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Review Article

The Role of Regenerative Agriculture in Reducing Non–Communicable Disease Risks

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Abstract
Cardiovascular disease, diabetes, cancer and chronic acute respiratory disorders are a few examples of non-communicable diseases (NCDs) that are regarded as serious global health issues. Even though diet and environmental exposures are significant risk factors for non-communicable diseases (NCDs), most food systems now prioritize high yields over nutrition or environmental health. Using methods like no-till farming, cover crops, crop rotation, polycultures and organic soil additions, regenerative agriculture aims to regenerate the soil and enhance ecosystem function. The history of rheumatoid arthritis and the theories put out about its potential association with a lower risk of non-communicable diseases (NCDs) are examined in this article. To assess the potential of foods and systems produced from regenerative agriculture to enhance diet quality and lower the risk of hazardous exposures, we integrate data from epidemiological surveys, clinical nutrition studies and ecological research. We found that regenerative agriculture has the potential to improve crop phytochemical content and nutritional richness, lower pesticide and antibiotic usage and preserve healthy and diversified food systems. These changes have been linked to dietary habits that are known to prevent cancer, diabetes, obesity and other non-communicable diseases (NCDs). The article discusses a number of important regenerative agriculture researchers and movements. These include the latest research on soil health, permaculture and biodynamics.

Keywords: *Cardiovascular disease, polycultures, ecosystem, permaculture, phytochemical.*

Introduction

All people, regardless of age, gender or financial level, are susceptible to non-communicable diseases (NCDs), which are now responsible for the majority of deaths and illnesses that occur all over the world. There are a number of non-communicable diseases that are quite prevalent, including cardiovascular problems (such as heart disease and stroke), type 2 diabetes, cancers and chronic respiratory diseases [17,18]. There are a number of established risk factors for non-communicable diseases, including a poor diet that is dense in processed foods, carbs and saturated fats, not getting enough exercise, smoking and drinking alcohol and environmental pollutants. An important factor to consider is diet: diets that are abundant in fruits, vegetables, whole grains, nuts and lean proteins offer protection, whereas diets that are high in refined carbohydrates, red and processed meats and ultra-processed foods are associated with an increased risk of non-communicable diseases. The industrialized food system, on the other hand, frequently produces foods that are not particularly nutrient-dense and include harmful chemicals (such as pesticides, hormones and antibiotics), which contributes to the environment being "obesogenic" and "toxic" [52,29]. The term "regenerative agriculture" refers to a novel approach to farming that prioritizes the well-being of the natural environment. The adoption of techniques that promote biodiversity, naturally cycle nutrients and increase the amount of organic matter in the soil is what regenerative agriculture is all about [67]. When compared to conventional farming, which typically involves the use of artificial inputs and monocultures, this is a distinct approach. The primary concept is that the use of healthy agricultural practices results in the production of food that is better for both the environment and the individual, which in turn helps people maintain their health. The purpose of this study is to present a complete and interdisciplinary investigation of regenerative agriculture as a technique to reduce the risk of non-communicable diseases [43]. We begin by examining the history of rheumatoid arthritis and highlighting significant scientists and movements in the field. In the next section, we will examine the ways in which regenerative agriculture reduces the risk of non-communicable diseases through four distinct lenses: improved nutrition, less exposure to potentially hazardous chemicals in the environment, economic benefits and modifications to the production process of food [53]. Following this, there is a summary of the evidence, which also includes clinical nutrition data, epidemiological studies on food and sickness and ecological and agronomic study on the results of rheumatoid arthritis. In order to promote regenerative agriculture, we conduct an analysis of policy and implementation techniques, identify impediments and trade-offs (economic, agronomic and social) and present example case studies from a variety of geographical locations [6,30]. In the late 1900s, the phrase "regenerative agriculture" became popular. Although the concept of farming that heals the earth has been around for a long time, the word "regenerative agriculture" is relatively new. They include J.I., who was a pioneer in the field. In the 1940s, Rodale, who was a pioneer in the field of organic farming, was also instrumental in the establishment of the Rodale Institute. It was his son Robert Rodale, who lived in the United States throughout the 1970s and 1980s, who coined the term "regenerative agriculture" to characterize practices that actively repair the health of the soil. One of the earliest formal organic farming methods was founded by Rudolf Steiner, who was from Austria and lived in the 1920s [19,54]. He was the founder of biodynamic agriculture. It includes planting seeds by the moon and using compost. In Japan throughout the 1940s and 1970s, Masanobu Fukuoka was a pioneer in the field of "natural farming" approaches. He advocated for no-till farming practices and little intervention. The concept of permaculture was initially conceived of in the 1970s by two Australians named Bill Mollison and David Holmgren. Agricultural practices, ecological principles and indigenous knowledge are all incorporated into this design science. Homogeneous grazing management was developed by Allan Savory, who was born in Zimbabwe and currently resides in the United States. This method involves the rotating grazing of cattle in a systematic manner in order to revitalize grasslands [68,7].

