Abstracts:

Keynote Presentations

RE-FRAMING SOIL SCIENCE TO FACE DEVELOPMENT CHALLENGES

J Bouma

Wageningen University, The Netherlands

E-mail: johan.bouma@planet.nl

Soil science is a vital science but there are concerns about about a lack of attention in policy circles and by stakeholders for soil degradation while climate change, water- and food security and biodiversity loss are widely recognized, also in legislative terms. Many hydrological and climate simulation models – essential to face "what if .." questions about future conditions - either don't contain soil data or only in a highly generalized manner that can be satisfied by non soil scientists, using pedotransferfunctions. Based on the inherent strength of the soil science discipline, that tends to be inward looking, re-framing is suggested to include: (i) an out-of-the- box approach, taking active part in interdisciplinary hydrological, climate and biodiversity studies; (ii) better interaction between soil subdisciplines in terms of soil and water ("Hydropedology"), soil chemistry and -biology. (iii) focusing soil research on a number of crucial soil functions, avoiding the wide, often unrelated, scatter of current soil research; (iv) re-establishment of the "knowledge chain", linking tacit knowledge of land users to cutting-edge researchers. As is, the chain, which represented a very strong feature of soil research in the past, appears to be broken; (v) more attention to development challenges by investing in achieving real successes in practice. As is, involvement often ceases as soon as a research project has been completed. This continuing involvement is time consuming and requires input by "knowledge brokers" injecting the right type of knowledge at the right time and place (Extension 2.0). Soil scientists are in a good position to play this role; (vi) attention for changing paradigms in environmental regulations where topdown command- and- control approaches slowly evolve into bottom-up participatory protocols. Basic affinity with the land and with land users puts soil scientists in a unique position to get involved. Re-framing does not involve dramatic revolutionary change, but, rather, a pragmatic return to some good old practices of the past when soil scientists had close links with land users and the policy arena. This can also re-vitalise basic research in the knowledge chain which is crucial to maintain the virility of the soil science discipline.

Keywords: Soil degradation, re-framing soil science discipline

FOOD SECURITY – WHAT DOES THAT REALLY MEAN?

KL Bristow

University of Pretoria Water Institute / Department of Plant Production and Soil Science, University of Pretoria, Private Bag X20 Hatfield, Pretoria 0028, South Africa; CSIRO Land and Water / Sustainable Agriculture National Research Flagship, PMB Aitkenvale, Townsville, QLD 4814, Australia

E-mail: Keith.Bristow@csiro.au

Ongoing growth in both population and consumption is placing unprecedented, and in many cases unsustainable, pressure on the world's soil and water resources. This together with climate change will increase concerns about food security and the well being of future generations unless human attitudes change and actions are taken to stabilise populations at levels that are consistent with the productive capacity of the ecosystems they rely on. The call for a new approach to looking after the environment was made by the World Commission on Environment and Development in 1987 when they defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In arriving at this definition they highlighted the need to conserve and enhance the Earth's natural resource base and stated that to achieve this, Government's must take responsibility for ensuring that their policies, programmes and budgets support development that is economically and ecologically sustainable. In this paper I revisit the issues of food security and sustainable development and discuss some of the challenges and opportunities society faces in changing agricultural and food systems in order to deliver on the 1996 World Food Summit's definition of food security, which states that "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". In doing this I argue that success in terms of meeting food security and hence sustainable development objectives is an ecological issue, not an economic one, and that society needs to take a more proactive approach to investing in the environment.

