Environmental Engineering and Management Journal *March 2012, Vol.11, No. 3, Supplement, S135*
http://omicron.ch.tuiasi.ro/EEMJ/

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Session 7
MICROBIAL FIXATION OF CO_2 AND OTHER CLIMATE CHANGE INDUCING GASES IN SOILS AND VIA BIOTECHNOLOGICAL PROCESSES

Main lectures

CLIMATE CHANGE AND MICRO-ORGNISM GENETIC RESOURCES FOR FOOD AND AGRICULTURE: STATE OF KNOWLEDGE, RISKS AND OPPORTUNITIES

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Abstract

Micro-organisms form the basis of most ecosystems on which agriculture and food production depend. Put simply, agriculture and food production would not exist without this "hidden" but critically important biodiversity.
Micro-organisms play essential roles that we can separate into five interlinked functional domains: soil inhabitants, plant and rhizosphere inhabitants, plant pathogens, biological control agents and food production micro-organisms. The focal point of this important role played by micro-organisms in the regulation of life on the earth is the unrivalled diversity of micro-organism genetic resources for food and agriculture, and the correspondingly huge variety of functions they confer to agriculture.
Many beneficial micro-organisms are linked with plants in the soil, where they induce resistance or perform biological control functions. Free-living soil-borne micro-organisms contribute to the formation and structure of soil, the storage of nutrients and carbon sequestration. Those acting in association with crop plants further regulate soil fertility and the accessibility of nutrients. Soil micro-organisms are also responsible for bioremediation of polluted sites by restoring soil fertility. Once food is produced, micro-organisms are relied upon for its conservation and transformation.
Climate change will act as an additional driver of change in agricultural systems as environmental conditions are altered drastically. As a consequence of the vital functions that micro-organism genetic resources for food and agriculture confer, they can be considered as pivotal to sustainable agriculture when challenged by such drivers of change. Because plants' performance is directly linked to interactions with micro-organisms, future strategies to counteract negative effects of climate change will need to involve more than simply deploying crop plants in environments to which they are well adapted.
Micro-organism genetic resources for agriculture can be used to produce energy directly, facilitate adaptation to climate change and mitigate climate change. Novel biological control agents can be used to limit the harmful impact of pathogens and pests, obviating the need for energy-expensive pesticides. Other micro-organisms could also be used to improve the efficiency of intensified agriculture, such as those that store carbon in the soil, and hence prevent the emission of greenhouse gases. The fertility of the soil for any particular cropping system could be enhanced naturally, either by creating conducive conditions for the proliferation of beneficial micro-organisms or by introducing them directly into targeted environments. Soil-regulating micro-organisms can be used to manage soil health and ecosystem resilience. Micro-organisms also have an important role in the protection and transformation of agricultural produce, post-harvest.