Mechanisms Linking Regenerative Agriculture to NCD Risk Reduction

Human health is impacted by regenerative agriculture in a number of different ways that interact with one another. The following are the four primary categories that we have identified: (1) the quality of nutrition and diet, (2) environmental exposures, (3) socioeconomic determinants and (4) changes in the nutritional system. Each process, in the long run, has an effect on the risk factors for non-communicable diseases , which include obesity, cardiovascular disease, diabetes, cancer and respiratory disorders [45,70].

Nutrition and Diet Quality

- Making food healthier is one of the primary ways that this may be accomplished. Both the amount of organic matter and the diversity of microorganisms in the soil are increased via the use of

Table 1. Regenerative Agriculture Practices vs. Expected Environmental and Health Outcomes [90, 31,44,55]

Practice/Intervention	Environmental / Soil Outcomes
No-till farming	Less soil erosion, higher soil organic carbon, improved moisture retention.
Cover cropping (green manure)	Continual soil cover builds organic matter, prevents erosion, nitrogen fixation (for legumes).
Crop rotation & diversification	Breaks pest/disease cycles, maintains soil nutrients, enhances biodiversity.
Polyculture/intercropping	Enhances farm biodiversity, each species supports others (e.g., pest predators, nutrient sharing).
Integrated livestock grazing	Manure returns nutrients to fields, strategic grazing controls weeds, cycles carbon, prevents fuel accumulation (fire risk).
Agroforestry (trees & shrubs)	Long-lived roots sequester carbon, improve water infiltration, habitat for biodiversity, shade/protection.
Minimal/precision fertilizer use	Targets nutrients to crops, reducing leaching, promotes soil microbes.
Water management (rainwater harvesting, swales)	Captures rainfall, recharges aquifers, prevents runoff & erosion.

regenerative technologies, which makes it simpler for plants to obtain those nutrients [56].

- The results of several studies have shown that crops grown in soils that are more biologically active and healthy contain higher levels of micronutrients (such as zinc, iron and vitamins) and bioactive phytochemicals (such as antioxidants, polyphenols and carotenoids) than crops grown in soils that are lacking in these elements. Recent research on regeneratively grown fruits and vegetables, for example, reveals that these products contain around 15–35% more essential vitamins (such as vitamin K, E and B2) and minerals (such as zinc and calcium), in addition to 20–60% more antioxidants and phytosterols than conventionally grown crops [20,69].
- The consumption of foods that are rich in nutrients can improve the levels of vitamins and minerals in the body, as well as promote a healthy metabolism and strengthen the body's physiological resistance. The consequence of this is quite significant in terms of preventing deficiencies and subclinical malnutrition, both of which can result in chronic disorders. Antioxidants and fiber included in plant foods that are regenerative can assist in the management of blood sugar levels, the reduction of inflammation and the improvement of lipid profiles. The prevention of obesity, diabetes and cardiovascular disease can be aided by all of these factors [66,8,32].
- Traditional farming, on the other hand, may involve the use of a significant amount of nitrogen fertilizer and the cultivation of a single crop type. This may result in the production of a high quantity of calories but a low quantity of micronutrients. Because of its emphasis on crop diversification and rotations, regenerative agriculture promotes the consumption of a larger range of nutrients in the human diet (for instance, nuts, pulses and brassicas), which has been associated with a reduced risk of non-communicable diseases [46].
- Additionally, regenerative farms often do not treat their crops with antibiotics or synthetic pesticides. This suggests that the quantities of these poisons found in fruits, vegetables and items derived from animals are far lower. When there is less exposure to pesticides, the risk of cancer and endocrine disruption is reduced. Additionally, the absence of antibiotic feed additives prevents the growth of microbes that are resistant to antibiotics, which may be beneficial to the human gut microbiota. In a nutshell, regenerative agriculture provides you with healthier food, which in turn assists you in eating better. The immediate outcome is a diet that contains more preventative substances and fewer ingredients that are harmful [21].

