Food, the source of Nutrition

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Food is the source of Nutrition. When taken at face value, this wouldn't appear to be a very controversial statement, especially when espoused within a journal dedicated to food and nutrition. However, when we take a closer look at current efforts being made in the fields of agriculture and nutrition, one often gets the impression that many food, nutrition, and agriculture experts have become convinced that food can no longer provide all of the nutrients which are essential to the optimal growth and development of the human body.

Amid reports of worldwide food insecurity, famines, malnutrition (in all forms), and the increasing challenge of trying to feed an ever-growing global population, we hear repeated calls for programs aimed at nutritional supplementation, fortification, and even the nutritional alteration of food through genetic engineering. This would seem to beg the question, 'What happened to our food?" The answer is 'nothing'. Highly nutritious foods, entirely capable of fulfilling human nutritional requirements, still exist. However, due to an over-reliance on monocropped and industrialized agricultural systems, nutritional diversity is increasingly being marginalized. Instead of asking 'What happened to our food,' a more pertinent question would be 'What happened to our food system'?

According to the Food and Agricultural Organization of the United Nations (FAO), research has identified approximately 250,000 plant species out of an estimated 300,000-500,000 in existence. Of that, about 30,000 are edible, and of these about 7,000 plants and an additional 700 animal species have been used throughout the world's history as food. Today, however, only 3 plants (wheat, rice, and maize) provide more than half of the global plant-derived energy. If we add 6 more crops (sorghum, millet, potatoes, sweet potatoes, soya beans, and sugar (cane or beet) we cover 75% of the world's energy. And, if we go a bit further, it is estimated that 95% of the world's dietary energy comes from only 30 crops.[1]



Figure 1: A feast of nutritional diversity at Kumbali Cultural Village in Malawi, Africa

The Green Revolution

In the late 1940s, a plant pathologist named Norman Bourlag was doing research in Mexico, trying to figure out how to get wheat—an ancient crop from the Nile Valley—to grow better in Central America. His advances in the hybridization (cross-breeding) of crops laid the groundwork for the development of higher-yielding varieties of cereal crops (primarily wheat, rice, and maize). In an attempt to solve problems of global hunger, these crops began to be promoted throughout the world in an effort known as the '*Green Revolution'*, and Bourlag became known as the '*Father of the Green Revolution'*. While higher yields of cereal-based monocultures resulted in an increase in 'calories-per-acre' of a *single* food, it has led to a reduction in the diversification of agriculture, and a resulting decrease in 'nutrition-per-acre' (especially

[1] Food and Agriculture Organization of the United Nations. The state of the world's plant genetic resources for food and agriculture. ftp://ftp.fao.org/docrep/fao/meeting/015/w7324e.pdf Published 1997; referenced in: 'Position of the Academy of Nutrition and Dietetics: Nutrition Security in Developing Nations: Sustainable Food, Water, and Health', http://www.eatrightpro.org/resource/practice/position-and-practice-papers/position-papers/nutrition-security-in-developing-nations-sustainable-food-water-and-health

proteins, fats, vitamins and minerals). Hand-in-hand with the promotion of these hybridized seeds, came the push towards the industrialization of monocropped fields, dependent upon the use of fossil fuels, chemical fertilizers, pesticides, and herbicides. After decades of implementing green revolution-style agriculture, many countries are now beginning to realize that this approach has had serious disadvantages.



