



A Guide

Completed as part of the Mercy Global
Action Emerging Leaders Fellowship

HARVESTING SOLUTIONS

Examining the Relationship between
Population Growth and Sustainable
Food Systems



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ACKNOWLEDGMENTS

I would like to express my heartfelt appreciation to the remarkable **MELF team** for their unwavering dedication in facilitating this fellowship. Your collective efforts have created an exceptional experience for all of us, guiding, supporting, and inspiring our personal and professional growth. From organizing enriching activities and workshops to providing invaluable mentorship and guidance, you have gone above and beyond to ensure our success. Your commitment has fostered a vibrant community that empowers us to reach new heights and make a meaningful impact. I am deeply grateful for your outstanding work and the indelible mark you have left on our journeys.

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Acknowledgements
Harvesting Solutions

PREFACE

This project stems from my profound passions for agriculture and my unwavering belief in the power of factual information to empower individuals. My love for agriculture has nurtured a deep appreciation for the intricate web of our global food systems and the need for sustainable practices. Combining my passion for agriculture with a burning desire to make a tangible impact, I recognize that providing people with accurate and relevant facts is crucial in empowering them to take meaningful action. Through this project, I aim to offer readers a wealth of information, supported by research and real-life examples, enabling them to develop a comprehensive understanding of the challenges we face. By equipping individuals with knowledge, I firmly believe they can become agents of change, making informed decisions and actively contributing to the creation of a more sustainable and resilient future for our planet.



Planting Seeds of Mercy

Cultivating Sustainable Solutions with Catherine McAuley's Spirit

"Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems" draws inspiration from the timeless spirit of mercy, embodied by Catherine McAuley, the founder of the Sisters of Mercy. Catherine McAuley's unwavering commitment to compassion, justice, and service to those in need provides a guiding light for this comprehensive guide.

In the spirit of mercy, this guide seeks to address the challenges posed by the growing global population and its impact on food sustainability. It recognizes the interconnectedness of these issues and the need to foster sustainable solutions that uplift and empower vulnerable communities.

Catherine McAuley's legacy of compassion for the marginalized and her tireless efforts to improve the lives of others resonate throughout this guide. It shines a spotlight on the remarkable achievements of women who, like McAuley, have taken bold strides in addressing the complexities of population growth and sustainable food systems. Their stories serve as a testament to the transformative power of empathy, resilience, and inclusive action.

By embracing the mercy spirit, "Harvesting Solutions" aims to inspire readers to cultivate a deep sense of responsibility towards one another and our planet. It invites individuals, communities, and governments to join hands and work together with compassion, empathy, and a commitment to justice, forging a path towards a more equitable and sustainable future for all.



Preface

Harvesting Solutions



"We should be shining lamps, giving light to all
around us"

Catherine McAuley



Seeing Yourself in the Picture

Throughout this guide, women from diverse backgrounds are prominently showcased, providing inspiration and representation for women from all walks of life. By featuring women of different races, ethnicities, cultures, abilities, and experiences, the guide aims to ensure that women from various backgrounds can see themselves reflected in the stories and achievements of these remarkable individuals.

This representation is aligned with the empowerment of women demonstrated by Catherine McAuley and the broader empowerment of women within the fellowship. Catherine McAuley believed in the inherent dignity and worth of every person, especially women, and worked tirelessly to empower them through education, healthcare, and social support.



**Winona
LaDuke**



**Wendy
Coleman**



**Vandana
Shiva**



**Shayna
Harris**



**Rhiana Gunn-
Wright**



**Rasha
Hasaneen**



**Sherri
Mitchell**



**Nina
Mannheimer**



**Danielle
Nierenberg**



**Christiana
Figueres**



**Dr. Asmeret
Asefaw Berhe**



**Sunita
Narain**



**Hindou
Oumarou
Ibrahim**



**Camille
Goldstone-
Henry**



**Arohi
Sharma**



**Joan
Salwen**



**Ahrum
Pak**



**Eva
Goulbourne**



**Corey
Ramsden
Scott**



**Autumn
Peltier**



"The simplest and most practical lesson I know...is to resolve to be good today, but better tomorrow. "

Catherine McAuley



Table of Contents

- 1** Introduction
- 3** UN Sustainable Development Goals
- 5** Blooming Numbers: Unearthing the Roots of Population Growth
- 9** Growth and Nourishment Entwined: The Fertile Ground of Population Growth and Sustainable Food Systems
- 11** Seeds of Demand: Growing population puts 'stalk' in the ground for increased food needs
- 13** Cultivating a Greener Plate: Branching Out to Sustainable Food Production
- 31** Planting Seeds of Action: Cultivating Change at Every Level
- 50** Conclusions
- 51** Rooted in Knowledge: References





INTRODUCTION

Welcome to "Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems," an introductory guide that delves into the challenges posed by the growing global population and the need for sustainable food systems. As the world's population continues to expand, it places a strain on our planet's resources, particularly in the realm of food production and consumption. This guide aims to shed light on the intricate interplay between population growth and food sustainability, while showcasing inspiring examples of how individuals, communities, and governments can actively work to address these complex issues.



Throughout this guide, we will explore the multifaceted nature of the global population growth phenomenon and its implications for food systems worldwide. We will examine how population growth impacts agricultural practices, land use, water resources, and greenhouse gas emissions, while also delving into the consequences for biodiversity, climate change, and social equity. By understanding the intricate web of challenges, we can begin to appreciate the need for transformative action to ensure a sustainable future for all.

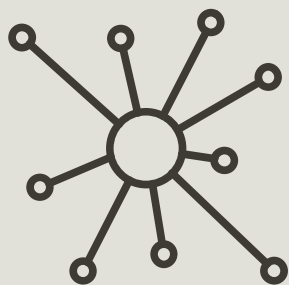




One crucial aspect we will highlight throughout this guide is the pivotal role women play in addressing these challenges. Women, who comprise a significant proportion of the agricultural workforce and household food producers, are often at the forefront of sustainable farming, conservation efforts, and community resilience. We will showcase the remarkable achievements of women who have taken bold strides in creating innovative solutions, challenging gender disparities, and empowering their communities to build sustainable food systems that benefit all.



Drawing from diverse global perspectives and experiences, "Harvesting Solutions" offers practical examples of how individuals, communities, and governments can contribute to addressing the complex nexus of population growth and sustainable food systems. We will explore strategies for reducing food waste, promoting agroecological farming methods, implementing inclusive policies, fostering technological innovations, and strengthening local food systems. By providing a range of insights and actionable recommendations, this guide aims to inspire and empower readers to become catalysts for change in their own spheres of influence.



Now is the time for us to come together, acknowledge the interconnectedness of population growth and sustainable food systems, and embark on a collective journey towards a more equitable, resilient, and nourished world. Let "Harvesting Solutions" be your compass as we navigate the path towards a sustainable future, amplifying the stories of those who have already made remarkable progress in forging a harmonious relationship between our growing global population and the essential need for sustainable food systems.

Introduction

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UN SUSTAINABLE DEVELOPMENT GOALS

ENTWINED THROUGHOUT THE PROJECT

The United Nations Sustainability Goals, also known as the Sustainable Development Goals (SDGs), were established in 2015 as a global framework to address social, economic, and environmental challenges. There are 17 interconnected goals, including poverty eradication, gender equality, clean energy, climate action, and partnerships for sustainable development. The goals aim to be universal and require collaboration among governments, organizations, and individuals. Progress is measured through indicators and targets. The SDGs have gained momentum and are integrated into policies and practices worldwide. Despite progress, challenges remain, and the COVID-19 pandemic has emphasized the need to address inequalities. The goals represent a shared vision for a more equitable and sustainable future.

This project on the interaction between the growing population and sustainable food systems aligns with multiple Sustainable Development Goals (SDGs) including: Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, Clean Water and Sanitation, Decent Work and Economic Growth, Industry Innovation and Infrastructure, Reduced Inequalities, sustainable cities and communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land and Partnership for Goals.

By addressing the complex relationship between population growth and sustainable food systems, this project can make valuable contributions towards achieving these SDGs. It recognizes the need for sustainable agricultural practices, food security, responsible consumption, climate action, biodiversity preservation, and collaborative partnerships, all of which are integral to creating a more sustainable and resilient future for our planet.



This guide addresses the challenge of ensuring food security and access to nutritious food for a growing population.



This guide addresses inequalities in access to resources, markets, and knowledge within the food systems. It advocates for policies that promote the fair distribution of resources and supports marginalized communities, ensuring that no one is left behind in benefiting from sustainable food systems.



By focusing on sustainable food systems, this guide contributes to promoting healthy diets and improving the overall well-being of individuals.



This guide highlights the importance of sustainable urban food systems, including urban agriculture, local food production, and access to nutritious food in urban areas. It promotes the integration of food security and sustainability considerations in urban planning and development.



By raising awareness and providing educational resources on sustainable food systems, agriculture, and nutrition. It promotes knowledge sharing and capacity building among communities, farmers, and stakeholders involved in food production.



Sustainable food systems aim to promote efficient resource use, reduce food waste, and encourage sustainable agricultural practices, which are central to achieving responsible consumption and production patterns.



This guide addresses gender inequalities within the agricultural sector by promoting equal access to resources, training, and opportunities for women farmers. It advocates for gender-responsive policies and empowers women to participate in decision-making processes related to food systems.



This guide considers the impact of agriculture and food production on greenhouse gas emissions, land use, and climate change. Implementing sustainable practices within food systems contributes to mitigating climate change and adapting to its effects.



This guide emphasizes the importance of efficient water management in agriculture and promotes sustainable irrigation practices. It also addresses water pollution and the need for proper sanitation facilities in agricultural communities.



This guide addresses the challenge of ensuring food security and access to nutritious food for a growing population.



This guide contributes to creating decent work opportunities in the agricultural sector by promoting sustainable farming practices and supporting smallholder farmers. It encourages the adoption of fair labor practices and ensures equitable economic growth within the food systems.



As this guide explores the interaction between population growth and food systems, it considers the impact on ecosystems, land degradation, biodiversity, and conservation. Promoting sustainable food systems can help protect and restore terrestrial ecosystems and ensure the preservation of biodiversity.