Environmental Exposures

- With regenerative agriculture, dangerous environmental exposures that might contribute to non-communicable diseases are reduced.

Through the reduction or elimination of synthetic pesticides, herbicides and fertilizers, regenerative agriculture helps to lessen the amount of pollution that is released into the air, water and food. For instance, cover crops and buffer strips prevent agrochemicals from going down the drain and into streams [33].

- This reduces the amount of nitrate and pesticide pollution, both of which can lead to developmental issues and cancers. The structure of the soil is also improved by regenerative agriculture and organic matter is added to it. This helps to trap dust and other pollutants, which in turn makes the air less polluted [89]. The prevalence of asthma and other respiratory conditions may decrease as a result of this. Additionally, improved soils are better at storing carbon, which is a factor in the fight against climate change. The amount of instances of high heat and ozone, which are known to induce stress on the heart and mortality, can be reduced by slowing down the process of climate change [71,57].
- In addition, regenerative agriculture prevents nutrients like as nitrogen and phosphorus from escaping from the soil, which in turn reduces the amount of algal blooms and the toxins that are released into the water as a result of these blooms. The risk of developing liver and kidney disease is reduced when one consumes water that is safe to drink. Producing crops and raising cattle on the same farm allows for the recycling of manure, which in turn increases the cycling of nutrients and reduces the amount of reliance on industrial farms [72].
- In addition to preventing the spread of illnesses that are transmitted by animals, this reduces the amount of antibiotics that are used as growth boosters. People who live in close proximity to regenerative farms enjoy improved air and water quality, less exposure to harmful chemicals and a climate that is more conducive to good health as a result of all of these environmental channels. In both direct and indirect ways, each of these factors contributes to a reduction in the number of non-communicable diseases [9].

Socioeconomic and Food System Factors

- Additionally, the design of regenerative food systems has an impact on social aspects that are thought to have an impact on health. In general, regenerative agriculture is in favor of farming that is on a smaller scale and is centered on the community. This has the potential to strengthen both the economy and the food security in the region. Stable employment opportunities in agricultural areas enable individuals to make more nutritious food choices and reduce the stress levels that are associated with poverty. Alternatively, communities that are economically dependent on industrial agriculture may be more prone to economic instability [22].
- When regenerative agriculture is implemented in a community or region, it has the potential to make a greater variety of fresh foods more accessible and offer them at lower prices. There is a possibility that local food networks, farmer's markets and cooperatives in the region of regenerative agriculture will make it simpler to get fruits, vegetables, whole grains and legumes throughout the entire year [88]. People are able to consume less processed food, which is high in calories but poor in nutrients, when they have better access to food opportunities. This contributes to the battle against metabolic diseases and obesity [58].
- Regenerative agriculture connections to traditional farming skills typically go hand in hand with improved cultural diets. This is another point to consider. Whole grains, legumes, vegetables and a little quantity of animal fats are some examples of foods that may be included in native or traditional diets. Bringing back such nutritious potential is the process of converting farms to grow produce of this kind [73].
- Agroforestry and mixed cropping are two examples of regenerative agriculture approaches that can mitigate against price shocks and fluctuations in the weather in many rural areas if they are used. The resilience of this food system ensures that populations continue to receive adequate nourishment even in the face of adverse conditions, such as a drought or a catastrophic market meltdown. As a result, this prevents increases in under nutrition and prevents individuals from depending excessively on unhealthy packaged foods to make up for it [59].
- Improved health education in the community is one of the social co-benefits that arise from this. A great number of regenerative agriculture programs also include activities that aim to promote awareness about the need of proper nutrition. After gaining knowledge about rheumatoid arthritis, farmers generally become advocates for diets that are abundant in plant-based foods [74]. People are encouraged to make healthier choices when they go grocery shopping because of the connection between farming and food in

regenerative agriculture. At long last, regenerative agriculture has the potential to reduce the costs of healthcare in the long run by focusing on ecosystem services including as pollination, clean water and fertile soil maintenance. This has the potential to have an indirect impact on health equity as well as the well-being of society [34].