Figure 2: Industrialized agriculture in Malawi, Africa

As underscored by an article in the UK's *Guardian Newspaper*: "Yields could be doubled or even trebled with heavy doses of synthetic chemical fertilisers and other inputs… The US agricultural science establishment, chemical and agribusiness industries love him [Bourlag], if only because he helped their industries grow massively around the world on the back of patented seeds and herbicides… Few people at the time considered the profound social and ecological changes that the revolution heralded among peasant farmers. The long-term cost of depending on Borlaug's new varieties, say eminent critics such as ecologist Vandana Shiva in India, was reduced soil fertility, reduced genetic diversity, increased soil erosion and increased vulnerability to pests. Not only did Borlaug's 'high-yielding' seeds demand expensive fertilisers, they also needed more water. Both were in short supply, and the revolution in plant breeding was said to have led to rural impoverishment, increased debt, social inequality and the displacement of vast numbers of peasant farmers."[2]

In a similar article by *National Geographic Magazine* entitled, '*The Global Food Crisis'*, it was reported: "The green revolution Borlaug started had nothing to do with the eco-friendly green label in vogue today. With its use of synthetic fertilizers and pesticides to nurture vast fields of the same crop, a practice known as monoculture, this new method of industrial farming was the antithesis of today's organic trend... "The green revolution has brought us only downfall," says Jarnail Singh, a retired schoolteacher in Jajjal village. "It ruined our soil, our environment, our water table. Used to be we had fairs in villages where people would come together and have fun. Now we gather in medical centers"."[3]

A report by the *United Nations Conference on Trade and Development (UNCTAD)* stated: "The world needs a paradigm shift in agricultural development: from a "green revolution" to an "ecological intensification" approach: This implies a rapid and significant shift from conventional, mono-culture-based and high-external-input-dependent industrial production towards mosaics of sustainable, regenerative production systems that also considerably improve the productivity of small-scale farmers. We need to see a move from a linear to a holistic approach in agricultural management, which recognizes that a farmer is not only a producer of agricultural goods, but also a manager of an agro-ecological system that provides quite a number of public goods and services (e.g. water, soil, landscape, energy, biodiversity, and recreation." [4]

Agroecology

Ecology is the study of living organisms in relation to the environments in which they live. When ecology is combined with agriculture, we get '*agroecology'*, a system "based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system."[5] '*Agroecology and the Right to Food*' states that "based on an extensive review of recent scientific literature, the report demonstrates that agroecology, if sufficiently supported, can double food



[2] https://www.theguardian.com/global-development/poverty-matters/2014/apr/01/norman-borlaug-humanitarian-hero-menace-society
[3] http://ngm.nationalgeographic.com/print/2009/06/cheap-food/bourne-text
[4] http://unctad.org/en/PublicationsLibrary/ditcted2012d3_en.pdf
[5] http://www.fao.org/agroecology/overview/en/

production in entire regions within 10 years while mitigating climate change and alleviating rural poverty."[6] Agroecology can include a variety of different practices that care for the environment including practices that heal the soil such as protecting and feeding the soil with mulch, compost and organic manure teas; managing and harvesting all water to make the most of every drop; diversifying the species of plants and animals raised in an area by integrating complementary species together and/or rotating species; and using integrated pest management to avoid or eliminate the use of chemicals.)

The dictionary defines 'agriculture' as: "The science, art, and business of cultivating soil, producing crops, and raising livestock." Industrialized agriculture's primary focus on 'science and business' has served to eclipse the 'art' of creating agricultural systems which are in harmony with natural systems. The path to a truly sustainable future lies in the immense diversification of the earth's ecosystems, and our ability, as humans, to learn from and adopt these natural patterns as the basis for all our systems of production. Diversification holds the key to unlocking agriculture's true potential; it allows for the implementation of food production systems which offers abundant nutrition on a seasonal and year-round basis. It helps to restore soil fertility and conserve water, it allows farmers to break their economic dependency on expensive agricultural 'inputs', it also diversifies incomes, and it leads directly to the achievement of true food and nutrition security. If agriculture is not inherently nutritious, we are doing it wrong.



Figure 4: Howard Zamula teaching about nutritional diversity during an open day at Never Ending Food in Malawi, Africa

For the past two decades, our family has been working on issues of sustainable food and nutrition security in Malawi, Africa. On our farm, we grow over 200 different foods throughout the year using free, organic, and seasonal systems of production. We train local interns in agroecological methodologies, we conduct community outreach with local farmers, schools, churches, health centers, and we host thousands of visitors each year who come to learn more about the implementation of sustainable solutions.

