

## Organic and Regenerative Farming

The nutrient composition of food crops is modulated by the water and nutrient supply used to grow them. In turn, the body composition of livestock reflects the composition of their feed. Ultimately the composition and function of our bodies are determined by the foods we eat and our physical activity. As we attempt to improve human nutrition part of the solution is likely to be production of nutritionally balanced crops and livestock with careful planning of how food plants and animals are grown.

Modern intensive agricultural practices are constructed to grow optimal quantities of crops rather than monitoring the richness of their nutrients. These practices have caused fundamental changes in the composition of food plants and animals in comparison the diets consumed during the evolution of mankind.

Organic agriculture is practiced in 172 countries, and 43.7 million hectares (a hectare is about 2.5 acres) of agricultural land are managed organically by approximately 2.3 million farmers. Australia is the country with the largest organic agricultural area (17.2 million hectares, with 97% of that area used for grazing), followed by Argentina (3.1 million hectares) and the United States of America (2.2 million hectares). The global sales of organic food and drink reached 80 billion US dollars in 2014. The United States is the leading market, followed by Germany, France, and China. However, in the United States, organic agriculture still accounts for a small fraction of total agricultural output.

Regenerative agriculture is a practice within organic farming designed to build soil health or to regenerate unhealthy soils. The practices associated with regenerative agriculture include those identified with other approaches to organic farming, including maintaining a high percentage of organic matter in soils, minimum tillage, biodiversity, composting, mulching, crop rotation, cover crops, and green manures. In practice farmers will use the dropping from grazing cattle as natural fertilizer to regenerate acreage later used to grow crops creating an ecosystem approach to agriculture.

Soil is not simply made up of minerals but also is teeming with bacterial life. The roots of plants interact with bacteria using some products produced by the bacteria to promote growth. At the same time the plants suppress the growth of destructive bacteria in the soil. In this way the soil is the microbiome of plants just as we carry our soil around with us as the bacteria in and on our bodies with the majority in the intestines. Just as our diet affects our microbiome, the soil ecology including roots and bacteria influence the microbiome of the soil.

The ideal future for agriculture would be to employ sustainable agriculture methods that led to foods that also optimized human health. Given the large populations of malnourished humans in many countries simply looking to obtain adequate calories to survive, this utopian notion seems out of place. To further complicate matters, there is an even larger population in industrialized consuming foods high in fat, sugar, and salt while failing to consume adequate amounts of fruits, vegetables, and grains being recommended by scientists and government agencies for the prevention of age-related chronic diseases. These individuals require extensive behavioral changes to increase physical activity and modify food intake including reducing the intake of

many foods currently marketed to the public. Therefore, changes could disrupt the current food supply chain that is providing calories to the undernourished world while also making changes appropriate for individuals living in industrialized nations.

Agricultural practices are currently a vital concern for government policy makers in many countries but the policies reflect the agriculture and farm industry priorities with attention increasingly being paid to public health concerns in some industrialized countries including the U.S.. More nutritious foods could help prevent chronic diseases, reduce government expenditures for health care, increase worker productivity, and so help to stabilize governments around the world. These economic benefits of sustainable ecosystems which consider all the elements of food production and consumption provide reality to the otherwise less tangible idea of sustainability.