This guide explores innovative solutions and technologies that improve agricultural productivity, resource efficiency, and value chain management. It promotes sustainable agricultural practices through the adoption of advanced technologies and the development of efficient infrastructure within food systems.



Collaboration and partnerships among different stakeholders, such as governments, farmers, researchers, and consumers, are essential to achieving sustainable food systems. This project can contribute to fostering partnerships and cooperation towards this goal.



BLOOMING NUMBERS:

UNEARTHING THE ROOTS OF POPULATION GROWTH

The world's population has been steadily increasing over the past few centuries, but the rate of growth has varied over time. Here are the key trends and projections regarding global population

HISTORICAL TRENDS

Prior to the 19th century, global population growth was relatively slow and stable, with occasional fluctuations due to epidemics, wars, and other factors. From around 5 million people at the dawn of agriculture in 8000 B.C., it grew to approximately 200 million by 1 A.D., although estimates vary. The growth rate during this 8,000-year period was less than 0.05% per year.

The Industrial Revolution in the 18th and 19th centuries brought about significant advancements in healthcare, sanitation, and agricultural practices, leading to a decrease in mortality rates and a subsequent population boom. It took until around 1800 for the global population to reach one billion, but then the second billion was achieved in just 130 years by 1930. The third billion followed in only 30 years by 1960, the fourth billion in 15 years by 1974, and the fifth billion in a mere 13 years by 1987.

In the 20th century, the global population experienced an unprecedented surge, primarily due to advancements in medicine, improved living conditions, and declining infant mortality rates. During this period the population grew from from 1.65 billion to 6 billion. Comparatively, the population in 1970 was only about half of what it is today. However, due to declining growth rates, it is projected to take over 200 years for the population to double again.

Blooming Numbers
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POPULATION SIZE IN 2023



10 LARGEST POPULATIONS

	China: 1.455 Billion
	India: 1.421 Billion
	USA: 336 Million
	Indonesia: 282 Million
	Pakistan: 234 Million
	Nigeria: 222 Million
	Brazil: 217 Million
	Bangladesh: 169 Million
	Russia: 146 Million
	Mexico: 133 Million

POPULATION GROWTH RATE

As of 2022, the global population is experiencing a growth rate of approximately 0.84% per year, a decline from previous years (1.05% in 2020, 1.08% in 2019, 1.10% in 2018, and 1.12% in 2017). The current estimate suggests an increase of 67 million people annually.

The peak of annual population growth occurred in the late 1960s, reaching around 2%. Since then, the rate has nearly halved and is expected to continue declining in the coming years.

While the world population will continue to grow in the 21st century, it will do so at a much slower pace compared to the recent past. Between 1959 and 1999, the global population doubled, increasing by 100% from 3 billion to 6 billion. It is now projected to take nearly 40 years for the population to increase by another 50% and reach 9 billion by 2037. This indicates a gradual deceleration in population growth in the years to come.



REGIONAL VARIATION AND DRIVING FACTORS

Population growth rates vary significantly across different regions of the world (Figure 1). Regions, such as Europe and North America, generally have lower population growth rates or even negative growth due to factors like aging populations and declining birth rates. Regions, such as in Africa and parts of Asia, continue to experience higher population growth rates. Discussed are some of the factors driving this regional variation.

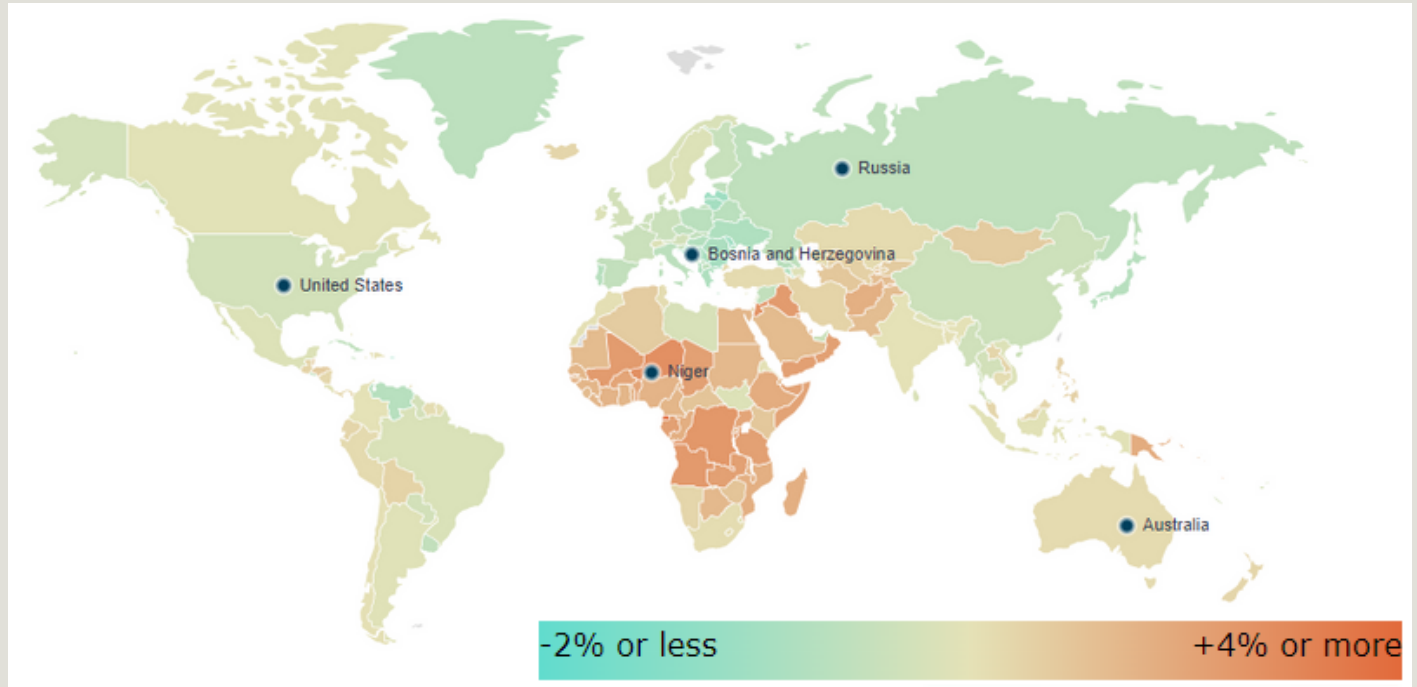


Figure 1: Population growth by country between 2012-2021 (Source: [WorldData](#))

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Asia's Dominance:

In 2020, Asia was home to 60% of the world's population. Eastern and South-Eastern Asia, the most populous region, had 2.3 billion people, with China accounting for 1.4 billion. Central and Southern Asia, the second largest region, had 2 billion people, with India contributing nearly 1.4 billion. Both regions are expected to reach their peak population size within a few decades.



Uncertainty in Population Projections:

Population projections become less certain over time. The range of likely population sizes is particularly wide for sub-Saharan Africa and Central and Southern Asia due to uncertainty around future fertility reductions. However, Eastern and South-Eastern Asia is likely to reach its peak population earlier than Central and Southern Asia.



Sub-Saharan Africa's Growth:

Sub-Saharan Africa's population is comparable in size to Europe and Northern America, with each region having around 1.1 billion people in 2020. Sub-Saharan Africa is currently growing at the highest rate among all regions, and it is projected to continue growing rapidly. By 2050, the population is expected to double, reaching between 2.0 and 2.2 billion. It is likely to become the most populous region globally in the early 2060s.



Stabilizing Populations:

Europe and Northern America's populations are stabilizing and projected to grow slower than the global average. Latin America and the Caribbean are also expected to experience slower population growth and may start declining in the second half of the century. In contrast, Northern Africa, Western Asia, and Oceania are expected to sustain their current pace of growth throughout the century.

Slowing Global Population Growth:

Global population growth has significantly slowed in the past 50 years, with a decreasing number of countries experiencing high growth rates. The populations of many countries are growing slowly or declining, particularly in Eastern and Southern Europe.



Regional Growth Disparities:

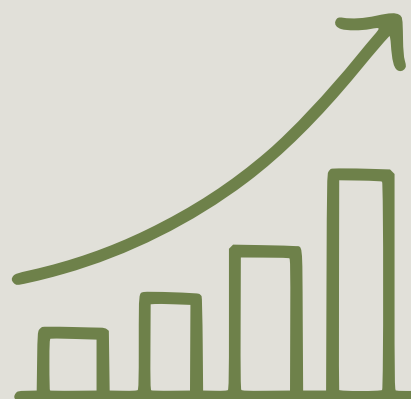
Sub-Saharan Africa and Central and Southern Asia are projected to contribute three-fourths of the global population increase until 2050. Eastern and South-Eastern Asia and Europe and Northern America will switch from population growth to decline in the 2040s, followed by Latin America and the Caribbean and Central and Southern Asia in the 2060s. Lower-middle-income countries currently contribute the most to population growth, but growth rates are expected to slow in all low-income and lower-middle-income countries.



Major Contributors to Population

Increase:

Nine countries, including India, the United States, and Nigeria, are projected to account for more than half of the global population increase between 2020 and 2050. China, Japan, and Russia, on the other hand, are expected to experience population loss. By the end of the century, China's population may decrease by over a quarter of its current size.



Long-term Projections:

Population projections for the second half of the twenty-first century indicate that countries with declining populations will lose a total of 910 million people, while growing countries will add 2.05 billion. High-income and upper-middle-income countries are likely to experience a net decrease in population size during this period, while low-income countries will drive global population growth, which is projected to decelerate towards the end of the century.



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Growth and Nourishment Entwined

The Fertile Ground of Population Growth and Sustainable Food Systems

Challenges and Opportunities Associated with a Growing Population

Challenges

Food Security: The primary challenge associated with a growing population is ensuring food security for all. Increasing population puts pressure on the agricultural sector to produce more food, leading to concerns about sufficient food availability, accessibility, and affordability.

Resource Scarcity: As the population grows, there is increased competition for limited natural resources such as land, water, and energy. This can lead to conflicts and environmental degradation, as well as challenges in meeting the growing demand for resources.

Urbanization and Infrastructure: Rapid population growth often leads to unplanned urbanization, straining infrastructure systems such as housing, transportation, sanitation, and healthcare. The need to accommodate growing urban populations and provide essential services becomes a significant challenge.