In Malawi, where monocropped agriculture has been pushed predominantly towards the over-production of maize (corn), we find that people often equate 'food security' to 'maize security'. Malawi currently suffers from unacceptable levels of nutritional 'stunting'. In 2015 a UN report, "*The Cost of Hunger in Malawi*', estimated the total annual costs associated with child undernutrition to be US$ 597 million, equal to 10.3% of Malawi's Gross Domestic Product.[7] An increase in maize production fails to address the problem of undernutrition; it may even serve to exacerbate the problem as nutritional diversity continues to be overshadowed by the over-production of one staple food.

Throughout the world, governments are now spending billions of dollars to subsidize monocropped agriculture, but as agriculture is failing nutritionally, these same governments are forced into spending billions of dollars to subsidize nutritional treatments (through fortification, supplementation, and medicinal programs). In 2012, the Malawian government received a $5 million dollar donation from Irish Aid, UNICEF, and USAID to fortify sugar with vitamin A.[8] Forbes Magazine, highlighting recent research on the health impacts of sugar, states: "Besides causing obesity and diabetes, eating a diet saturated with sugar is linked to a number of abnormal brain functions, including poor memory and cognitive activities."[9] Malawi faces deficiencies in most micronutrients (such as vitamin A and iron), often resorting to health centers and fortification programs to provide these nutrients in medicinal form, yet the country is rich in natural sources of these nutrients (fruits, vegetables, legumes, nuts, oilseeds, fats and foods from animals) which are being overlooked, over-shadowed, and ignored by the push to only produce and eat a limited handful of crops. *Nutrition Profile for Malawi* states: "Routine supplementation with vitamin A is

[6] http://www.srfood.org/en/report-agroecology-and-the-right-to-food
[7] https://www.wfp.org/content/cost-hunger-malawi
[8] http://www.nyasatimes.com/malawi-spends-5m-for-vitamin-a-sugar-fortification-programme/
[9] https://www.forbes.com/sites/quora/2016/11/08/new-studies-show-sugars-impact-on-the-brain-and-the-news-is-not-good/#5062c312652d

implemented, but programmes for ensuring a more adequate intake of vitamin A rich foods for vulnerable groups, i.e. women and young children, are lacking. Anemia affects almost three-quarters of children under five years and more than two women out of five. A high proportion of pregnant women receive iron supplementation but few take supplements consistently during pregnancy. Food-based strategies are lacking to improve the micronutrient status of the population in a sustainable way."[10]

There is currently a new '*Green Revolution*,' which is being promoted throughout Africa by, among others, the *Alliance for a Green Revolution in Africa (AGRA)*,[11] which is funded by the Bill and Melinda Gates Foundation and the Rockefeller Foundation. Here again we find efforts being made to scale up the intensification of chemical-based, monocropped, and industrialized agriculture, but this time with an emphasis on the use of genetically engineered plants and animals. In language similar to the original Green Revolution's promotion of hybridized and chemical-based monocropping, Africa is once again being told that if it doesn't embrace genetic engineering, it will remain undeveloped and incur enormous economic losses.[12] It has even been asserted that those who suggest that Africa already has access to sustainable, agroecological, and non-genetically engineered solutions are somehow 'heartless, callous, and cruel."[13] The notion that large-scale industrialized food production is currently feeding the world, is false. As stated by the United Nations Special Rapporteur on the Right to Food, Professor Hilal Elver, "Empirical and scientific evidence shows that small farmers feed the world. According to FAO, 70% of food we consume globally comes from small farmers. This is critical for future agricultural policies. Currently, most subsidies go to large agribusiness. This must change."[14]

Double Standards

There are many 'double standards' which are used for measuring the success of sustainable systems, such as agroecology, when compared to the current implementation of chemical-based industrialized systems. Questions repeatedly asked of sustainable agricultural practitioners throughout the world include: "How much land does sustainable agriculture need to feed a family?" Or, "Can agroecological approaches be used to feed the world?" A strange thing happens when we reverse these questions and look at them from the perspective of the current commercially-driven systems of monocropped agriculture.

