15 MARCH 2000: WEATHER, WATER AND HORTICULTURE

Mr N Reynard, Institute of Hydrology - Climate and hydrological variability - **n.reynard@ioh.ac.uk**

Climatological and hydrological systems both exhibit a high degree of natural variability at all time scales, from days to decades. This presentation will describe the highly variable nature of some of the climatological and hydrological indicators in the UK, particularly focussing on the recent past, as a period of extreme variability for many regions of the country. The description of the behaviour of these time series of environmental data leads naturally onto a discussion of possible trends and the dangers associated with extrapolating too much from relatively short series. Finally there will be a section that takes a forward look, with future climate change in mind, attempting to relate some of the current patterns with available scenarios of climate change

Dr R Butterfield, University of Oxford - Climate change, climate variability and agriculture in Europe: An integrated assessment - **ruth.butterfield@ecu.ox.ac.uk**

The paper will present selected results from the CLIVARA project "Climate change, climatic variability and agriculture in Europe" and the preceding CLAIRE project to illustrate the possible impacts of climate change on agricultural and horticultural crops in Europe. The CLIVARA project, funded under the European Commission's Environment Programme, involved multidisciplinary researchers from sixteen European research institutes.

The CLIVARA project addressed 2 main themes: (i) the advancement of fundamental research on modelling of crop responses to climate change, and; (ii) the development of methods for scaling up field-based crop models to investigate regional climate change impacts.

Experiments have been conducted on the effects of extreme weather events and/or elevated carbon dioxide on crop physiology. Results from these experiments were used to improve the performance of existing site-based mechanistic models. Four spatial scales were central to the project: nine sites; three regional studies (central England, Paris Basin/Camargue and Tuscany); five national studies (Great Britain, Finland, Denmark, Hungary and Spain) and the European continent. The sensitivity of the scaling up methods and crop models to changes in both mean climate and the variability of climate has been analysed. The crop-climate models were run with projections of future climates from transient global climate models.

Professor P Hadley, University of Reading - Responses of vegetable crops to global environment change - **p.hadley@reading.ac.uk**

Increases in emissions of radiatively active greenhouse gases, such as CO_2 as a result of industrial activities are predicted to lead to rapid changes in future climates including increases in seasonal temperature. These increases are likely to result in changes in yield,

quality and maturity characteristics of vegetable crops. In studies on a range of vegetable crops grown under field conditions designed to simulate future climate change, rate of progress to crop maturity was increased with a rise in temperature but was unaffected by elevated CO_2. Yield of all crops increased under conditions of elevated CO_2 concentration; a 50% increase in CO_2 typically increased yields by at least 30%. However, in crops such as cauliflower and onion this increase was offset by a reduction in yield brought about by warmer temperature. For example, in cauliflower a 1^oC rise in temperature reduced yield by 6%. However, in other crops such as carrot, yield was positively related to increased CO_2 and temperature. Generally crops that showed a positive response to both CO_2 and temperature were those that were harvested at an early stage in their physiological development (for example, carrot) whereas those that were harvested late in their development showed a negative response to temperature (for example, onion and cauliflower). The implications of these responses to future vegetable production in the UK are discussed.

Dr J Morison, University of Essex - Plant and environmental control of water use - **morisj@essex.ac.uk**

Very little of the water 'used' by plants is directly used in the biochemistry of photosynthesis. Most is unavoidably lost because of the evaporation of water from the leaf internal surfaces, as plants take up carbon dioxide to grow. Plant water use therefore depends on well established physical relationships, but also on various plant characteristics. Most obvious among these is leaf area, and of course leaf acre changes in seasonal climates for both annuals and perennials. Margary was one of many people who have studied how plants develop and how for example bud burst in spring varied between seasons. This paper will describe in simple terms some of the controls on plant water use in a range of contrasting plants and environments, ranging from the Amazon floodplains to Oxfordshire woodland. In particular the linkage between water use and growth will be explored, ending with some speculation on the impact of interannual variation in seasonal timing.

Mr G Barter, RHS Wisley - Drought resistant gardening - **guyb@rhs.org.uk**

Trees in UK gardens are expected to last 50 - 120 years, and shrubs 15 years or more. Climatic change could affect longevity and therefore impact on long term planning.

Even 'instant gardens' and shorter term plantings, lawns and perennial borders for example, may not perform as expected if weather patterns become more unpredictable and extreme. British gardeners complain about the weather, but at least severe droughts and extreme rainfall have been unusual. Increased uncertainty when planning plantings, may reduce the popularity of a major leisure activity.

Providing for gardeners supports an industry, worth according to recent reports £640 million, which has expanded by 40% in the 1990's. The changing needs of gardeners mean that the horticultural industry will have to provide new products and services. With

the lengthy production cycles of some plants these will need to be identified before gardeners recognise the need.

Having said that, gardeners are increasingly seeking advice on the long term prospects for particular trees and shrubs and on the benefits of planning to replace features and plantings with ones using plants more likely to resist expected changed in growing conditions