relief and low vegetation cover and are listed as a region of high desertification risk (Giorgi, 2006; Zanis et al., 2008). The impacts of climate change such as decreased rainfall, temperature increases and extreme weather phenomena, are expected to affect significantly agricultural production, biodiversity, soil structure, and, as a result, local economic activities (JRC, 2014). For millennia terraces allowed the cultivation of island areas with poor and dry soils, reducing soil erosion and wildfire risk. For identifying the most vulnerable regions and prioritize future interventions in the Aegean area, potential future climate changes are examined using projections derived from state-of-the-art Regional Climate Model (RCM) simulations, developed within the framework of EURO-CORDEX (Coordinated Regional Climate Downscaling Experiment). Changes in climate indices, which directly or indirectly affect agriculture in the examined areas, are studied for control and future periods and examined under two new IPCC (2013) emissions scenarios (the medium mitigation scenario and the high emission scenario with no climate mitigation policies). This work aims to provide information on the use of drystone terraces as green infrastructures resilient to climate change impacts, in order to improve agricultural ecosystem resilience, support a modern, extensive and climate smart agricultural sector for the Mediterranean islands, with benefits for local societies.

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Exploring the effectiveness of EU agricultural products quality policy, employing a hybrid Delphi-SWOT paradigm

Dimitra Lazaridou (dimitral@for.auth.gr)

Aristotle University of Thessaloniki, Thessaloniki, Greece

Strength2Food is a project to improve the effectiveness of Europe’s quality food sector. Its aim, among others, is to generate policy recommendations for improving the operation of agricultural products quality policy and public sector food procurement procedures. The intended outcomes will emerge by applying a Delphi technique. The Delphi technique will be employed to evaluate and verify the main project’s policy findings, resulting from previous work packages. Particularly, a hybrid model that combines strength, weakness, opportunity and threat (SWOT) analysis with the Delphi method is recommended for identifying and quantifying the internal and external factors that influence the impact of quality and food procurement policies, on the social and economic sustainability of rural territories. An independent panel of experts, comprised of 50 participants (academics, policy directors, business executives and selected producers and processors), will be invited in two rounds to assess and rank all factors, identified by the SWOT. After experts’ ranking, they will be invited in one more round to propose potential policy implications for the major weaknesses and threats, which will emerge from the results analysis. The findings from this approach could be a tool for improvement the effectiveness of EU agricultural products quality policy and integration of short food supply chains. Moreover, they could assist the formulation of strategy in enhancing the environmental, economic and social sustainability of rural regions, as well as in fostering consumer’s trust and confidence.

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ADAPT2CLIMA tool: A decision support tool for adaptation to climate change impacts on the Mediterranean islands’ agriculture

Ioannis Lemesios (jlemesios@noa.gr)

National Observatory of Athens, Athens, Greece

The ADAPT2CLIMA tool makes it possible to simulate the impacts of climate change on crop production and the effectiveness of selected adaptation options in decreasing climate change impacts on the three Mediterranean islands, namely Crete (Greece), Sicily (Italy), and Cyprus. The tool provides an interactive way (web-GIS platform): i) current climate and future climate projections, with the use of two EURO-CORDEX RCM models, for the areas under study for two different IPCC RCP scenarios (RCP4.5 & 8.8); ii) ground water level projections; iii) impact indicators of selected crops relevant to crops’ biomass (e.g. yield), phenology (e.g. day of flowering and maturing) and physiology (e.g. PE, AE); (iv) socio-economic indicators; (v) overall impact and adaptation assessments for each crop together with an evaluation of the proposed adaptation options. Finally, for the replicability and transferability of the tool, a “processing” function has also added to the tool in order for the stakeholders and policy makers to be able to upload their own data or to modify existing data and to perform customized impacts assessments for other crops or other areas as well.