Keywords: Food security, sustainable development

HORTICULTURAL RESEARCH AND PRACTICE FOR IMPROVED NUTRITIONAL AND FOOD SECURITY IN SOUTHERN AFRICA

SJE Midgley[1] and MP de Wit[2]

[1]OneWorld Sustainable Investments, PO Box 1777, Cape Town, 8001, South Africa; [2]de Wit Sustainable Options Pty Ltd, PO Box 546, Brackenfell, 7561, South Africa

E-mail: stephanie@oneworldgroup.co.za

About 95 million people (40% of the population) of southern Africa are undernourished, one of the indicators of food insecurity. Socioeconomic issues, including poverty, environmental stressors and conflict, underlie the problem. Efforts to reduce undernourishment must be contextualized within current and future risks to food systems such as climate shocks and changing population demographics. We conducted a trend analysis, and analysed the most important relationships between undernourishment and food system indicators for 1990-2006 using FAO and other data sources. Although undernourishment is related mostly to insufficient carbohydrate (although proportionally too high) and protein intake, there was a significant association with low fruit consumption. There exists enormous potential for increased fruit and vegetable production across southern Africa, especially where water resources are underutilized or suitable 'grey water' could be made available. This would contribute to greater resilience of food production by reducing the high dependence on maize monoculture and spreading risk through increased crop and income diversification. The nutritional status of a high proportion of populations, especially women, children, the elderly and the sick, would also improve.

This paper will draw on four issues of relevance: 1. Identification of vulnerable people and where they live, and why the food system is failing them; 2. Problems caused by the lack of data and statistical analysis of the food system; 3. Barriers to increasing horticultural food production and how horticultural researchers and practitioners can help address these; and 4. The enormous potential for developing urban fruit and vegetable supply chains to address the increasing food insecurity in burgeoning urban and peri-urban areas. The key to unlocking the African market and contributing to job creation, increased household income and improved food security lies in taking an integrated 'systems' approach which draws on the best possible science but is rooted in economic growth as a means to an end, namely towards human and social development while maintaining ecosystem functioning.

Keywords: Food security, demographic changes, vulnerability, food system, urban supply chains

INNOVATIVE AGRICULTURAL SCIENCES FOR PROGRESS TO MEET RESEARCH AND DEVELOPMENT CHALLENGES

CEG Mulder

Agricultural Research Station (Pty) Ltd, P.O. Box 19734, Nelspruit 1200

E-mail: chris.mulder@tiscali.co.za

The biggest challenge to agriculture in the world is to provide sustainable high quality food at affordable prices to the ever increasing world population. The area of arable land in the world is 1.5 billion ha and should produce enough food for an estimated 10 billion population in 2050.

Maize production in the RSA is a classic example of how the utilization of agricultural sciences enhanced production per land unit used. The application of good agricultural practices such as hybrid cultivars, fertilisers, crop protection and chemical weed control resulted in the production of an annual average of 12.3 million ton on 3 million ha in 2009–11 compared with 4.g million ton on 3.96 million ha in 1959-61.

Weed science can truly be described as an innovative agricultural science based on the simplistic view that unwanted plants can be selectively controlled in a crop with a herbicide without adversely affecting the crop. Fundamental to innovative weed science is the understanding of the interaction between herbicide and plant and how to bring about something new. Research on the mode of action of herbicides, the target sites in plant cells, the herbicide mobility within the plant explained herbicidal selectivity and efficacy and also lead to the use of this information to develop new techniques in the testing of new active ingredients. Currently the success rate in the development of a new herbicide is 1:1400, takes 8-10 years per product to reach the market at a cost of €200 million.

The development of transgenic crops (GMO) with herbicide resistance commenced in the late 1970's and came to fruition in 1997 with Roundup Ready crops which lead the way to the Herbicide Renaissance in 2002. Biological variation in weed species as in herbicide resistance (tolerance) challenged the use of a single broad spectrum herbicide in maize, soya beans and cotton. To avoid chemical selection of herbicide resistant weeds, a system solution in the application of different modes of action had to be implemented.

There is never a perfect solution in weed control due to the bio-diversity in which this is practiced. Continued search of new chemistry, breeding or manipulating resistance in crops, developing system solutions remain the challenges for innovative agricultural research to ensure affordable, sustainable food supplies to feed the growing world population.

Keywords: Herbicide Renaissance, herbicide mobility