Food System and Supply Chain Dynamics

- Regenerative agriculture alters food supply chains in ways that alter the risk of non-communicable disease. Supply chains that are shorter and initiatives that add value on the farm (such as community-supported agriculture and farm-to-school programs) reduce the amount of processing that is done and preserve the nutrients by doing so. When there is less processing, there is also less potential for additives (such as excessive amounts of sugar, salt and transfat) to enter the diet [75].
- Fairness and transparency are commonly emphasized in regenerative supply chains, which can assist in establishing a connection between market incentives and health outcomes. For instance, retailers may pay a higher price for products that have the regenerative agriculture mark. This would enable farmers to meet their expenses without having to expand their fields. As a consequence of this, individuals may consume a greater quantity of fresh fruits and vegetables and a lesser quantity of inexpensive processed foods, which would be beneficial to the nutritional status of the community [10,47].
- Using regeneration methodologies, globalized systems are able to differentiate between economic growth and the "nutrition transition" that leads to non-communicable diseases. Using regenerative agriculture on a large scale would allow a country to potentially grow enough nutritious calories and nutrients on its existing farmland (after the soils recover, yields are frequently comparable to those of traditional farming). This would eliminate the need for the country to either expand its cropland or import low-cost, highly processed foods from other countries. It is possible that regenerative agriculture will alter the entire food chain in order to make it healthier. Each step of the regeneration process, from selecting seeds to distributing them, is centered on quality and diversity [60,23].

Evidence Synthesis

Epidemiological Studies

- Diets and environments that are compatible with regenerative principles are related with lower burdens of non-communicable diseases, according to studies conducted at the population level, which provides indirect but substantial evidence. It has been demonstrated time and again by epidemiological research that countries and communities who consume a greater quantity of fruits, vegetables, legumes and whole foods have much lower rates of cardiovascular diseases, type 2 diabetes and obesity [1,12].
- As an illustration, "Blue Zone" regions such as Okinawa, Japan, Sardinia, Italy, Nicoya, Costa Rica, Ikaria, Greece and Loma Linda, United States of America all have comparable eating patterns. The majorities of the foods that they consume is plant-based and consist of a high proportion of fresh fruits and vegetables, legumes, nuts and a little bit of fish or meat [87,76]. These regions have extremely low rates of cardiovascular disease, stroke and diabetes, which show that lifestyle and diet have a role in the development of these conditions. In spite of the fact that these diets have been around long before the term "regenerative agriculture" was coined, the food that is consumed typically comes from farms that are ecologically managed and do not make extensive use of pesticides, which is comparable to the consequences of regenerative agriculture [35,11].
- Cross-country comparisons also reveal the presence of risk. In Japan and South Korea, for instance, traditional diets that were low in processed fats were associated with extremely low rates of obesity and diabetes that were seen in those countries. Dietary changes in Western countries have only lately led to an increase in non-communicable diseases. Obesity rates are higher than 30–40% of individuals in Western nations (the United States of America, the United Kingdom and Australia) and the prevalence of diabetes is higher than 10%. Ultra-processed foods account for 50–60% of calorie intake [61].
- There are further epidemiological studies that focus on certain experiences. Research on pesticide exposure (for example, agricultural communities as opposed to the general population) reveals that those who are exposed to pesticides have a higher prevalence of cancers and metabolic issues. This suggests that farming operations that do not include the use of such chemicals have advantages [86,77]. In a similar

vein, research that links environmental problems (such poor air quality and water contamination) to chronic diseases demonstrates how actions related to regenerative agriculture that improve ecosystems may also improve health. There are not many clear population trials of therapies for rheumatoid arthritis, but this collection of evidence suggests that there may be a potential benefit [24,48].