Environmental Impact: A larger population contributes to increased consumption patterns and resource extraction, resulting in environmental challenges such as deforestation, habitat loss, pollution, and climate change. Balancing the needs of a growing population with environmental sustainability is a complex challenge.

Health and Social Services: The provision of adequate healthcare, education, and social services becomes more challenging with a larger population. Ensuring access to quality healthcare, education, and social support systems for all individuals becomes a crucial task.



Growth and Nourishment Entwined
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Opportunities



Economic Growth: A growing population can provide opportunities for economic growth and development. More people can lead to increased labor supply, entrepreneurship, and market demand, stimulating economic activity and innovation.

Cultural Diversity and Exchange: A larger population brings together diverse cultures, ideas, and perspectives. This diversity can lead to cultural enrichment, cross-cultural exchanges, and increased social interactions, fostering creativity and understanding.

Human Capital: A larger population means a larger pool of human resources. This provides an opportunity to develop and utilize the talents, skills, and knowledge of individuals, contributing to economic and social development.

Innovation and Technological Advancement: Population growth can drive innovation and technological advancements to meet the needs of a larger population. It can lead to research and development efforts in various sectors, including agriculture, healthcare, energy, and communication.

Social Progress and Development: With a growing population, there is an opportunity to achieve social progress and development. This includes improving access to education, healthcare, and social services, reducing poverty and inequality, and empowering marginalized communities.

Growth and Nourishment Entwined

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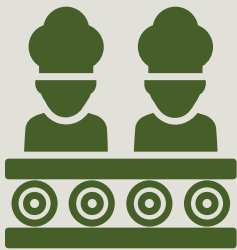
Seeds of Demand:

GROWING POPULATION PUTS 'STALK' IN THE GROUND FOR INCREASED FOOD NEEDS

The implications of population growth on food demand are significant and multifaceted. As the global population continues to increase, several key factors come into play regarding the demand for food:

Increased Food Requirements

A larger population inherently translates to a greater number of mouths to feed. As more people are added to the global population, the overall demand for food also rises. This necessitates increased agricultural production and distribution systems to meet the growing food needs.

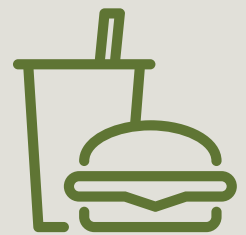


With rising incomes and changing lifestyles, dietary patterns tend to shift. As populations become more urbanized and economically developed, there is often a transition towards higher consumption of animal products, processed foods, and a more varied diet. These changes in dietary preferences and habits further drive up the demand for food, particularly in terms of livestock production and processed food manufacturing.

Changing Dietary Patterns

Urbanisation and Dietary Shifts

Urbanization is closely linked to population growth, as more people migrate from rural areas to cities in search of employment and improved living conditions. Urban dwellers typically have different dietary patterns compared to rural populations, leading to increased demand for processed foods, convenience foods, and a greater reliance on food supply chains to deliver products from production areas to urban centres.



Food Security Concerns



As population increases, ensuring food security for all becomes a critical challenge. Food security encompasses not only the availability of food but also its accessibility, utilization, and stability. Meeting the food demand of a growing population requires addressing issues such as agricultural productivity, infrastructure development, storage and transportation systems, market access, and affordability of food, particularly for vulnerable and marginalized populations.



Environmental Impacts

Population growth can exert additional pressures on natural resources and the environment. To expand agricultural production, land is often converted from forests, wetlands, or other ecosystems, leading to deforestation and habitat loss. Increased water usage for irrigation and livestock rearing can exacerbate water scarcity concerns. Additionally, intensive agricultural practices may contribute to soil degradation, water pollution, greenhouse gas emissions, and other environmental challenges.

Agricultural Intensification and Technological Innovations

To meet the growing food demand, agricultural practices often intensify, aiming to maximize productivity and yield. This includes the use of synthetic fertilizers, pesticides, irrigation systems, and mechanization. Technological innovations, such as genetically modified crops, precision agriculture, and vertical farming, are also being explored to boost productivity. However, these practices need to be balanced with environmental sustainability, biodiversity conservation, and human health considerations.



Hidden Hunger: Nutrient Deficient Diets



As the global population continues to expand, there is a growing challenge to meet the nutritional needs of an increasing number of people. Unfortunately, many individuals suffer from "hidden hunger," a term used to describe the lack of essential micronutrients in their diets. This arises from a heavy reliance on staple foods that are deficient in vital vitamins and minerals. Addressing hidden hunger necessitates diversifying diets and promoting access to nutrient-rich foods, which in turn escalates the demand for a broader range of agricultural products. To sustainably feed a growing population while combating hidden hunger, it becomes crucial to prioritize agricultural practices that emphasize both quantity and quality, ensuring sufficient food production while simultaneously improving the nutritional value of the global food supply.

Addressing the implications of population growth on food demand requires adopting sustainable and inclusive approaches to agriculture, promoting equitable access to nutritious food, supporting small-scale farmers, improving agricultural productivity, investing in research and development, and ensuring environmentally friendly practices. Furthermore, promoting education, empowering women, and reducing poverty and inequality are crucial elements in achieving food security for a growing population.



CULTIVATING A GREENER PLATE

BRANCHING OUT TO SUSTAINABLE FOOD PRODUCTION



Definition and Principles of Sustainable Food Production

The Food and Agriculture Organization of the United Nations defines a sustainable food system as

"a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised."

It must be economically, social and environmentally sustainable.

The global food system is facing numerous challenges due to factors such as population growth, urbanization, changing consumption patterns, and climate change. While there have been positive developments in food systems, particularly in developing countries, such as increased off-farm employment and a wider variety of food choices, there are also significant challenges that impact food security and nutrition.

These challenges include the availability and consumption of highly processed, low-nutrition food items, limited market access for small-scale producers, food loss and waste, food safety issues, and increased energy usage and environmental impact associated with lengthy and industrialized food supply chains.

To address these challenges and maximize the positive contributions of food systems, it is crucial to gain a better understanding of the functioning of diverse food systems. By doing so, it becomes possible to minimize negative impacts and promote sustainable practices that enhance food security and nutrition.



Cultivating a Greener Plate

Harvesting Solutions

Key Principles

Environmental Stewardship:

Minimizing negative impacts on the environment by conserving natural resources, reducing pollution, and promoting biodiversity. This involves sustainable land management, water conservation, and responsible use of fertilizers and pesticides.



Social Equity:

Ensuring fair and equitable access to nutritious food for all individuals, regardless of socio-economic status, race, or geographic location. It involves promoting social justice, supporting small-scale farmers, and enhancing local food systems.



Economic Viability:

Building a resilient and economically viable food system that supports farmers, workers, and local economies. This includes fair trade practices, promoting sustainable livelihoods, and fostering economic opportunities in rural communities.



Health and Nutrition:

Prioritizing the production of nutritious and safe food, considering both consumer health and the well-being of farm animals. This involves sustainable farming practices, reducing food waste, and promoting healthy diets.



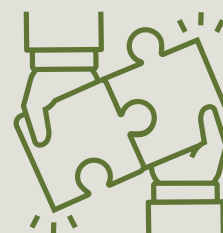
Resilience and Adaptability:

Developing food systems that can withstand and adapt to challenges such as climate change, natural disasters, and market fluctuations. It includes diversifying crops, promoting sustainable agricultural techniques, and fostering research and innovation.



Collaboration and Knowledge Sharing:

Encouraging partnerships, knowledge exchange, and collaboration among stakeholders, including farmers, researchers, policymakers, and consumers. This facilitates the adoption of sustainable practices and the development of effective policies.



By adhering to these principles, sustainable food production aims to create a food system that is environmentally regenerative, socially just, economically viable, and capable of nourishing the global population now and in the future.

Sherri Mitchell

Sherri Mitchell is an Indigenous Rights attorney and the executive director of the Land Peace Foundation. With a focus on protecting Indigenous land and water rights, as well as preserving the Indigenous way of life, Mitchell has made significant contributions to the field of food sustainability.

Having been actively involved in Indigenous rights for over 25 years, Mitchell brings a wealth of experience and expertise to her work. She serves as a trusted advisor to the American Indian Institute's Healing the Future Program and plays a crucial role as a helper and advisor to the Indigenous Elders and Medicine People's Council of North and South America.

One of Mitchell's notable achievements is organizing "Healing the Wounds of Turtle Island," a global healing ceremony rooted in the Wabanaki Prophecy of Reopening of the Eastern Gate. The ceremony began in 2017 and has garnered participation from individuals hailing from six continents. Designed to continue for 21 years, the ceremony will move in four-year cycles, eventually reaching all four corners of the United States.

Sherri Mitchell's work has been recognized and featured in the documentary film "Dancing with the Cannibal Giant" produced by BALE (Building A Local Economy). Through her advocacy and efforts, Mitchell actively addresses the interconnected issues of Indigenous rights, land conservation, and sustainable food practices, making substantial contributions to the preservation of Indigenous cultures and the promotion of food sustainability.



Rhiana Gunn-Wright

Rhiana Gunn-Wright is a rising figure in the realm of climate policy and social justice. During her tenure in the Detroit Department of Health in the mid-2010s, Gunn-Wright recognized the significant influence of the environment on various social justice issues. While acknowledging the urgency of addressing climate change, she realized that a comprehensive approach was necessary, as people were also being adversely affected by other environmental problems such as pollution.

Driven by this holistic perspective, Gunn-Wright has brought her expertise to the national stage, working with New Consensus, a think tank closely aligned with progressive lawmakers. As the Green New Deal policy lead for the organization, she plays a vital role in formulating and strategizing the implementation of this ambitious climate plan. Her responsibility entails delving into the practical details and intricacies of the program, envisioning innovative strategies, and crafting policy proposals.

Gunn-Wright's work has the potential to shape the trajectory of climate policy, especially if progressive Democrats continue to gain influence in Washington. Her proposals and ideas could translate into tangible laws and policies that address climate change while simultaneously addressing systemic inequalities and promoting social justice.

By bridging the gap between climate action and social justice, Rhiana Gunn-Wright represents a dynamic and influential force in the pursuit of a more sustainable and equitable future. Her dedication to a comprehensive approach and her expertise in crafting transformative policies contribute significantly to the ongoing efforts to combat climate change and build a more just society.