"How much land does it take a commercial farmer to feed his or her family?"

Despite many large-scale farmers having thousands of acres under the production of corn or soy, the majority of these farmers sell these 'cash-crops' to buy balanced nutrition at their local grocery stores or from their local (small-scale) farmer's markets. The problem with many of today's agricultural commodities is that they are often geared more towards '*production*' than '*consumption*'. The mountains of maize, wheat, and soy that we now see coming from industrialized farms are seldom used for 'food' on-site. Rather, it is sold to off-site consolidation points, which is, in turn, sold to processing centres. These processed foods are then re-sold to supermarkets, often after being combined with additives, preservatives, and artificial ingredients, and then sold back to consumers, including the farmers themselves. Research published the British Medical Journal defines 'Ultra-processed' foods as those which, "besides salt, sugar, oils and fats, include substances not used in culinary preparations, in particular additives used to imitate sensorial qualities of minimally processed foods and their culinary preparations." This study concluded that: "ultra-processed foods represent more than half of all calories in the US diet, and contribute nearly 90% of all added sugars."[15]

Industrialized agriculture's emphasis on obtaining maximum yields through monocropping completely ignores the nutritional reality that people cannot thrive on a monocropped diet. Nutritionists across the globe are already sounding the alarm about the world's growing over-reliance on high-

[10] http://www.fao.org/ag/agn/nutrition/mwi_en.stm
[11] http://www.foei.org/wp-content/uploads/2012/09/AGRAs-Technology-Push-in-Africa.pdf
[12] https://www.farminguk.com/News/Anti-GM-activists-holding-back-innovation-could-cost-poorest-nations-1-5-trillion_38670.html
[13] http://blog.acton.org/archives/85738-anti-gmo-activists-heartless-callous-and-cruel.html
[14] https://www.tni.org/en/article/un-only-small-farmers-and-agroecology-can-feed-world
[15] http://bmjopen.bmj.com/content/6/3/e009892

carbohydrate low-nutrient foods such as wheat, rice, and maize. In 2015, *Business Insider* ran an article about a genetically engineered rice that would make it "easier to feed more than half the world's population," stating: "Finally, researchers think they may have a solution: GMO rice that's been modified to have longer, hardier grains that cook faster and taste better."[16] A basic understanding of nutrition is sufficient to recognize the shortcomings and vulnerabilities of trying to feed 'half the world' on one staple crop, let alone trying to make it sound like a major triumph for food security. The monocropping of hybridized crops, and more recently the enormous push towards genetically engineered crops, continues to move agricultural systems away from nutritional and ecological diversity and, in the process, creates many of the problems that genetic engineering is claiming to address (including an increase in pest populations, plant diseases, malnutrition, and susceptibility to floods and drought). In an era of increasing climate change, this 'putting all our eggs in one basket' approach is just about the worst path that we could possibly be taking.

There is also a grave misconception that genetic engineering is increasing yields. In 2016, the *New York Times* reported that: "genetic modification in the United States and Canada has not accelerated increases in crop yields or led to an overall reduction in the use of chemical pesticides."[17] But even if yields were being increased, it would still only be an increase in a handful of crops, not the agricultural diversity we need to achieve food security which "exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization, and stability."[18]

