Editor: Thomas Panagopoulos

Advances in Climate Changes, Global Warming, Biological Problems and Natural Hazards

3rd WSEAS International Conference on CLIMATE CHANGES, GLOBAL WARMING, BIOLOGICAL PROBLEMS (CGB '10)
3rd WSEAS International Conference on NATURAL HAZARDS (NAHA '10)

University of Algarve, Faro, Portugal, November 3-5, 2010

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Preface

This year the 3rd WSEAS International Conference on CLIMATE CHANGES, GLOBAL WARMING, BIOLOGICAL PROBLEMS (CGB '10) and the 3rd WSEAS International Conference on NATURAL HAZARDS (NAHA '10) were held at the University of Algarve, Faro, Portugal, November 3-5, 2010. The conferences remain faithful to their original idea of providing a platform to discuss climate change factors, variations within the earth's climate, non-climate factors driving climate change, human influences on climate change, monitoring the current status of climate, simulation of climate change, climate change and biodiversity, dynamics and stability of ecosystems, natural hazards, crops & drought, conditions that help the spread of vector-borne diseases etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Effects of Global Climate Change on Development and Growth of Crops

Professor Jose Paulo de Melo-Abreu
Instituto Superior de Agronomia
Technical University of Lisbon (TULisbon)
Tapada da Ajuda, 1349-017 Lisboa, Portugal

Abstract: The increase of emissions of green house gases is changing the global climate. In most areas of the world, temperature will go on increasing, rainfall patterns will be distorted, absolute humidity will rise, and extreme weather events will be likely more frequent and severe. However, the projections that have been published show that the climates of the various geographical areas are affected differently. In general, as far as crop performance is concerned, lower latitudes get the most pernicious effects and higher latitudes tend to have little or no crop loss. Increased carbon dioxide concentration and some of the changes on weather elements will influence crop development and growth in a simple way, but other repercussions are more difficult to grasp.
Increased carbon dioxide concentration in the air augments photosynthetic rate, mainly of C3 plants. Air temperature increases favour plant development and growth under colder conditions, but may reduce plant performance in warmer areas. Higher temperatures may favour the development of pests and diseases. Increases in winter temperature may lead to inadaptation of crops, mainly deciduous tree crops, that require chilling before new leaves and flowers are formed. Increases in summer temperature may lead to heat stress of some crops or varieties. Concentration of rainfall, that is likely to occur in many areas, will alter the soil water balance. These changes may occur seasonally or throughout the year, but they will mean less water available for crops and natural vegetation. This means that water availability for crop production is likely to decrease in many areas where irrigation is necessary and rainfed production is already vulnerable to natural climate variability. It may therefore result in the need for changing crop patterns or to adopt different crop varieties, and to use different cropping techniques, including changes in planting dates.
This presentation undergoes a comprehensive discussion of all these aspects, taking a quantitative perspective, that includes the exhibition of results of simulations, under different scenarios.

Brief Biography of the Speaker: Professor Jose Paulo Mourao de Melo e Abreu is Associate Professor w/ Habilitation in the Instituto Superior de Agronomia, The Technical University of Lisbon, and has undertaken researched in the areas of Global Change, Agrometeorology and Modelling in Horticulture and Agriculture. Published about eighty publications, including two FAO books, and delivered about fifty invited talks in Portugal and abroad. Developed twelve models.
He is the national representative of Portugal in the European Society for Agronomy, is a referee of about twenty international journals and has organized three international meetings. Has been responsible for six research projects, including two international, and cooperated in many others.

Plenary Lecture 2

The Contribution of Portuguese Agriculture to the Climate Change and Adaptation Strategies for the Sector

Mrs. Corina Carranca
Researcher
INRB, I.P/INIA
Quinta do Marques, Av. Republica, Nova Oeiras
2784-505 Oeiras, Portugal
E-mail: corina.carranca@inrb.pt

Abstract: Agriculture in Portugal contributes for less than 10% of total greenhouse gas (GHGs) emissions, where 34% comes from methane (CH_4) from animal husbandry, 64% comes from nitrogen (N) oxides (NOx and N_2O) by the intensive use of mineral fertilizers, the incomplete nitrification and denitrification processes, the waterlogged rice fields, the addition of organic compounds to the soil, the drip fertigation, the N2 fixation by legumes, particularly, the pastures, and the sediments, by the alternate wetting and drying processes and the presence of soil organisms such as worms. Animal husbandry is the main responsible (71%) for total emission coming from agriculture, particularly the dairy cows housed. Methane emissions from animal housing are mainly caused by enteric fermentation. During storage and after spreading of farmyard manure in the soil substantial differences concerning ammonia (NH_3), N_2O and CH_4 emissions occur with composted and anaerobically stacked farmyard manure. The compost can emit more NH_3 than the anaerobically stacked farmyard manure. Ammonia is also released during the industrial production of mineral fertilizers and from senescent leaves. In agriculture, forests are the main responsible for CO_2 emission (4 Mt CO_2 equivalent year^{-1}) by the respiration process, and the double amount can be reached in presence of fires. However, forests have an important role on CO_2 capture during the photosynthetic process, by C accumulation in the plant biomass and soil organic matter. The Portuguese forest can sequester about 80 t CO_2 ha^{-1} year^{-1} and contributed to about 18% of C sequestration in 2010. The eucalyptus has a very efficient capacity to use water and nutrients and can accumulate C in the biomass and soil more efficiently than other plant species in temperate climate. Microbial activity is also responsible for CO_2 emission, particularly under soil disturbance. This is the case of pastures conversion to annual crops. On the other hand, if soil conservation practices have been used, such as for permanent pastures, CO_2 sequestration in the soil is appreciable. "Montado" is a Portuguese extensive farming system consisting of cork and holm-oak trees, several shrubs and biodiverse pastures. This is a very sustainable agricultural system where the biodiverse pasture consists of more than 20 species and include several legumes. They can sequester more than 4 t C ha^{-1} year^{-1}, particularly in the soil since the crops are used for animal feeding (-4.5 t C km^{-2} year^{-1}). Supposing an increase from 10 to 30 g organic matter kg^{-1} soil, an accumulation of 33 t C ha^{-1} in a 15 cm layer is expected, corresponding to a sequestration of the order of 128 t CO2 ha^{-1}. These data show that 200,000 ha of permanent pastures will largely meet the Kyoto Protocol Commitment (1997). About 80% of cultivated plants can be associated with mycorrhizal soil fungi. This symbiosis allows a better performance and health for most efficiently mycorrhized plants, particularly under biotic and abiotic stress, such as drought, high temperatures, saline soil and contaminants. These plants can capture more CO_2 from the atmosphere by the photosynthetic process, producing higher levels of photo assimilates which are exuded by the roots enriching the mycorrhizosphere and contributing for C sequestration.

Brief Biography of the Speaker: Corina Carranca is a Researcher at INRB, I.P./INIA, at Oeiras (Portugal). She is a specialist in nitrogen cycling, namely nitrogen dynamics in soils and plant nutrition. She published ninety eight publications, including ten book chapters and thirty-three publications in national and international peer-review journals. She was a national representative of Portugal in the European Union for the Directive for Soil Conservation and Protection. She has been a referee of sixteen national and international journals and books and was included in two Editorial Boards of two international journals. She has been responsible for fifteen national research projects and cooperated in many others.

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