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Modelling olive groves sustainability in the Mediterranean under current and future climate

Hanene Mairech (mairech.hanene@gmail.com)

The University of Perugia, Department of Agricultural, Food and Environmental Sciences, Perugia, Italy

Olive (Olea europea L.) is the basic tree species among those cultivated in the Mediterranean basin. It has been given considerable prominence regarding its socioeconomic and ecological importance for the area. Nowadays, the cultivation of olive is facing several challenges to maintain its sustainability and improve its production. The footprint of evolution in olive farming concerns economic and environmental aspects. This study focuses on a qualitative and quantitative assessment of olive production process to understand the responses of olive orchards to changes in both climate and agricultural management over the Mediterranean region under present and future conditions. OliveCan model was used to simulate the interaction between olive trees and their environment enabling the comprehension of olive orchard dynamics under heterogeneous environmental conditions in term of productivity, net ecosystem exchange and carbon sequestration potential. Simulations of the olive groves evolution in term of structure and management practices allowed understanding the responses of olive trees to different forcing regarding management practices and climate change impacts. This helped highlight appropriate management techniques with the potential to increase the environmental sustainability of olive groves. This assessment at the Mediterranean region level will improve the understanding of olive capacity to adapt to challenges posed by climate changes and define best management practices for a more sustainable and resilient olive cultivation. Identifying resilient farming management capable of increasing environmental sustainability of olive groves can help promote olive cultivation as a promising measure to reduce greenhouse gases emissions and mitigate climate change.

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Wheat yield and drought in the Iberian Peninsula: interannual variability and crop loss

Patrícia Páscoa (ppramos@fc.ul.pt)

Faculty of Sciences, University of Vigo, Ourense, Spain

The wheat production in the Iberian Peninsula (IP) is mostly rainfed, thus becoming particularly vulnerable to changes in climate. The precipitation regime in the IP presents a high interannual and decadal variability, as well as a high spatial variability. Moreover, there is evidence of a generalized decrease in spring precipitation in the IP, as well as an increase in temperature and drought severity. In this work, the influence of drought conditions on wheat yield at a provincial scale was assessed, using two approaches: a correlation analysis between wheat yield and the Standardized Precipitation Evaporation Index (SPEI) was performed from 1929 to the present; and copula functions were used to relate wheat yield and three indicators, from 1986 to the present: SPEI, the Vegetation Condition Index (VCI), and the Thermal Condition Index (TCI). Wheat yield was available at the province scale, allowing to perform an analysis with a high spatial resolution. The first approach takes advantage of the long wheat yield time-series available: it is possible to see a West-East pattern over the IP, likely due to different climate conditions, and a shift in the relation between wheat yield and SPEI occurring in the 20th century. The second approach allows to include more recent information, obtained using satellite data. Copula functions allow to describe the dependence between variables, using their joint distributions, and were used to compute the conditional probability of crop loss under drought conditions. The selected copula functions are mostly Clayton, pointing to a joint distribution of low extremes.

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Learning from Lubelski region of Eastern Poland: Synergies and trade-offs in the search for common grounds among stakeholders for sustainable biomass supply under climate change

Kesheng Shu (kesheng.shu@iung.pulawy.pl)

State Research Institute of Soil Science and Plant Cultivation, Pulawy, Poland

While facing global challenges, such as climate change, energy transition and urbanization, the role of bioenergy has been recognized by many countries. Meanwhile, unprecedented large-scale biomass production has led to the concerns about its sustainability. However, priorities of different stakeholder groups are not always identical or even conflict with each other. Therefore, understanding the divergences and identifying the possible synergies and trade-offs among diversified interests are critical to find common grounds for a sustainable biomass supply. We choose Lubelski region in Poland as our case study, whose agricultural organization is experiencing a dramatic transition from state-regulated farms to market-based individual peasants in recent years. In this study, we construct a regional recursive dynamic partial equilibrium model to simulate biomass supply chain under climate change. Through modelling the decision making process of aggregate farmers on the municipality level subject to the constraints composed of climate change, land resource availability, institutional arrangements and agronomic rotations, we can identify their opportunities and adaptation strategies. Furthermore, we assume five different objectives (subsidy, labor employment, agricultural welfare, fertilizers usage and carbon sequestration) projecting the preferred strategic aims of each stakeholder group, including farmers, governments and environmentalists. By adopting the multiple criteria decision analysis, we can easily illustrate against whom the one particular group is in conflict and to what extent. By the integration of mathematical programming and multiple criteria procedures, the synergies and trade-offs of diversified interests can be accurately and inclusively presented. Reference point method will be implemented to find compromised solutions to facilitate dialogues among stakeholders. In such a way, the consensus on how to maintain a sustainable biomass supply in the face of climate change can be reached.