Shayna Harris

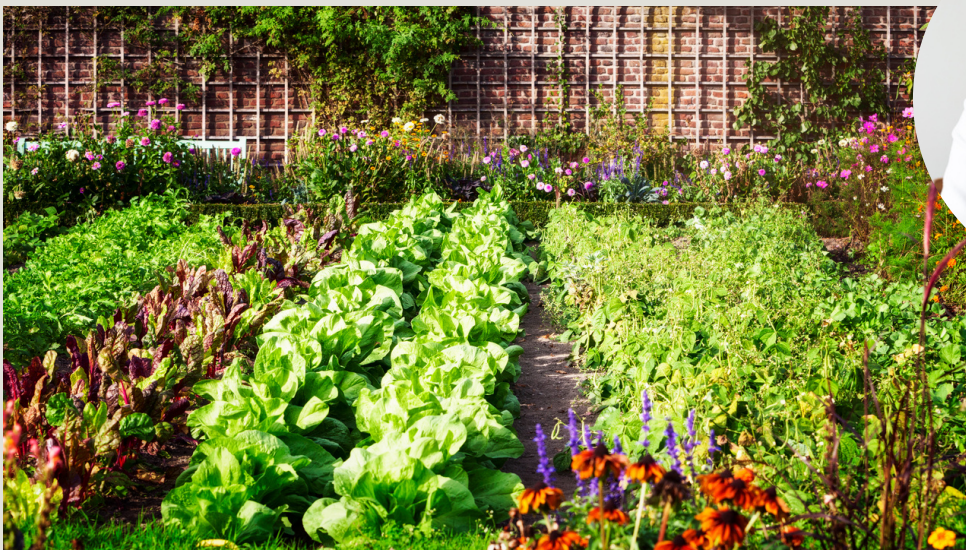
Shayna Harris, as the managing partner at Supply Change Capital, plays a pivotal role in advancing food sustainability through her work at the intersection of food, culture, and technology. Supply Change Capital is a venture capital firm that focuses on catalyzing early-stage businesses that align with these key areas.

Harris co-founded Supply Change Capital in late 2020 alongside Noramay Cadena, an aerospace engineer. Since its inception, the firm has made five investments in 2021 and plans to expand its support to startups in food and agriculture technology, ingredient technology, and consumer-facing brands in the coming year. They provide seed-stage checks ranging from \$500,000 to \$1 million to nurture and empower innovative ventures.

Harris and Cadena keep a keen eye on various themes that are critical to food sustainability. These include the intensification of the climate crisis and its impact on the food system, supply chain disruptions and transparency, and the reduction of food waste.

One of the key aspects that differentiates Supply Change Capital is its strong commitment to diversity. As a 100 percent women-led and owned investment firm, with 50 percent Latina ownership, it challenges the prevailing norms in venture capital circles, where female and BIPOC investors are still underrepresented. Supply Change Capital prioritizes investing in diverse startup founders, actively seeking out underrepresented individuals. Harris has made it a point to highlight that diversity is not a pipeline problem but a matter of perspective. To date, all of her investments have been led by underrepresented founders, with 80 percent being woman-led. Moreover, in 2021, over 75 percent of the 800 deals reviewed by the firm were led by a woman or person of color.

Shayna Harris's work through Supply Change Capital showcases her commitment to supporting and empowering early-stage businesses that drive positive change in the food industry. By leveraging her expertise and focusing on diverse founders, Harris contributes to fostering a more inclusive and sustainable future for the food system. Her dedication to promoting diversity and sustainability in venture capital serves as an inspiration for other food-focused investors to follow suit.



Cultivating a Greener Plate

Harvesting Solutions

Hindou Oumarou Ibrahim

Hindou Oumarou Ibrahim, a member of the Mbororo pastoralist community in Chad, has emerged as a prominent advocate for both climate change action and the rights of indigenous communities. Over the past decade, Ibrahim has dedicated herself to bridging the gap between international climate change decisions and the realities faced by people on the ground, particularly in her home country of Chad. Through her work, she seeks to provide a voice for her community and shed light on the challenges they face.

Through extensive travels across Chad, Ibrahim has witnessed firsthand the profound environmental changes occurring in her country. She has observed dwindling resources and witnessed the struggles her people endure to secure their survival. Motivated by these experiences, Ibrahim has been actively involved in advocating for indigenous rights, especially in the lead-up to the historic 2015 climate change meetings in Paris.

During the negotiations, Ibrahim played a crucial role as a key leader representing indigenous groups. Through her efforts, she successfully lobbied for the recognition of indigenous rights, ensuring that their unique perspectives and experiences were acknowledged in the international climate discourse. Her influential presence led to her selection as a speaker at the signing ceremony of the Paris Agreement.

Ibrahim firmly believes that indigenous communities, despite being among the most vulnerable to the impacts of climate change, hold valuable solutions. Drawing on centuries-old traditional knowledge, these communities possess insights that can aid in global adaptation efforts. By highlighting the wisdom and expertise of indigenous peoples, Ibrahim aims to promote sustainable practices and foster resilience in the face of climate challenges.

In the context of food sustainability, Ibrahim's work is integral. As a member of the Mbororo pastoralist community, she has a deep understanding of the connections between environmental changes, livelihoods, and food security. Her advocacy contributes to raising awareness about the impact of climate change on agriculture and pastoralism, emphasizing the need for sustainable land and resource management practices. Ibrahim's efforts serve to amplify the voices of indigenous communities and underscore the importance of incorporating their traditional knowledge into strategies for adapting to and mitigating the effects of climate change on food systems.

Hindou Oumarou Ibrahim's work stands as a testament to her commitment to building a more inclusive and sustainable future. By bridging the gap between international climate decisions and local realities, she paves the way for meaningful change, ensuring that the voices and wisdom of indigenous communities are heard and valued in the global fight against climate change.



Winona LaDuke

Winona LaDuke is a prominent Indigenous environmentalist, political activist, and program director. With a strong focus on climate change, renewable energy, sustainable food systems, and environmental justice, LaDuke has dedicated herself to advocating for the rights of Indigenous communities and protecting the Earth.

LaDuke's remarkable contributions and achievements have garnered widespread recognition. Her induction into the National Women's Hall of Fame and inclusion in Time magazine's list of 50 most promising leaders under 40 years old reflect her significant impact and influence in the field.

As the program director for Honor the Earth, LaDuke collaborates with numerous individuals and organizations to raise awareness about Indigenous activism for environmental justice. She emphasizes the importance of building a society that honors and respects the Earth, recognizing that such a society will be sustainable and capable of supporting all life forms. LaDuke's work encompasses a holistic approach that integrates Indigenous wisdom, cultural practices, and the principles of environmental sustainability.

LaDuke's efforts extend to various areas, including advocating for renewable energy solutions and sustainable food systems. She recognizes that Indigenous communities possess valuable knowledge and practices that can contribute to addressing climate change and promoting food security. By highlighting the voices and perspectives of Indigenous peoples, LaDuke emphasizes the need to respect and learn from their traditional ecological knowledge, which can offer innovative solutions to environmental challenges.

Through her activism, Winona LaDuke inspires and mobilizes individuals and communities to take action in the pursuit of environmental justice. By championing the rights of Indigenous peoples and promoting sustainable practices, she contributes to the broader movement for a more equitable and sustainable society. LaDuke's work serves as a reminder of the vital role that Indigenous knowledge and activism play in creating a harmonious relationship between humans and the Earth.





The issue with previous approaches

The complexity of food systems necessitates a holistic and coordinated approach. Food security and nutrition challenges are multifaceted and require integrated actions from various stakeholders at different levels, including local, national, regional, and global. These actions should encompass not only agriculture but also trade, policy, health, environment, gender norms, education, transport, and infrastructure.

Traditional food security programs often focus on increasing food production as a means to address food security. While inadequate production remains a major issue in some regions, the dynamic changes in food systems have introduced complex interactions and feedback loops that impact food security and nutrition in diverse ways. Solely focusing on production neglects other root causes and leverage points within the food system.

Approaches utilizing systems thinking, such as value chain (VC) development and market systems approaches, have gained popularity. The VC development approach analyzes how value is created and captured by various stakeholders in the chain, emphasizing systemic analyses and integrated interventions. However, this approach tends to overlook the interdependencies of different value chains within the broader food system. On the other hand, the market systems approach recognizes markets as complex adaptive systems and addresses systemic constraints to market linkages. While it can overcome some limitations of the VC approach, it may still have a narrow perspective limited to a specific market.

To effectively address food security and nutrition challenges, it is necessary to take a comprehensive view of the interactions and interdependencies of all food value chains at the food system level. A coordinated and inclusive approach that considers multiple angles and stakeholders is vital for achieving broad-based developmental impacts and creating sustainable and resilient food systems.

Stages of Sustainable Food Systems

Sustainable food systems encompass the entire agricultural value chain, from pre-production to consumption, and are interconnected in their efforts to promote sustainability.

The **pre-production stage** focuses on conserving and utilizing genetic resources to improve the quality and productivity of crops and livestock. It also involves innovations in agricultural inputs and practices to enhance yields, incomes, and resilience in the face of climate change.

During the **production stage**, farmers face various challenges such as pests, diseases, extreme weather events, and market fluctuations. Despite the increasing demand for food, current production efforts are falling short, leading to rising levels of global hunger and malnutrition.

The **supply chain stage** involves the steps taken to deliver food from farmers to consumers. This includes processing, packaging, storage, and transportation. Post-harvest food loss is a significant issue in developing countries where infrastructure and transport systems are often inadequate, resulting in more than 40% of food losses occurring after harvest and during processing.

The **consumption stage** is not just about how food is grown but also how it is cooked, eaten, and disposed of by consumers. Consumer choices have implications for food and nutrition security, community well-being, and the environment. There are disparities in food spending across countries, with some high-income countries spending less than 10% of their income on food, while others in Africa and Asia spend more than 40%. Similarly, some countries face obesity epidemics, while others suffer from undernutrition.

Overall, achieving sustainability in food systems requires addressing all stages of the value chain, considering the interdependencies between them, and promoting responsible consumer choices that prioritize nutrition, community well-being, and environmental conservation.