Agricultural diversification is one of the best ways to increase yields, while simultaneously achieving nutrition security, which is defined as "secure access to an appropriately nutritious diet (i.e., protein, carbohydrate, fat, vitamins, minerals, and water) coupled with a sanitary environment and adequate health services and care, in order to ensure a healthy and active life for all household members"[19]. Malawi's over-reliance on the 'green revolution' monocropping of maize helps to highlight the incredible short-sightedness of such approaches. In 2005, the country launched the *Farm Input Subsidy Programme,* which was designed to heavily subsidize the costs of synthetic fertilizers and hybridized maize seed. The costs associated with this program have been in the hundreds of millions of US dollars and often account for more than 50% of the nation's entire annual agricultural budget. For example: In 2006/7, Malawi spent $90.9 million US dollars on this program (61% of the Ministry of Agriculture's budget); in 2007/8, it spent $116.8 million US dollars (61% of the agricultural budget); in 2008/9, it increased to $265.4 million US dollars (74% of the agriculture budget); and in 2009/10, it spent $121.3 million US.[20]

In 2003, the *Comprehensive Africa Agriculture Development Programme (CAADP)* set forth a declaration, which Malawi signed, aimed at "increasing fertilizer consumption from 44.6 kilograms per hectare (kg/ha) of arable land to 65 kg/ha of arable land by 2015; increasing cereal yield in kg/ha hectare from an average of 1,392 to 2,000 by 2015; and doubling the adoption rate of proven technologies such as improved seed varieties."[21] Malawi's increased spending on synthetic fertilizers helped to meet its goal for an increase in 'cereal production'. Maize yields improved from an average of 1,300 kg/ha pre-CAADP period (2000-2003) to just over 2,100 kg/ha between 2009-2013.[22]

[16] http://www.businessinsider.com/gmo-rice-could-feed-half-the-world-2015-7?IR=T
[17] https://www.nytimes.com/2016/10/30/business/gmo-promise-falls-short.html
[18] Food and Agricultural Organization of the United Nations. Declaration of the World Summit on Food Security World Summit on Food Security. Rome, Italy: Food and Agricultural Organization of the United Nations; 2009.
[19] Food and Agricultural Organization of the United Nations. The State of Food Insecurity in the World: Economic Growth is Necessary But Not Sufficient to Accelerate Reduction of Hunger and Malnutrition. Rome, Italy: Food and Agricultural Organization of the United Nations; 2012.
[20] https://www.oecd.org/tad/agricultural-policies/46384473.pdf
[21] http://www.usc.es/economet/journals2/eers/eers1429.pdf
[22] http://www.usc.es/economet/journals2/eers/eers1429.pdf

A hectare of land represents 100 meters by 100 meters (or 10,000 meters squared). A maize harvest of 2,100 kg/ha works out to 0.21 kilograms of food per square meter. As the Green Revolution crops have come to eclipse (and even stigmatize) the use of traditional crops (and animal foods), we are now ignoring incredible local solutions. For example, in Malawi there is a local yam (Dioscorea species), which can grow up to 20 kg or larger.[23] If a farmer were to take two-meters by two-meters of their land (4 meters squared) to plant each yam, it would allow for 2,500 yams within a hectare (10,000/4 = 2,500). At 20 kg each, this would amount to 50,000 kg of a staple food (47,900 kg more food per hectare than the current 2,100 kg/ha of maize, or 4.79 kg more food per square meter than the current 0.21 kg of maize). In addition, the vines of these yams like to climb trees, so fruit and nut trees could be added to this hectare of land, while still leaving room for the incorporation of additional vegetables, legumes, staples and oil crops—all serving to boost overall yields even higher. A well-thought-out agroecological design should be able to push overall yields well beyond 50,000 kg/ha, especially in a tropical country—like Malawi—which should have access to seasonal, perennial, and highly-nutritious foods throughout the entire year.



Figure 5: Never Ending Food Manager, Peter Kaniye, holding a 21.8 kg local yam harvested during Malawi's 2016 agricultural 'drought'.

In the '*Sustainable Nutrition Manual'*, used by the Malawian Government[24] there is a list of nearly 600 traditional or naturalized foods that Malawi could be utilizing to achieve food security. Many of these foods have had hundreds—or thousands or millions—of years to adapt to Malawi's growing conditions. They are often highly resilient, pest-resistant, drought-resistant, high yielding, and highly nutritious. Our family raises and consumes about 200 of these foods.