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Climate change and its effect on food safety – Problems facing Bulgaria

Zornitsa Spasova (Z.Spassova@ncpha.government.bg)

National Center of Public Health and Analyses, Sofia, Bulgaria

Global warming is exacerbating the food crisis, the poorest regions in the world being most vulnerable. Bulgaria will be also affected by the adverse climate change in terms of agriculture and food safety. The higher air temperatures in Bulgaria will cause an earlier maturing of crops which is related to a shorter reproductive period in which the grain growth occurs. The phenological phases will occur earlier as the effective temperatures necessary for the certain phase of development of the vegetation are coming faster in warmer climate. The shortage of precipitation will greatly affect the agricultural production in Bulgaria. The precipitation sum during the vegetation period will diminish because of the lower precipitation amount and the shortage of the vegetation period. All climate models predict diminishing of the precipitation from March until June, thus negatively affecting soil humidity in the spring period, when most of the spring vegetation starts growing. It is expected that the areal of some crops will move to more northern latitudes and higher altitudes. The agriculture should start using more effectively the water resources and adapt to drought-resistant sorts. Climate change in Bulgaria in the 21st century will mostly affect the spring crops due to the expected precipitation deficit during the warm half of the year; cultures on irrigated lands; the arable lands in southeastern Bulgaria where even in the present climate, precipitation quantities are insufficient for normal growth of crops. The change in temperature and precipitation can affect livestock in terms of reproduction, metabolism, health and nutrition. It will have the most significant effect on food resources during the year, which sets nutrition and profitability of farms. This change can affect feeding indirectly by affecting the resources available for grazing. Raising the air temperature in some cases can cause stress in animals, and even cause death of overheating. A risk exists of the spreading and increase of population and the number of agricultural weeds, diseases and pests. It can lead to an increase in the amount of pesticides and veterinary drugs in food. Changes in rainfall, temperature and relative humidity can easily contaminate food such as peanuts, wheat, corn and rice with mycotoxins that can cause fatal consequences for human health. Bulgaria is considered one of the countries most exposed to risk of aflatoxins among all EU member states, due to climate change.

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The future of farming: A literature review on deconstructing the "young farmer problem in Europe"

Glykeria Theodoridou (glykerit@agro.auth.gr)

Faculty of Agriculture, Forestry and Natural Environment, School of Agriculture, Aristotle University of Thessaloniki, Thessaloniki, Greece

The purpose of this article is to evaluate the evidence for “young farmers problem” in European Union, through a systematical and critical review on recent literature and statistical analysis of Eurostat figures. This analysis demonstrates the differences in young farmer numbers, indicating that there is no lack of young farmers at national level in countries such as Germany, France or Switzerland, but occurs in countries where small-scale holdings are more predominant, such as Italy, Portugal and Greece. However, literature evinces the shortage in young farmers. The number of young farmers has declined in several developed countries in European Union. In 2013, about 30 % of European farms were managed by farmers aged 65 years or older, and in some countries this figure is even higher (Italy 40 %, and Portugal 50 %). European Union is therefore faced with a dual problem: the scarcity of new and consequently young farmers and the rapid ageing of the farmer population. Thus, Common Agricultural Policy pays special attention to the reduction in young farmers, having inducted different policy measures and motives for new farmers in agriculture. A recent strategy adopted by the EU is the “Young Farmer Payment” which provides an additional payment on top of the average basic payment introduced in the last CAP reform. Plenty of different research areas have devoted their research to the future of farming, so a review of the existing literature in order to determine the incentives of young farmers to stay in agriculture, seems very relevant.

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How climate change affect the distribution of Ursus arctos in Europe

Zoi Touloudi (zoitoul32@gmail.com)

Mediterranean Agronomic Institute of Chania, Chania, Greece

Climate change is one of the most critical threats in a global level which can affect the ecosystem and biodiversity. Animals and plants have been affected by recent global temperature changes, potentially leading to shifts of their habitats or local extinction. Species Distribution Models (SDM) being widely and successfully used to predict species responses to climate change. In this study SDM was used in order to assess the impact of climate change on the Ursus arctos (Brown bear). Using the Natura 2000 database and the Maximum Entropy model the current and the future potential distribution were estimated with an excellent model fit (Area Under the Curve= 0.935), using specific bioclimatic variables. The outcome of this study showed that the potential future distribution of Ursus arctos would be decreased significantly and would shift towards the northern countries of Europe. In this research only climatic factors were used in order to specify the Ursus arctos distribution but food availability, area suitability and other factors also influence the presence of a species and represent additional limitations to the species’ current distribution and possible future displacements. Given the above limitations, the impact of climate change of Ursus arctos future distribution is open to further studies.