Cultivating a Greener Plate
Harvesting Solutions

Autumn Peltier

Autumn Peltier, despite being only 16 years old, has already emerged as a powerful advocate for sustainable water management and access to clean drinking water. Her impactful work revolves around raising awareness about water rights and addressing the urgent need for safe water for all.

Peltier's efforts have gained significant recognition, and she has been invited to speak at prestigious events such as the United Nations World Water Day. Her passionate advocacy and powerful speeches have drawn attention to the pressing issue of water scarcity and the importance of protecting this vital resource.

Notably, Peltier made headlines when she fearlessly confronted Canadian Prime Minister Justin Trudeau about the need for water protection. This brave act brought international attention to the water-related challenges faced by Indigenous communities in Canada and shed light on the urgency of taking action to ensure access to clean water for all.

Despite her young age, Peltier's determination and commitment have garnered numerous honors and accolades. Her advocacy work has inspired people around the world and has become a catalyst for change, sparking conversations about the importance of sustainable water management and the right to clean drinking water.

Through her activism, Autumn Peltier has become a symbol of hope and resilience, reminding us of the power of youth voices in shaping a sustainable future. Her dedication to raising awareness about water rights and advocating for water protection serves as a powerful example for individuals and communities globally. Peltier's work contributes to the broader movement for environmental justice and underscores the critical need to prioritize water sustainability and accessibility for all.



Danielle Nierenberg

Danielle Nierenberg, as the co-founder and president of Food Tank, has been a prominent figure driving change in the field of food sustainability. Through her work, Nierenberg plays a crucial role in bridging gaps and educating stakeholders about the transformation of food systems.

While the impact of bridge-building and educational activities can be challenging to measure, Nierenberg and her team at Food Tank are increasingly strategic in their approach to drive effective change in food systems. In 2023, they are particularly enthusiastic about two projects that aim to address key issues in the food system.

One project involves a partnership with the Swette Center for Sustainable Food Systems at Arizona State University to organize an event series in Washington, D.C., targeting policymakers. These events will focus on tackling hunger among college students and exploring potential solutions. By leveraging the expertise of Food Tank's academic working group, meaningful conversations will take place to address food insecurity on college campuses.

Additionally, Nierenberg plans to create further momentum around food systems during COP28, the climate change conference to be held in Dubai. She aims to ensure that the conference programming shines a spotlight on food solutions and will publish content related to the negotiations on Food Tank's website and in her newsletter. This effort will help raise awareness and encourage meaningful dialogue about the vital role of food systems in addressing climate change.

Through her leadership at Food Tank, Danielle Nierenberg actively contributes to the advancement of food sustainability by fostering collaboration, knowledge sharing, and advocacy. Her dedication to addressing pressing issues such as food insecurity and climate change highlights the urgency and importance of transforming our global food systems to ensure a sustainable and equitable future for all.



Cultivating a Greener Plate

Harvesting Solutions

Arohi Sharma

Arohi Sharma is an advocate working towards achieving policy changes in the food and agriculture system that prioritize soil health as a climate solution. With a focus on regenerative agriculture, Sharma's work aims to address the environmental and social challenges within the sector.

Sharma's policy priorities are shaped by extensive interviews with 113 farmers and ranchers, ensuring that the regenerative agriculture policy platform developed by the Natural Resources Defense Council (NRDC) reflects the diverse experiences and perspectives of growers across the United States. By incorporating the voices and insights of farmers, her approach seeks to create policies that are rooted in the realities of those directly involved in agriculture.

The policy recommendations put forth by Sharma and her team, featured in the "Regenerative Agriculture: Farm Policy for the 21st Century" report, prioritize equity and Indigenous leadership alongside climate benefits. This inclusive approach acknowledges the importance of addressing historical inequities in the agricultural sector and honoring the stewardship of Indigenous communities over the land.

One of Sharma's key recommendations focuses on the Federal Crop Insurance Program, advocating for a shift in incentives. Instead of subsidizing farming practices that degrade soil health, Sharma proposes rewarding farmers for adopting methods that improve soil health and reduce climate risks on their farms. This approach aims to encourage more farmers to embrace regenerative practices, ultimately leading to increased acres under regenerative management.

Sharma's work contributes to the broader goal of advancing food sustainability by promoting regenerative agriculture practices and recognizing the critical role of soil health in addressing climate change. By integrating equity considerations and honoring Indigenous leaders for their land stewardship, Sharma's advocacy reflects a comprehensive and inclusive approach towards a more sustainable and equitable food system.

Corey Ramsden Scott

Corey Ramsden Scott is a dedicated advocate for food sustainability, particularly within the dairy production system. As part of her work at Truterra, a subsidiary of Land O'Lakes focused on carbon markets, Ramsden Scott collaborates with dairy farmers and stakeholders throughout the supply chain to implement a holistic sustainability approach.

Ramsden Scott recognizes the need to go beyond traditional concerns like manure management and address the emissions associated with cow feed and digestion, which constitute the majority of dairy's overall emissions. By working closely with dairy farmers, she aims to develop innovative strategies that tackle these emissions and promote more sustainable practices.

In 2023, Ramsden Scott plans to expand a pilot project she developed in partnership with cheese manufacturer Bel Brands. This project focused on helping a dairy farmer adopt regenerative practices in feed production, leading to the sequestration of 784 pounds of carbon dioxide equivalent per acre per year, as evaluated by Truterra. Beyond carbon, Ramsden Scott also assesses changes in soil quality, erosion, and fertilizer efficiency, emphasizing the multifaceted benefits of sustainable practices.

Building on the success of the pilot project, Ramsden Scott aims to bring this approach to more than a dozen additional farmers in the Bel Brands milk supply shed. Furthermore, she seeks to develop new strategies that bridge the gap between environmental sustainability and the economic viability of farmers and ranchers.

Corey Ramsden Scott's work in embedding holistic sustainability practices within the dairy industry contributes to the broader goal of food sustainability. By collaborating with farmers and stakeholders, she drives innovation, promotes regenerative practices, and seeks to create a more sustainable and resilient dairy production system. Ramsden Scott's efforts reflect a commitment to finding practical solutions that benefit both the environment and the bottom lines of farmers and ranchers.



Examples of Sustainable Food System Initiatives

In this section, we will explore various sustainable food initiatives, examining their strengths and weaknesses, and identifying the contexts in which they are most effective. It is important to recognize that there is no one-size-fits-all approach to food sustainability. By reviewing a range of initiatives, we aim to highlight the diverse strategies and practices available. Each approach has its own pros and cons, and the optimal choice depends on factors such as local conditions, resources, and specific goals. Through this exploration, we can gain a deeper understanding of the multifaceted nature of sustainable food systems and identify the most suitable approaches for different contexts.

Carbon Farming

Carbon farming, also known as regenerative agriculture or climate-smart agriculture, is an approach to farming that aims to sequester carbon dioxide (CO₂) from the atmosphere and mitigate climate change while promoting sustainable agricultural practices.

Pros of Carbon Farming:

1. **Carbon sequestration:** Practices such as cover cropping, agroforestry, and conservation tillage can enhance soil organic matter and sequester carbon in agricultural soils, helping to mitigate climate change.
2. **Improved soil health:** Carbon farming practices promote healthier soils by increasing soil organic matter, nutrient cycling, water retention, and microbial diversity.
3. **Enhanced resilience:** Carbon farming techniques can improve the resilience of agricultural systems to extreme weather events, such as drought and heavy rainfall, by improving water infiltration and soil moisture retention.
4. **Biodiversity conservation:** Many carbon farming practices, such as hedgerows, buffer strips, and diverse crop rotations, provide habitat for beneficial insects, birds, and wildlife, thereby promoting biodiversity.

Cons of Carbon Farming:

1. **Knowledge and training:** Implementing carbon farming practices effectively requires knowledge, training, and technical support. Farmers may need to learn new techniques and adapt their management practices, which can be a barrier to adoption.
2. **Transition period:** It may take time to observe significant carbon sequestration and measure the full benefits of carbon farming practices. Initial investment costs and adjustments in farming systems may pose challenges during the transition period.
3. **Context-specific:** The suitability and effectiveness of specific carbon farming practices vary depending on the local climate, soil conditions, and agricultural systems. What works well in one region may not be applicable or effective in another.



Cultivating a Greener Plate

Harvesting Solutions

When is Carbon Farming Best Used:

1. Agricultural lands: Carbon farming is best suited for agricultural lands, including croplands, pasturelands, and orchards, where management practices can be modified to enhance carbon sequestration and improve sustainability.
2. Diverse landscapes: It is particularly effective in regions with diverse landscapes that allow for the implementation of practices such as agroforestry, riparian buffer zones, and wetland restoration.
3. Collaboration and incentives: Carbon farming can be most successful when there is collaboration between farmers, researchers, and policymakers. Financial incentives and support programs can encourage farmers to adopt carbon farming practices and provide technical assistance.

Carbon farming is a promising strategy for reducing greenhouse gas emissions, promoting sustainable agriculture, and building resilience in farming systems. It can contribute to climate change mitigation while simultaneously providing environmental, economic, and social benefits. However, its successful implementation requires a comprehensive understanding of local conditions and careful consideration of the specific farming context.

Agroforestry

Agroforestry is a land-use management system that integrates the cultivation of trees with crops, livestock, or both, on the same piece of land. It is a sustainable agricultural practice that offers a range of benefits. Here are its pros, cons, and when it is best used:

Pros of Agroforestry:

1. Biodiversity and habitat preservation: Agroforestry systems provide habitats for various plant and animal species, promoting biodiversity conservation and ecological balance.
2. Soil health improvement: Trees in agroforestry systems contribute to soil fertility by fixing nitrogen, enhancing nutrient cycling, preventing soil erosion, and improving soil structure and water-holding capacity.
3. Carbon sequestration and climate change mitigation: Trees in agroforestry systems sequester carbon dioxide from the atmosphere, helping to mitigate climate change by reducing greenhouse gas emissions.
4. Diverse products and income streams: Agroforestry allows farmers to diversify their income sources by providing a range of products such as fruits, timber, nuts, fodder, and medicinal plants.
5. Microclimate regulation: Trees in agroforestry systems provide shade, windbreaks, and microclimate regulation, benefiting crops and livestock by reducing temperature extremes and wind erosion.