Unfortunately, due to an over-reliance on maize, combined with poor soil and water management practices, and increasing changes in climate, a disruption in the growth and maturation of one crop can lead to devastating consequences. During Malawi's 2015/16 growing season much of the country saw long gaps in rainfall, which led to poor maize harvests. According to the *Integrated Food Security Phase Classification (IPC)* program: "As of May-June 2016, almost 4.1 million people, 30% of the rural population, in 27 out of 28 districts of Malawi are classified in "Crisis" (IPC phase 3) and "Emergency" (IPC phase 4). From July to September 2016, even though supplies from the winter harvest, as well as remaining stocks, are likely to maintain a certain food availability, the situation is expected to worsen and almost 4.5 million people (33% of rural population) are estimated to face 'Crisis' and 'Emergency' food insecurity conditions."[25]

During this same 2015/16 growing season, despite the drought-like conditions, farmers who implemented agroecological practices did not face that same problems as farmers who did not implement agroecological practices. The following two pictures show two different systems of agriculture. Both pictures were taken on February 10th, 2016 in the midst of Malawi's drought. These fields are about 100 meters apart from each other, and both received the same amount of rainfall. The picture on the left is what many 'Green Revolution', degraded soil, monocropped maize fields looked like in our area, while the picture on the right is the agroecological field of a young local farmer, Chiku Zamula. The pictures speak for themselves, and forces one to question whether Malawi had a 'drought' or a complete neglect of natural resources.

[23] https://www.integratedbreeding.net/attachment/1376/Yam%20Brief.pdf
[24] http://www.neverendingfood.org/sustainable-nutrition-manual/
[25] http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Note_SummaryResults_SouthernAfrica_final.pdf



Figure 6: Local Malawian farmer, Chiku Zamula, standing in two different systems of agriculture during Malawi's 2016 'drought'.

"Can industrialized agriculture be used to feed the world?"

While many believe industrialized agriculture to be more profitable than sustainable agriculture approaches, this is called into question when we factor in the billions of dollars that are being spent annually to artificially subsidize the costs of this expensive, high-input approach. According to a *Worldwatch Institute*, report: "Government interventions in agricultural markets are continuing to grow internationally, despite widespread acknowledgement that these practices tend to be biased in favor of industrial-scale production, undercutting smaller producers and poor economies while often exerting negative impacts on the environment. Farmers in the world's top 21 food-producing countries, responsible for nearly 80 percent of global agricultural markets, received about $486 billion in public support in 2012, the most recent year for which data is available."[26]

We also need to look at the amount of energy that is needed to sustain the current system of agriculture. The *International Energy Agency* estimated that in 2014, the "global subsidy bill for fossil fuels stood at about $490bn."[27] FAO estimated that: "The food sector, including input manufacturing, production, processing, transportation, marketing and consumption, accounts for approximately 30 per cent of global energy consumption."[28] And, in 2014, the *Wall Street Journal* reported that the entire industrialized food production system is estimated to be responsible for up to 57% of all greenhouse gas emissions. They wrote that: "Typically, estimates of greenhouse-gas emissions from agriculture are around 11%-15% of global emissions. Estimates discussed earlier this week at the United Nations Climate Summit put that number closer to 50%. This is an important calculation as climate change issues come to the fore, with record greenhouse-gas emissions and international negotiations to halt that rise…The 43%-57% estimates, which are published in UNCTAD's 2013 Trade and Environment Review, look at food production more broadly to also include emissions from land-use change and deforestation, as well as the processing, packaging, transport and sale of agricultural products."[29]

We should also take a look at what we are doing with the food which is already being produced. According to *Food First*, for the past two decades, the rate of global food production has increased faster than the rate of global population growth with more than 1 1/2 times enough food to feed everyone on the planet - enough to feed 10 billion people, the world's 2050 projected population peak.[30] But, according to a study cited in the *Guardian Newspaper*: "As much as half of all the food produced in the world – equivalent to 2bn tons – ends up as waste every year…The UK's Institution of Mechanical Engineers blames the "staggering" new figures in its analysis on unnecessarily strict sell-by dates, buy-one-get-one free and

