

# Preface

One of the greatest concerns of the current generation is how are we going to provide food for the next generation in a manner that respects our finite natural resources. However, perhaps the critical question is how are we going to feed the next two generations especially with a global population expected to exceed nine billion people by 2050 (<http://esa.un.org/UNPP> and <http://www.census.gov/main/www/popclock.html>). With the expectation of feeding a growing population, additional pressure is placed on how we more efficiently utilize the natural resources required for food production. This includes land, water, fertilizer, and other resources and how to employ these in a sustainable manner. We are concerned about appropriate management of our agricultural resources at the beginning of the twenty-first century; therefore, it is imperative that we start to plan now for managing these resources in a sustainable way for the year 2050 and beyond.

From the time man made the transition from a nomadic to agrarian society, land has been altered for the purpose of growing cultivated crops. The earliest record of deforestation for the purpose of plant cultivation was approximately 9,000 years ago in the Ghab Valley of Northwest Syria (Yasuda et al. 2000). Since this time, man has primarily relied on incorporation of more land for agricultural production as the primary means for increasing food production at the expense of the native species that were originally present. Increased incorporation of arable land for food production continues today, particularly in developing countries. The FAO in a 2012 report by Alexandratos and Bruinsma described both increase and decrease of arable land for food production projections. More specifically, there will be a reduction in arable land in developed countries (North America and Europe primarily) and an increase in land for producing food in developing countries (primarily Asia, South America, and Africa). Within Latin America, it has been estimated that the rate of deforestation of humid tropical forests to be  $5.8 \pm 1.4$  million hectares lost each year, with a further  $2.3 \pm 0.7$  million hectares of forest visibly degraded (Achard et al. 2002). The net change across all world regions inclusive of developing and developed countries is for more land to be used for food production (Alexandratos and Bruinsma 2012). With land being a finite resource, continuing this pattern is not sustainable. Therefore, it is imperative that food

production be increased on the land that is currently utilized for agricultural purposes.

In a recent FAO report, *How to Feed the World in 2050*, the three drivers affecting food security are population growth, increase in urbanization, and increase in income (FAO 2009). A good example of increased urbanization and increased income over the past decade has been in Asia, particularly China and India (Zhou et al. 2004; Bloom and Finlay 2009). It is expected that additional demand on the food system will come from those individuals living in countries with rapidly growing economies where the variety of foods consumed will likely increase (Edgerton 2009). This additional pressure on food production will increase in addition to the pressure placed by the demand due to an increase in the sheer number of people by 2050.

The World Health Organization in 1996 defined Food Security as when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. The USDA, in a 2013 study by Coleman-Jensen et al., defined Food Security as households that have consistent, dependable access to enough food for active, healthy living. Furthermore, the authors quantified this and determined that 85.5% of U.S. households were Food Secure throughout all of 2012, indicating that 14.5% of U.S. households were Food Insecure at least some time during the year in 2012. The WHO and USDA definitions are certainly similar in scope, and there is some ambiguity in the details.

Hand-in-hand with Food Security is Energy Security. The International Energy Agency (IEA) defines Energy Security as uninterrupted availability of energy sources at an affordable price. The United States Congressional Budget Office defines Energy Security as the ability of households and businesses to accommodate disruptions of supply in energy markets. Clearly these definitions define energy security from two different perspectives and leads to ambiguity regarding the discussion involving energy security.

What is the definition of Sustainable Agriculture? Recently, in the United States, there has been considerable pressure to alter the definition of sustainable agriculture from how it is defined by the United States Department of Agriculture. It is important to have a definition that is endorsed by the Federal government as it will serve as the central element for program grants, such as the Sustainable Agriculture Research and Education (SARE) program through NIFA. The definition of sustainable agriculture utilized by SARE is as follows:

The term “sustainable agriculture” (U.S. Code Title 7, Section 3103) means an integrated system of plant and animal production practices having a site-specific application that will over the long term:

- Satisfy human food and fiber needs.
- Enhance environmental quality and the natural resource base upon which the agriculture economy depends.
- Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls.
- Sustain the economic viability of farm operations.
- Enhance the quality of life for farmers and society as a whole.

The 1990 U.S. Farm Bill emphasizes sustainable agriculture upon three key components: environmentally friendly, economically viable, and accepted by society.

The debate over the definition of sustainable agriculture has been ongoing for several years (see Redick, Chap. 3) and extends far beyond the United States to virtually every country in the World. In the future, there will be a need for a global definition of Sustainable Agriculture that spans all the continents. Clearly a balance is necessary regarding the definition of Sustainable Agriculture and, more so, regarding the interaction of Food Security, Energy Security, and Sustainable Agriculture. This was the impetus behind the creation of this book and its title “Convergence of Food Security, Energy Security and Sustainable Agriculture.” It is the convergence where we need to be as a global community to serve the caloric needs of humanity. It is the convergence where we need to be as a global community to grow the food that we need for life. It is the convergence where we need to be as a global community to insure that our children and grandchildren have food to eat in the next generation and beyond.

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