Cons of Agroforestry:

1. Management complexity: Agroforestry systems require careful planning, monitoring, and management to balance the interactions between trees, crops, and animals. The complexity of these systems can pose challenges for farmers in terms of skill and knowledge requirements.
2. Initial investment and time: Establishing agroforestry systems may require upfront investment in tree planting, fencing, and irrigation infrastructure. It may also take time for trees to mature and start providing significant benefits.
3. Market challenges: Some agroforestry products, such as timber, may have longer production cycles and require specialized markets, which can present challenges for marketing and generating income.



When is Agroforestry Best Used:

1. Marginal or degraded lands: Agroforestry is well-suited for areas with degraded soils or marginal lands that are less suitable for traditional agriculture. The presence of trees can improve soil fertility and productivity on such lands.
2. Small-scale farming: Agroforestry systems are often more suitable for small-scale farmers who can integrate trees with their existing agricultural practices, providing diverse income sources and improving food security.
3. Watershed and conservation areas: Agroforestry can be highly beneficial in watershed and conservation areas, as it helps prevent soil erosion, improves water quality, and supports habitat restoration.
4. Climate-vulnerable regions: Agroforestry can enhance the resilience of agricultural systems in regions prone to extreme weather events, such as drought or flooding, by providing windbreaks, stabilizing soils, and improving water management.

Agroforestry is a flexible and adaptable land-use system that offers numerous environmental, economic, and social benefits. It is best utilized in contexts where the integration of trees with crops or livestock can enhance sustainability, productivity, and resilience in agricultural systems.

Camille Goldstone-Henry

Camille Goldstone-Henry is a dedicated wildlife conservation scientist, data advocate, environmental activist, and proud Kamilaroi woman. With a Bachelor of Animal and Veterinary Bioscience from The University of Sydney, she has extensive experience in managing threatened species populations and has worked with endangered species worldwide. Camille's career spans various sectors, including NGOs, universities, and social enterprises, and she has authored numerous reports and book chapters in the field of conservation.



Camille's deep passion for wildlife, technology, equality, and the environment drives her to implement innovative solutions. One of her notable contributions is through her organization, Xylo Systems. Xylo Systems is a cloud-based platform that leverages data and artificial intelligence (AI) to support businesses in measuring and managing their biodiversity impact. The platform assists companies in understanding their interactions with nature and implementing nature-based solutions.

Xylo Systems simplifies the incorporation and reporting of biodiversity data in environmental, social, and governance (ESG) reports through AI analysis. By utilizing advanced technologies, Xylo Systems enables businesses to assess and monitor their biodiversity impact more effectively. This helps them make informed decisions that support conservation efforts, sustainable practices, and the preservation of ecosystems. The ultimate goal of Xylo Systems is to ensure that businesses operate in harmony with nature, contributing to long-term food sustainability and a healthier environment.

Camille's outstanding achievements have garnered recognition within her field. She was honored as the Women's Weekly Woman of the Future in 2021, received the Women in Artificial Intelligence Trailblazer and AI in Climate awards in 2022, and was a finalist for the 2022 NSW Young Woman of the Year. She was also selected for Taronga Zoo's HATCH Accelerator program and received a highly commended distinction at the UNSW Sir Rupert Myers Sustainability Award in 2021.

Through her remarkable work and the innovative solutions provided by Xylo Systems, Camille Goldstone-Henry is driving positive change and making significant contributions to the conservation of wildlife, the advancement of technology, and the promotion of sustainable practices for the benefit of future generations.

Permaculture

Permaculture is a holistic design system that aims to create sustainable and self-sufficient human habitats by mimicking natural ecosystems. It integrates principles from ecology, agriculture, architecture, and social systems to create regenerative and resilient environments. Here are its pros, cons, and when it is best used:

Pros of Permaculture:

1. **Sustainability and resilience:** Permaculture systems prioritize long-term sustainability, ecological balance, and resilience by working with natural patterns and processes. They aim to minimize waste, energy consumption, and environmental impacts.
2. **Soil regeneration and fertility:** Permaculture focuses on building healthy soil through techniques like composting, mulching, and crop rotation, resulting in increased fertility and soil structure.
3. **Biodiversity promotion:** By creating diverse ecosystems and incorporating native plants, permaculture supports biodiversity conservation and enhances habitat for beneficial insects, birds, and wildlife.
4. **Food production and self-sufficiency:** Permaculture systems emphasize food production by integrating edible plants and animals, allowing for self-sufficiency and reducing dependence on external food sources.
5. **Water management:** Permaculture designs often include strategies for water conservation, such as rainwater harvesting, swales, and water-efficient irrigation techniques.

Cons of Permaculture:

1. **Knowledge and skill requirements:** Implementing permaculture effectively requires a comprehensive understanding of ecological principles, design techniques, and management practices. It may take time to develop the necessary knowledge and skills.
2. **Space and land requirements:** Permaculture designs typically require sufficient space to accommodate diverse elements such as gardens, orchards, livestock, and water features. Limited land availability may pose a challenge for urban or densely populated areas.
3. **Initial investment and maintenance:** Establishing a permaculture system may require upfront investment in infrastructure, such as earthworks or water storage systems. Regular maintenance and ongoing management are also necessary for optimal productivity.

When is Permaculture Best Used:

1. **Homesteads and small-scale farming:** Permaculture is highly suited for homesteads, small-scale farms, and backyard gardens. It can be implemented in both rural and urban settings, depending on available space and local regulations.
2. **Ecosystem restoration:** Permaculture principles can be applied to restore degraded landscapes, such as eroded lands, deforested areas, or damaged ecosystems, promoting ecological recovery and resilience.
3. **Sustainable community development:** Permaculture can be used to design and develop sustainable communities, eco-villages, or cooperative living arrangements that prioritize self-sufficiency, resource sharing, and regenerative practices.
4. **Education and demonstration projects:** Permaculture is often utilized in educational settings, community gardens, and demonstration sites to showcase sustainable living and regenerative agriculture principles.

Permaculture offers a holistic and systems-based approach to creating sustainable human habitats. It is best used in contexts where there is a commitment to long-term sustainability, self-sufficiency, and regenerative practices. However, its successful implementation requires careful planning, ongoing learning, and a willingness to adapt to local conditions and resources.



Subsistence Farming

Subsistence farming refers to a form of agricultural practice where farmers primarily produce food for their own consumption and the immediate needs of their families or local communities. Here are its pros, cons, and when it is best used:

Pros of Subsistence Farming:

1. **Food security:** Subsistence farming helps ensure a reliable and steady food supply for the farming household and local community. It reduces dependence on external food sources and provides self-sufficiency in food production.
2. **Cultural preservation:** Subsistence farming often involves traditional farming methods, heirloom seed varieties, and indigenous knowledge, which helps preserve cultural practices and agricultural biodiversity.
3. **Minimal environmental impact:** Subsistence farmers typically rely on low-input and traditional farming techniques, which can result in minimal use of chemical fertilizers and pesticides. It promotes a closer connection to the natural environment and sustainable use of resources.
4. **Local economy and self-reliance:** Subsistence farming can contribute to the local economy by reducing the need for purchasing food and agricultural inputs from external sources. It promotes self-reliance and strengthens local communities.

Cons of Subsistence Farming:

1. **Limited surplus production:** Subsistence farming is primarily focused on meeting immediate needs, which often leaves little surplus for commercial purposes or income generation. It can limit economic opportunities for farmers.
2. **Vulnerability to shocks and risks:** Reliance on subsistence farming may make households more vulnerable to climate change, natural disasters, and market fluctuations. Lack of diversification and access to modern farming technologies can hinder resilience.
3. **Limited access to services and infrastructure:** Subsistence farmers often have limited access to modern agricultural inputs, technologies, and extension services, which can restrict their productivity and growth potential.
4. **Poverty and rural-urban migration:** Subsistence farming is commonly associated with poverty, particularly in regions where access to education, healthcare, and economic opportunities is limited. This can lead to rural-urban migration in search of better livelihoods.

When is Subsistence Farming Best Used:

1. **Remote and marginalized areas:** Subsistence farming is often practiced in remote and marginalized regions with limited access to markets, infrastructure, and modern agricultural resources. It provides a means of survival and sustenance in such contexts.
2. **Traditional and cultural preservation:** Subsistence farming is valuable in areas where cultural traditions, indigenous knowledge, and agricultural biodiversity preservation are significant priorities.
3. **Local food systems and self-sufficiency:** Subsistence farming is well-suited in situations where promoting local food systems, reducing dependence on external sources, and achieving food security at the local level are primary objectives.
4. **Agroecological and sustainable farming approaches:** Subsistence farming often aligns with agroecological and sustainable farming principles, focusing on minimal environmental impact, biodiversity conservation, and organic practices.

It's important to note that subsistence farming is not inherently sustainable or capable of lifting farmers out of poverty. Supporting subsistence farmers with access to resources, education, and market opportunities can help enhance their livelihoods and transition towards more sustainable farming practices.

Hydroponics and Aquaponics

Hydroponics and aquaponics are soilless farming methods that allow plants to grow in a nutrient-rich water solution. Here's an overview of each system, their pros and cons, and when they are best used:

Hydroponics:

Hydroponics is a method of growing plants without soil, where the plant roots are submerged in a nutrient solution. The plants are typically grown in containers or channels with a growing medium to support the root structure.

Pros of Hydroponics:

1. **Water efficiency:** Hydroponics uses significantly less water compared to traditional soil-based agriculture, as water is recirculated in the system.
2. **Optimal nutrient control:** Nutrient levels can be precisely controlled in hydroponics, providing plants with the right balance of nutrients for optimal growth.
3. **Faster growth and higher yields:** Hydroponic systems provide plants with direct access to nutrients, resulting in faster growth rates and potentially higher crop yields.
4. **Year-round cultivation:** Hydroponics can be practiced indoors or in controlled environments, enabling year-round cultivation independent of seasonal changes.