[26] http://www.worldwatch.org/system/files/MintPress-AgSubsidiesVSO-032014.pdf
[27] https://www.ft.com/content/fb264f96-5088-11e6-8172-e39ecd3b86fc
[28] http://www.un.org/apps/news/story.asp?NewsID=40579#.WSGYb2iGPIU
[29] https://blogs.wsj.com/numbers/how-much-of-worlds-greenhouse-gas-emissions-come-from-agriculture-1782/
[30] https://foodfirst.org/publication/we-already-grow-enough-food-for-10-billion-people-and-still-cant-end-hunger/

Western consumer demand for cosmetically perfect food, along with "poor engineering and agricultural practices", inadequate infrastructure and poor storage facilities."[31]

Organic systems have often been criticized as being less productive than conventional agriculture, but in the world's longest running (30-year) side-by-side comparison study by the *Rodale Institute*, they found that:

- Organic yields match conventional yields.
- Organic outperforms conventional in years of drought.
- Organic farming systems build rather than deplete soil organic matter, making it a more sustainable system.
- Organic farming uses 45% less energy and is more efficient.
- Conventional systems produce 40% more greenhouse gases.
- Organic farming systems are more profitable than conventional.[32]

Many assessments of industrialized agriculture fail to take into consideration the negative effects on humans and the environment as a result of depleted nutrition, exposure to toxic chemicals such as pesticides, herbicides, and fungicides, the mismanagement of soil and water resources, and the depletion of biodiversity to make room for expanded monocropping. The suffix '*-cide'* comes from the Latin *'cida'*, meaning 'death' or 'killer'. When we choose to discard the flawed and detrimental methods of industrialized agriculture, we begin to move towards systems which foster life instead. When we begin to learn how to embrace the nature-enhancing models of sustainable agriculture such as agroecology, we begin to realize that all the questions soon merge into one resounding answer: *Yes*, we can use every single available square inch of land and/or space to produce enough highly-nutritious food to feed the world, as well as to elevate the health, growth, and development of all people in all countries to their maximum potential. This can, should, and *already is* being implemented in people's yards[33], gardens[34], farms[35], businesses[36], schools[37], churches[38], hospitals[39], public green spaces[40], urban areas[41], road sides[42], roof spaces[43], communities[44], and nations.[45]

[31] https://www.theguardian.com/environment/2013/jan/10/half-world-food-waste
[32] http://rodaleinstitute.org/assets/FSTbooklet.pdf
[33] http://www.foodnotlawns.com/
[34] https://permaculturenews.org/2016/03/11/5-simple-ideas-for-transitioning-into-a-permaculture-garden/
[35] https://permaculturenews.org/category/permaculture-projects/commercial-farm-projects/
[36] http://www.npr.org/sections/thesalt/2012/12/20/167529920/one-airports-trash-is-2-million-worms-treasure
[37] http://www.edibleschoolgardens.org/
[38] http://www.churchdays.co.uk/index.php?option=com_content&view=category&id=23&Itemid=203
[39] http://www.ecowatch.com/urban-farm-hospitals-2151088898.html
[40] http://www.who.int/sustainable-development/cities/health-risks/urban-green-space/en/
[41] http://www.resilience.org/stories/2014-08-01/20-urban-food-forests-from-around-the-world/
[42] http://www.thehindu.com/news/national/govt-launches-green-highways-policy/article7702950.ece
[43] https://www.theguardian.com/world/2015/mar/20/france-decrees-new-rooftops-must-be-covered-in-plants-or-solar-panels
[44] http://www.villagehomesdavis.org/
[45] https://www.youtube.com/watch?v=fssoAytSy0M