Clinical Nutrition and Interventions

- The findings of clinical and nutritional research create more direct linkages between the eating habits of individuals and the outcomes of illnesses. A large number of randomized controlled trials and cohort studies have compared diets that are similar to restorative outputs (plant-based, high-fiber, whole foods) to diets that are considered to be normal. One such example is the Mediterranean diet, which emphasizes the consumption of vegetables, legumes, whole grains, olive oil and moderate portions of fish and poultry [85,2].
- When compared to the normal diets of the Western world, it significantly reduces the risk of cardiovascular disease, diabetes and mortality. An eating plan that is abundant in fruits and leafy greens, which is a diet that is frequently recommended by regenerative agriculture food systems, has been demonstrated time and again to be effective in lowering blood pressure, cholesterol and blood sugar levels. Meals that are high in bioactive compounds, such as those that are present in nutrient-dense regenerative agriculture veggies, have been shown to improve endothelial function and inflammation in experimental feeding trials [61,36].
- Despite the fact that there are not many clinical trials that directly compare food "from regenerative agriculture" to food from traditional sources, the nutritional differences that were noted before imply that there may be health consequences in the future. According to the findings of several studies on regenerative agriculture crops, it is reasonable to expect that the intake of crops that have twenty to thirty percent greater amounts of vitamins and antioxidants would boost the favorable effects that have been found in clinical examinations of diets that are high in green vegetables [13].
- A rising number of people are interested in the ways in which changes in the microbiomes of soil and plants might have an effect on the microbiome of the human stomach as a result of eating. According to the findings of some preliminary studies, fermented or unwashed raw vegetables grown in organic soils may have an effect on the variety of microorganisms in the gut, which may have implications for the health of the immune system and the metabolism. Despite the fact that it is still in its infancy, this research suggests that rheumatoid arthritis may have a major impact on the risk of non-communicable diseases through a mechanism that is promoted by the microbiome [49,37].
- In general, the findings of clinical nutrition research strongly advocate that individuals alter their diets to incorporate all-plant meals that are entire. A great number of regenerative systems are designed to accomplish just this [78]. In addition, it demonstrates how essential it is to reduce the amount of dietary pollutants (such pesticides and nitrates), which is something that regenerative agriculture farming accomplishes. Enhanced soil and agricultural practices give nutritional advantages that are acknowledged to prevent or alleviate non-communicable diseases. In conclusion, the clinical data that was acquired from patients provides evidence that supports the proposed mechanism of rheumatoid arthritis [25].

Ecological and Agronomic Studies

- Studies of regenerative farms and landscapes that are conducted over extended periods of time give more data. For example, the Rodale Institute's Farming Systems Trial in the United States compared organic farming practices (including some similar to regenerative agriculture) to conventional farming methods over the course of several years. Over the course of a few years, the levels of soil organic carbon began to increase in organic plots whereas they began to decrease in conventional plots. Organic plots produced yields that were comparable to or even higher than those produced by conventional plots during dry years [50].
- Additionally, there was evidence that organic crops included a greater quantity of nutrients per unit of weight. In addition, several studies conducted all over the world (for maize, wheat, rice and other crops) have demonstrated that the incorporation of cover crops, compost and rotations into the mix results in an increase of 10–50% in the micronutrient content of grains when compared to systems that need a significant amount of inputs [84,79]. A recent meta-analysis of more than a dozen studies found that

increasing the amount of organic matter (such as compost, manure and cover crops) that was added to grains and fruits resulted in a significant increase in the amount of zinc and iron that was present in those foods [38].

- Monitoring the environment reveals that regenerative methods are also responsible for the restoration of ecosystem services [3]. These services include improved water retention, an increase in the number of pollinators and additional habitats for wildlife. In addition to helping the environment, these changes also benefit people. For instance, enhanced pollination may result in an increase in the quantity of fruits and vegetables, while cleaner water and more consistent weather may help communities remain safe. This association is still being researched, but one ecological advantage in regard to non-communicable diseases is the reduction of "leaky gut" in populations that are subjected to environmental pressures [51].
- According to the findings of several studies on land management, residing in places that are more biodiversity and greener might have psychological benefits. These benefits are associated with lower levels of stress, improved mental health and perhaps reduced risk behaviors. These community health benefits of regenerative landscapes may further lower the risk of non-communicable illnesses (for example, by reducing behaviors linked with hypertension or depression). These benefits appear to be indirect, but they are nevertheless beneficial [62,14].