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Estimating the drought index SPEI over Africa for the present climate

Antonios Tsingoudis (tsingoud@geo.auth.gr)

Aristotle University of Thessaloniki, Thessaloniki, Greece

This study assesses the severity of drought events in Africa and identifies the exposed areas to drought, using the Standardized Precipitation Evapotranspiration Index (SPEI) as an index for drought monitoring, which is estimated using the ERA5 reanalysis dataset. The standardized precipitation evapotranspiration index (SPEI) has been used in a mounting number of climatological and hydrological studies. The SPEI is based on precipitation and potential evapotranspiration (PET) data, and has the advantage of exploiting multi-scalar time series and thus has the ability to include the effects of temperature and PET variability on drought evaluation. The course of action to calculate the index involves a climatic water balance, the accumulation of shortfall and surplus at different time scales, and modulation to a log-logistic probability distribution. One of the challenges in assessing drought events, is the successful identification of their beginning and end, as well as their severity. This identification is one of the main goals of this study as well as the overall understanding of drivers of drought impacts.

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Synoptic weather pattern-based compositing of hail-storm characteristics with emphasis to the ambient air flow

Maria Olga Voudouri (mariaolg@geo.auth.gr)

Aristotle University of Thessaloniki, Thessaloniki, Greece

Moist convection occurs nearly every day in the continental areas of Central and especially Northern Greece during spring and summer seasons. Quite often the convection takes the form of damaging hailstorms. For the staff of the Meteorological Application Centre of the Hellenic Agricultural Insurance Organization, who work on weather modification, it is a challenging task to decide which convective cells to seed, or which side to seed them from. In order to achieve that, the knowledge of the relative air flow field in the vicinity of the cell is of basic importance. In the case of the developing stage, relative air flow can be approximated by the ambient one minus the propagation speed. A compositing is performed to the cells that were associated with hail of diameter > 5 mm, during 2005 - 2017, based on the synoptic weather pattern (Sioutas, 2016). Apart from the air flow field, the reflectivity, satellite derived radiance and the hailstone size are also composited. This work is intended to provide a scientific basis for assistance to the work of both meteorologists and pilots, involved in the National Hail Suppression Programme.

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Scenarios of Brazilian soybean production under climate change

Marcia Zilli (marciatz@gmail.com)

National Institute of Space Research (INPE), Sao Jose dos Campos, Brazil

Agriculture is responsible for 24 % of the Brazilian gross domestic product (GDP), with the main commodity, soybean, representing almost 57 % of the country’s cropland. The country produces 34.7 % of the total soybean consumed in the world and should have a 27.5 % area expansion over the next 10 years, mainly toward eastern Amazon and Matopiba region. However, these advances can be directly impacted by climate change. Here, we quantify these impacts through the year 2050 using GLOBIOM-Brazil, a global bottom-up partial equilibrium model of competition for land use between agriculture, forestry, and bioenergy sectors which includes various refinements reflecting Brazil’s specificities. It computes consumption and trade for 30 regions of the world; and production and land use at a 50 km grid resolution in Brazil and 250 km in other regions for the most important crops, wood, and animal products. Land use change depends on the feedback between agricultural demand and biophysical and regulatory constraints on land. The model also considers international trade and exogenous drivers. Data on the impacts of climate change on future potential yields are obtained from the ISIMIP platform. Here we considered two crop models, EPIC and LPJmL, forced by climatic parameters derived from two Global Climate Models (GCM), HadGEM2-ES and IPSL-CM5A, run for RCP8.5 emission scenario. GLOBIOM-Brazil simulations indicate negative impacts on soybean area and production, more intense when using LPJmL data, despite differences in the spatial distribution between the crop models. Regardless of uncertainties among scenarios, the consistent negative impact can affect the Brazilian economy and exports.