Cons of Hydroponics:

1. **Energy dependence:** Hydroponic systems require energy for lighting, water circulation, and environmental control, leading to increased energy consumption compared to traditional farming methods.
2. **Initial investment costs:** Setting up a hydroponic system can be expensive, including infrastructure, equipment, and nutrient solutions.
3. **Technical knowledge:** Hydroponics requires specialized knowledge of nutrient management, pH balance, and system maintenance. It may involve a learning curve for farmers new to the technique.

When is Hydroponics Best Used:

1. **Urban agriculture:** Hydroponics is suitable for urban areas with limited space, as it allows for vertical farming and cultivation in controlled indoor environments.
2. **Water-scarce regions:** Hydroponics can be advantageous in areas where water resources are limited or subject to drought conditions, as it offers water-efficient growing systems.
3. **High-value crops:** Hydroponics is often used to cultivate high-value crops, such as salad greens, herbs, and specialty vegetables, where the investment in the system can be justified by the higher market value of the produce.



Cultivating a Greener Plate
Harvesting Solutions

Aquaponics:

Aquaponics is a combination of aquaculture (fish farming) and hydroponics. It involves cultivating plants in a hydroponic system that receives nutrient-rich water from a fish tank. The plants filter the water, removing nutrients and purifying it for the fish.

Pros of Aquaponics:

1. **Efficient resource utilization:** Aquaponics integrates fish farming and plant cultivation, creating a symbiotic relationship where fish waste provides nutrients for the plants, and the plants purify the water for the fish.
2. **Reduced water use:** Aquaponics uses less water compared to traditional soil-based agriculture, as water is recirculated in the system and losses due to evaporation are minimized.
3. **Year-round production:** Aquaponics can be practiced indoors or in controlled environments, allowing for year-round production regardless of weather conditions.
4. **Diverse products:** Aquaponics enables simultaneous production of both fish and plants, providing a diverse range of products for food and income generation.

Cons of Aquaponics:

1. **Complex system design and management:** Aquaponics systems require careful design and management to balance the needs of fish and plants, including monitoring water quality, nutrient levels, and maintaining the right pH balance.
2. **Initial investment costs:** Similar to hydroponics, setting up an aquaponics system can involve significant initial investment costs, including infrastructure, equipment, and fish stock.
3. **Knowledge and expertise:** Successful aquaponics operation requires knowledge of fish biology, plant cultivation, and system dynamics. It may require specialized training or expertise.

When is Aquaponics Best Used:

1. **Small-scale farming:** Aquaponics is well-suited for small-scale farming operations, including backyard systems or community projects, where the integration of fish and plant cultivation can enhance sustainability and self-sufficiency.
2. **Controlled environments:** Aquaponics can be effectively practiced in controlled environments, such as greenhouses or indoor spaces, providing year-round production opportunities.
3. **Local food systems:** Aquaponics can contribute to local food systems by providing fresh fish and vegetables. It is suitable for regions where access to diverse, locally sourced produce is limited.

Both hydroponics and aquaponics offer unique advantages in terms of resource efficiency, year-round production, and control over plant nutrition. They are particularly valuable in urban environments, water-scarce regions, and areas where space or soil quality is limited. However, the initial investment costs, energy requirements, and technical knowledge needed for successful implementation should be considered before adopting these systems.



Conclusion

The examples of sustainable farming we have discussed so far employ various practices to promote environmental health and productivity. Other practices that can be intergrated into farming systems can include:

1. **Crop Rotation and Diversity:** Planting a variety of crops, employing intercropping, and multiyear crop rotations enhance soil health and pest control.
2. **Cover Crops and Perennials:** Planting cover crops during off-seasons and maintaining perennial crops year-round protect soil, prevent erosion, and reduce the need for chemicals.
3. **Reduced Tillage:** No-till or reduced-till methods reduce soil erosion and improve overall soil health by avoiding traditional plowing.
4. **Integrated Pest Management (IPM):** Employing a range of controls, such as mechanical and biological methods, minimizes chemical pesticide use while managing pest populations.
5. **Livestock and Crop Integration:** Integrating animal and crop production efficiently can enhance farm sustainability.
6. **Whole Systems and Landscape Management:** Utilizing natural areas and less intensively cultivated spaces, like streamside vegetation and prairie strips, supports biodiversity, reduces pollution, and controls erosion.

These practices share a common focus on soil health, which is vital for healthy crops, water retention, pollution prevention, and community well-being. Diversification is also a central theme, as more diverse and complex agricultural systems tend to be more sustainable and productive, mirroring nature's own diversity.

The exploration of diverse sustainable food initiatives within this section underscores the complexity of achieving food sustainability. As we've examined the strengths and weaknesses of various approaches, it becomes clear that there is no universal solution to this intricate challenge. Instead, the effectiveness of each initiative depends on the unique interplay of local conditions, available resources, and specific objectives. By embracing this diversity and understanding that no single approach can fit all contexts, we are better equipped to make informed decisions and tailor sustainable farming systems to meet the specific needs of our communities and ecosystems. This nuanced perspective is crucial as we continue to navigate the ever-evolving landscape of food sustainability and work towards a more resilient and environmentally responsible future.



PLANTING SEEDS OF ACTION

CULTIVATING CHANGE AT EVERY LEVEL



In this section, we turn our attention to the crucial task of addressing the intertwined challenges of population growth and sustainable food systems. As we delve deeper into these complex issues, our focus now shifts towards exploring how individuals, communities, and governments can actively engage in solutions. Central to our examination is the enduring spirit of Mercy and Catherine McAuley, whose values of compassion, justice, and service continue to inspire meaningful action. Their legacy serves as a potent reminder of our shared responsibility to address matters of social and environmental justice within our global community. By applying these principles to the critical intersection of population growth and sustainable food systems, we aim to catalyze transformative change and contribute to a more equitable and sustainable future for all.

Addressing the issues of population growth and sustainable food systems at every level, from individual actions to community initiatives and governmental policies, is of paramount importance in our pursuit of a more equitable and sustainable world. At the individual level, our daily choices regarding consumption, waste reduction, and dietary preferences collectively have a substantial impact on the environment and food systems. Empowering individuals with knowledge and fostering a sense of responsibility can lead to significant positive changes. Communities, on the other hand, possess the strength to drive local initiatives, such as community gardens, farmers' markets, and food cooperatives, that not only enhance access to sustainable food but also strengthen social bonds and resilience.

However, the role of governments cannot be overstated in this endeavor. National and regional policies wield the power to shape entire food systems, influencing production, distribution, and accessibility. Legislative measures can incentivize sustainable farming practices, promote research and innovation in agriculture, and ensure equitable access to nutritious food for all citizens. Governmental agencies can also facilitate partnerships between communities and industries, fostering collaborative efforts that amplify the impact of sustainable food initiatives.

Incorporating the spirit of Mercy and Catherine McAuley into these collective actions at every level underscores the moral imperative of our shared responsibility. Catherine's legacy of compassion and service challenges us to recognize that addressing the interconnected issues of population growth and sustainable food systems is not just a matter of practical necessity but a reflection of our commitment to justice, equity, and the well-being of all people, particularly those most vulnerable to the consequences of environmental degradation and food insecurity.

Planting Seeds of Action
Harvesting Solutions

Creating Change in Our Own Life

Addressing the pressing issues of population growth and sustainable food systems at the individual level is a crucial step towards creating a more equitable and environmentally responsible world. Individuals can make a significant impact through their daily choices and actions. Here are some key ways individuals can contribute:

1. Reducing Food Miles: Choosing food products that have traveled shorter distances to reach your plate can reduce carbon emissions associated with transportation.

Example: An individual may prioritize buying locally grown fruits and vegetables, supporting nearby farmers and reducing food miles.

2. Reduce Food Waste: Being mindful of food waste is essential. Individuals can plan meals efficiently, store food properly, and compost organic waste. Reducing food waste not only conserves resources but also minimizes methane emissions in landfills.

Example: A person can create a meal plan, use leftovers creatively, and compost kitchen scraps instead of throwing them away.

3. Support Sustainable Brands: Choosing products from companies committed to sustainability and ethical sourcing can encourage responsible business practices. Look for certifications like Fair Trade, organic, and non-GMO when shopping.

Example: An individual may opt for fair-trade coffee, organic skincare products, or clothing made from sustainable materials.

4. Advocacy and Education: By staying informed about food system issues and advocating for positive change, individuals can raise awareness and influence policies. Engaging in discussions with peers, sharing information on social media, and supporting organizations working towards sustainable food systems can have a ripple effect.

Example: Someone might join local or online advocacy groups, participate in community discussions, or support campaigns that promote sustainable farming and food practices.



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Harvesting Solutions

5. **Gardening and Urban Agriculture:** Even in urban settings, individuals can grow their own vegetables and herbs, contributing to food self-sufficiency and reducing the demand for industrially produced food.

Example: A person might start a small container garden on their balcony or participate in a community garden project.

6. **Consumer Choices*** Prioritizing products with minimal packaging and avoiding single-use plastics can reduce waste. Supporting products made from recycled materials or opting for reusable items also plays a role in sustainable living.

Example: Individuals can switch to reusable shopping bags, invest in a durable water bottle, or purchase products with eco-friendly packaging.

7. **Energy and Water Conservation:** Reducing energy and water consumption at home, such as using energy-efficient appliances and conserving water while cooking and cleaning, can indirectly impact food systems by reducing resource depletion.

Example: Someone might install LED lights, fix leaking faucets, or use energy-saving cooking appliances.

In summary, individuals possess the capacity to effect meaningful change when it comes to addressing the intertwined challenges of population growth and sustainable food systems, all while embodying the compassionate spirit of Catherine McAuley. In adopting conscious choices related to their diet, consumption habits, and advocacy endeavors, individuals honor the legacy of Catherine McAuley by contributing to a more sustainable and just food future, echoing her commitment to compassion, service, and the well-being of all members of our global community.

A Spotlight on Impact Investing:

Impact investing can play a crucial role in supporting sustainable food production by directing financial resources towards companies, projects, and initiatives that align with environmental, social, and governance (ESG) criteria. Here we will explore Impact Investing in relation to addressing sustainable food production to provide for our growing population, however a more comprehensive guide can be found in [“Money as Mercy: A Guide for The Global Mercy Community On Participating Meaningfully In The Impact Economy”](#) By MELF Cohort 1 Fellow Jemima Welsh.