Policy and Implementation Pathways

For the purpose of reducing the prevalence of non-communicable diseases, we require policies that are supportive on all levels. There are a great number of new applications and programs that are being developed all around the world:

- **Subsidies and Incentive Programs:** In order to induce regenerative agriculture practices, governments have the ability to alter the manner in which they provide financial assistance to farmers. For example, if agricultural subsidies were changed to reward soil conservation, crop variety and organic inputs rather than monoculture cereals, this would encourage farmers to employ regenerative agriculture. Some countries have begun to pay for ecosystem services, which imply that farmers are compensated for activities such as the storage of carbon and the provision of clean water [63].
- **Research and Extension:** The allocation of funds by the government for research and the provision of extension services by universities may prioritize agroecology and regenerative gardening techniques. Through the use of training programs and technological assistance, farmers may be able to overcome knowledge gaps. It is possible to demonstrate the significance of this for policy by having health ministries collaborate with agriculture ministry's to investigate the relationship between soil health and nutrition [80].
- **Regulation and Standards:** It is possible that regenerative agriculture might be indirectly encouraged by regulations and standards that make it more expensive to farm in a traditional manner by imposing stricter constraints on the amount of pesticide residues that can be found in food and water. There is a possibility that certification systems, such as "regenerative organic" or sophisticated biodynamic certification, might assist in bringing attention to respiratory goods on the market. It is possible that labeling systems that are connected to health outcomes may assist individuals in making decisions [81].
- **Public Procurement and Dietary Guidelines:** Governments and institutions (such as schools, hospitals and the military) have the ability to purchase food from sources that are beneficial to the environment. This ensures that there will always be a market for the food that is purchased from these sources. National dietary standards can provide an emphasis on whole foods that are farmed locally, which is consistent with the concepts of regenerative agriculture. Educating the public through campaigns can assist individuals in comprehending the impact that their food has on their health [39].
- **Public Procurement and Dietary Guidelines:** In the realm of infrastructure and markets, the establishment of supply chains for regenerative agriculture goods is of utmost significance. If farmers make investments in local processing industries (such as grain mills and fruit drying plants), cold storage facilities and distribution networks, they will reap financial benefits. Small farmers might receive assistance in meeting criteria and delivering their products to clients through the use of cooperatives or farmer's organizations [26].
- **Infrastructure and Markets:** By incorporating regenerative agriculture into global initiatives like as the United Nations Sustainable Development Goals (UN SDGs), the Paris Climate Agree-

ment and the choices made by the World Health Assembly, it is possible to channel international finances and financing into activities that are beneficial to the environment. It is possible that climate funding, which includes carbon offset markets, may assist soil carbon projects in generating revenue. It is possible that health authorities may collaborate in order to address the connection between nutrition and security, with the goal of utilizing regenerative agriculture as a climate-related health strategy [64,4].

Barriers and Trade-offs

- Despite the fact that more individuals are interested, there are still significant challenges associated with putting regenerative agriculture into practice and reaping the benefits it offers in terms of health. An insufficient amount of farmer skill, substantial initial costs (for no-till equipment and cover crop seeds), inadequate infrastructure and market systems that prioritize the production of commodities above the development of high-quality goods are all examples of typical obstacles. A number of farmers are concerned about relatively short-term decreases in productivity as well as the requirement to acquire new management skills [5].
- The potential trade-offs must also be taken into consideration. There is a concern that if the yields per hectare of regenerative agriculture are initially a bit lower (but typically increase with time), then in order to satisfy the overall need for food, it would be necessary to purchase additional land or import crops that require a great deal of energy. This might potentially nullify some of the positive effects that regenerative agriculture has on the environment. In cattle systems, there is still another trade-off that occurs [42].
- As an illustration, animals who are fed in a regenerative manner produce meat that is healthier (with a greater concentration of omega-3 fats), whereas grazing results in the production of methane. It is necessary to make cautious plans in order to reduce emissions of greenhouse gases. One example of this would be to ensure that the number of ruminants is maintained in proportion to the growth of the pasture. It is possible that concentrating on high-value regeneration crops like as almonds or coffee might lead to an increase in revenue, yet, if staples are neglected, the variety of meals may decrease. When it comes to nutrition, it is essential to strike a balance between cash crops that are rich in nutrients and foods that are considered to be fundamental [28].
- In addition to this, there are certain societal compromises. Due to the possibility of certification fees or distribution networks, regenerative agriculture food may be distributed to high-end establishments, making it more difficult for individuals with lower resources to obtain it. It is possible that this will result in substantially larger health disparities if it is not addressed. Affordable solutions, such as school programs and urban gardens, as well as commercial choices, need to be encouraged by policies [65,41].
- One other point to consider is that there are information gaps, which will be discussed further down, which may make it difficult to establish opinions based on the facts. When there are no sufficient criteria to quantify the health of the soil or the amount of nutrients produced, it is difficult to standardize the term “regenerative” and compare different systems. All things considered, the benefits of regenerative agriculture for the prevention of non-communicable diseases are substantial, yet, in order to achieve effects that are both long-lasting and inclusive, it is necessary to overcome these challenges and find a way to reconcile the trade-offs involved [16,82].

