*Plant Disease and its Control in Agricultural systems:*

Most soil microorganisms that associate with plants form beneficial or commensal relationships with plant roots, but a small percentage can be pathogenic. Depending on the crop and region, plant disease creates between 5-25 percent of yield loss (relative to potential yields) [1]. Management of soilborne pathogens is particularly challenging because of the difficulty of accessing roots in the soil and the bulk soil minerals, among other features.  As such, plant resistance, crop rotation and gas fumigants have been the major tools employed.  Each strategy has limitations and disadvantages leading researchers to find alternative ways to manage soilborne diseases.

Pesticides (including soil fumigants and fungicides used to control foliar and soilborne pathogens) have a direct financial burden on farmers with the cost associated with their purchase and applications, as well as large indirect costs related to human health, environmental remediation, loss of biodiversity and even yield reduction. Pesticides have been implicated in a variety of human health issues, for example interference with endocrine system, developmental issues, estrogenic effects, carcinogenicity, and neurotoxicity to name a few. Additionally the environmental concerns such as water table contamination, depletion of ozone, lower soil biodiversity, bioaccumulation, disruption of nitrogen fixation, decline in honeybee population, have now been attributed to pesticides. It is because of such severe post-application side effects the search for alternatives has been sought-after.

One alternative for some plant pathogens is plant genetic resistance to disease. Crops are bred for resistance to disease using two genetically distinct strategies: major (i.e. dominant, single-locus)

*Disease Suppressive Soils as an Alternative Management Strategy*

Disease-suppressive soil, a well-known phenomenon in which soilborne diseases fail to develop in spite of high infestation levels, has emerged as a potential management strategy for the control of soil pathogens in agricultural systems. In the Chateaurenard region of France, naturally suppressive soils showed nearly zero incidence of *Fusarium* wilt of melon in soils where the pathogen was present, while neighboring non-suppressive soils with ten-fold lower inoculum levels sustained 50% incidence of disease [6]. Many pathogens have been managed by suppressive soils: *Fusarium oxysporum* [6,7], *Verticillium dahliae* [6,8], *Phytophthora spp.* [9]*, Rhizoctonia solani* [10], and *Pythium spp.* [11]*,* among others.

It is clear from experiments in which sterilized disease-suppressive soil loses its suppressive properties, that suppression is microbially mediated [7]. However, the mechanism of suppression is not well understood. Hypotheses range from volatile toxic compounds and improved plant nutrition (leading to enhanced resistance), to biological control mechanisms such as competition, induced systemic resistance, antibiosis, and parasitism/predation. Virtually all soils possess some biological capacity to restrict disease progression, as evidenced by the fact that disease caused by an introduced pathogen is less severe in a native soil than in the same soil that has been pasteurized [12]. This general disease suppression is conferred by the resident microflora, but further characterization of the precise microbial properties in disease suppressive soil will be important for integrating disease-suppressive soil into agricultural management practices.