Conclusion

In the 21st century, one of the most significant challenges to public health is the prevalence of non-communicable diseases. In order to combat non-communicable diseases, we need to address the fundamental factors that contribute to their development, such as the standard of our meals and the state of the environment in which we live. According to the findings of this study, regenerative agriculture is a multifaceted approach that improves not only the quality of food but also the health of the environment, hence reducing the risk factors for non-communicable diseases at their origin location. When regenerative methods are utilized, the soil becomes more fertile and diversified, which ultimately results in crops that are healthier and ecosystems that are cleaner. Not only do these enhancements make it simpler to consume foods that are rich in micronutrients and bioactive molecules, but they also lessen the negative effects that chemicals have on the body. Better nutrition for individuals, more balanced gut microbiomes, more food security and stronger communities are all factors that are known to help prevent obesity, diabetes, heart disease, some cancers and chronic respiratory issues. The downstream impacts include all of these things. There have been policy

Table 2. Nutrient Profiles of Crops under Regenerative vs Conventional Systems [65,15,27,40,83]

Crop	Nutrient	Regenerative agriculture -grown (amount)	Conventional (amount)
Tomato	Vitamin C (mg)	25	18
	Lycopene (µg)	10,000	7,000
	Potassium (mg)	290	250
Carrot	Beta-carotene (µg)	6000	4800
	Vitamin C (mg)	6.5	5.2
	Fiber (g)	2.8	2.4
Spinach	Iron (mg)	3.8	2.5
	Vitamin C (mg)	30	22
	Folate (µg)	160	130
Broccoli	Vitamin K (µg)	270	210
	Vitamin C (mg)	140	110
	Calcium (mg)	70	50
Wheat (grain)	Zinc (mg)	4.5	3.8
	Protein (g)	13.5	13.0
Rice (grain)	Zinc (mg)	2.8	2.4
	Vitamin B1 (mg)	0.45	0.40
Apple	Vitamin C (mg)	6.0	4.2
	Quercetin (mg)	10	7
Potato	Vitamin C (mg)	22	17
	Potassium (mg)	470	420
Beans	Protein (g)	9.0	8.0
	Fiber (g)	7.0	6.0
	Folate (µg)	120	95

initiatives and case studies conducted all around the world that demonstrates that regenerative agriculture is not only feasible but also has the potential to offer significant benefits. On the other hand, there are still issues that arise when these methods are expanded. It is necessary for us to bring together health and agricultural policy, assist farmers in making the transition and educate customers if we are to achieve success. The material that has been compiled and presented below makes it abundantly evident that the intentional integration of agricultural policy with health policies can in fact result in significant advantages. Agriculture that is regenerative is an example of the concept of "One Health", which states that the health of the land, plants, animals and humans are all interconnected and interdependent on one another. As part of their efforts to reduce the prevalence of non-communicable diseases, we propose that governments, international organizations and the scientific community make regenerative agriculture a key priority. This includes providing financial support for research that spans several fields, establishing incentives for agricultural practices that are beneficial to health and initiating educational initiatives that demonstrate how soil influences health. It is possible that by accomplishing this, food systems will go from being a component of the NCD issue to becoming an essential component of the solution. The ultimate goal is to create a society in which each and every meal not only provides sustenance for humans but also contributes to the preservation of the environment. If the practice of regenerative agriculture were to gain widespread acceptance, it would be feasible to create a society in which people are healthier and live in harmony with ecosystems.

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