Here are some ways impact investing can be utilized to support sustainable food production:

1. **Investment in sustainable agriculture:** Impact investors can allocate funds to companies and organizations focused on sustainable farming practices. This includes supporting regenerative agriculture, organic farming, permaculture, and agroforestry. Investments can be made in businesses that prioritize soil health, biodiversity conservation, and natural resource management.

2. **Support for smallholder farmers:** Impact investors can help improve the livelihoods of smallholder farmers by investing in organizations that provide them with access to finance, training, and sustainable farming techniques. This can enhance productivity, reduce post-harvest losses, and promote equitable and fair-trade practices.

3. **Financing for agricultural technology:** Impact investors can channel funds into companies developing innovative technologies that improve efficiency, reduce waste, and minimize environmental impacts in food production. This includes investments in precision agriculture, vertical farming, aquaponics, and other sustainable farming methods that require less water, energy, and land.

4. Promoting sustainable supply chains: Impact investors can focus on supporting companies committed to sustainable supply chains. This involves investing in businesses that prioritize responsible sourcing, fair labor practices, and the reduction of greenhouse gas emissions throughout the supply chain. This encourages sustainable practices from farm to fork.

5. Investment in food waste reduction: Impact investors can contribute to reducing food waste by supporting companies and initiatives that address this issue. Investments can be made in businesses involved in food recovery, redistribution, preservation technologies, and composting systems, thus promoting a circular economy and reducing the environmental impact of food waste.

6. Education and awareness: Impact investors can support projects and organizations that focus on educating consumers and stakeholders about sustainable food production. This includes investments in initiatives that raise awareness about the importance of sustainable diets, food waste reduction, and the environmental and social implications of food choices.

By strategically directing financial resources towards these areas, impact investors can contribute to the development and growth of sustainable food production practices, helping to address key challenges such as environmental degradation, food insecurity, and social inequality.



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Wendy Coleman



Wendy Coleman is a driving force in the realm of food sustainability through her work with LA Urban Farms. As a distributor of vertical aeroponic gardens, Coleman, along with Jennifer Crane and Melanie Dorsey, has revolutionized urban gardening over the past eight years. Their innovative technology allows for the growth of leafy greens, vegetables, and herbs without the need for soil or chemicals while using 90 percent less water and land compared to traditional gardening methods.

Beyond the environmental benefits, Coleman firmly believes in the power of enabling individuals to grow their own food, fostering a deeper appreciation for the journey of food and encouraging healthier food choices. LA Urban Farms has successfully garnered an impressive roster of clients, including Los Angeles Mayor Eric Garcetti, renowned hotels and resorts like Hilton, Marriott, and the Bellagio in Las Vegas, as well as prominent companies such as Nike and Ikea.

In their most recent project, LA Urban Farms installed 24 aeroponic gardens on the rooftop of Google's new headquarters in Los Angeles. These gardens house 672 organic edible plants, including broccoli, cauliflower, spinach, zucchini, strawberries, and various leafy greens. The harvested produce from this rooftop garden is donated to the LA Mission, an organization dedicated to assisting individuals experiencing homelessness in downtown LA.

Looking ahead to 2022, Coleman, Crane, and Dorsey have ambitious plans in store. They have collaborated with the Green Bronx Machine and the Future Food Institute, two organizations at the forefront of sustainable and just food movements, for a grant proposal to the Italian Ministry of Education. If accepted, the proposal will bring tower gardens and a comprehensive growing curriculum to 800 schools in Italy, further expanding access to sustainable food practices and education.

Wendy Coleman's work with LA Urban Farms showcases her commitment to revolutionizing urban agriculture and fostering food sustainability. Through their vertical aeroponic gardens, Coleman and her team provide practical solutions for growing fresh, healthy food in urban environments while minimizing resource consumption. By partnering with diverse clients and engaging in impactful projects, they are inspiring individuals and communities to take control of their food systems and make sustainable choices.



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Joan Salwen

Joan Salwen is a passionate advocate for food sustainability, specifically focusing on mitigating the climate impact of livestock farms. With a diverse background that includes 20 years in management consulting and leading a girls' college preparatory school in Atlanta, Salwen embarked on a journey as a visiting scholar at Stanford University to explore innovative solutions in this field. Today, she serves as the CEO of Blue Ocean Barns, a startup dedicated to cultivating red algae as a feed supplement for cows, effectively reducing their methane emissions.

While the concept of using algae as a feed supplement has been around for some time, Salwen and her team have made significant strides in testing its impact and overcoming production challenges. They are on the verge of launching their first commercial product called Brominata, in collaboration with corporate partners. During a trial at Straus Family Creamery, an organic farm in California, cows that consumed the algae supplement produced an average of 52 percent less methane emissions. Importantly, this reduction was achieved without compromising the quality and quantity of milk production or causing any animal welfare issues.

What sets Blue Ocean Barns apart is that their innovative technology requires no additional capital equipment or specialized training for livestock workers. This makes it a viable solution for both large and small producers, offering the potential to significantly reduce the extraordinary climate impact of beef and dairy production.

In the first year of launching Brominata, Salwen anticipates preventing the equivalent of 1000 metric tons of carbon from entering the atmosphere. Additionally, the technology will enable the production of 100,000 pounds of lower-emission dairy and beef products. This demonstrates the potential for Blue Ocean Barns to make a substantial contribution to mitigating greenhouse gas emissions associated with livestock farming.

Joan Salwen's work through Blue Ocean Barns showcases her commitment to leveraging innovative solutions for food sustainability. By focusing on reducing methane emissions from cows through the cultivation of red algae, Salwen and her team are addressing a significant climate challenge within the livestock industry. Their efforts hold the potential to transform beef and dairy production, making it more environmentally friendly and contributing to a more sustainable future.



Planting Seeds of Action
Harvesting Solutions

Ahrum Pak

Ahrum Pak is a trailblazer in the field of food sustainability, working to address the environmental impact of cocoa production through her innovative food tech company, WNWN Food Labs. With a focus on creating a sustainable alternative to traditional chocolate, Pak's work contributes to the development of more environmentally friendly and ethical food choices.

Pak acknowledges the dark side of chocolate, recognizing that its production emits more CO2 compared to other food products. However, she believes there is a solution that doesn't require eliminating chocolate from our lives entirely. In 2022, Pak's company became the first to introduce cocoa-free chocolate, offering a softer alternative that benefits both the planet and the people involved in its production.

Drawing inspiration from her Korean heritage and the fermentation techniques used in traditional Korean cuisine, Pak explores the potential for using fermentation to create chocolate-like products from ingredients such as barley and carob. Through this innovative approach, WNWN Food Labs aims to reduce the carbon emissions and water usage associated with conventional chocolate production. Their cocoa-free chocolate reportedly emits 80 percent less carbon and uses 90 percent less water than traditional chocolate.

By launching cocoa-free chocolate bars in U.K. retail stores and online, Pak hopes to provide consumers with a transparent option that reduces the pressure on traditional cocoa supply chains. This alternative has the potential to empower cocoa farmers, offering them more bargaining power and enabling them to reduce their environmental impact.

Ahrum Pak's pioneering work demonstrates her commitment to finding sustainable solutions within the food industry. By addressing the environmental and social challenges of chocolate production, her efforts contribute to the broader goal of food sustainability. Pak's innovative approach not only offers consumers an ethical and planet-friendly option but also highlights the potential for innovation and transformation within the food sector as a whole.



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Harvesting Solutions





Eva Goulbourne

Eva Goulbourne, as the founder and CEO of Littlefoot Ventures, is a driving force in the realm of food sustainability. With a background as a founding team member of ReFED, a nonprofit focused on ending food loss and waste, she has been at the forefront of accelerating solutions for this critical climate and social justice issue.

Recently, Goulbourne assumed the role of president of the Upcycled Food Foundation, a trade association dedicated to fostering the growth of the upcycled food economy. In this capacity, she is determined to steer the strategic direction of the association, transforming upcycled food from a trend into a staple within the sustainable food space. Goulbourne aims to influence policy and investment decisions that impact the industry while enhancing consumer and retailer understanding of upcycled foods.

A major priority for Goulbourne in 2022 is the establishment of a national campaign aimed at inspiring and mobilizing consumers to take action in reducing food waste. Collaborating with three other influential female figures in the food industry—Sophie Egan, Eve Turow-Paul of the Food for Climate League, and Dana Gunders of ReFED—Goulbourne seeks to raise awareness about the issue of food waste. By increasing consumer consciousness, the quartet hopes to exert pressure on food businesses, retailers, restaurants, and suppliers to improve their practices. Their collective vision is to reduce food waste by 50 percent over the next decade, fostering significant positive change in the country's food system.

Eva Goulbourne's work embodies her dedication to promoting food sustainability and combatting food waste. Through her leadership roles, she drives innovation, collaboration, and policy change to address this pressing issue. Goulbourne's efforts inspire both individuals and businesses to embrace more sustainable practices, creating a pathway towards a more resilient and environmentally conscious food system.

Planting Seeds of Action
Harvesting Solutions

Communities in Action

Addressing the pressing issues of population growth and sustainable food systems at the community level is a vital step towards achieving positive change. Communities can play a pivotal role in shaping local food systems, reducing environmental impact, and promoting equitable access to nutritious food. Here are some key strategies and examples of how individuals and groups can address these issues at the community level:

- 1. Community Gardens:** Establishing and maintaining community gardens provides local residents with access to fresh, locally grown produce. These gardens not only promote sustainability but also foster a sense of community and shared responsibility. For instance, in urban areas, initiatives like "CitySprouts" in Boston, Massachusetts, empower students and communities to create and maintain gardens in schoolyards, enriching both education and access to fresh food.
- 2. Farmers' Markets:** Supporting and participating in farmers' markets creates a direct connection between consumers and local growers. These markets stimulate the local economy while reducing the carbon footprint associated with transporting food over long distances. The "Portland Farmers Market" in Oregon, for example, showcases the region's agricultural diversity while emphasizing sustainable farming practices.
- 3. Food Cooperatives:** Community-owned food cooperatives enable members to collectively purchase and manage food sources, emphasizing sustainability and ethical practices. "Park Slope Food Coop" in New York City is a notable example where members actively engage in decision-making and promote sustainability through their purchasing choices.
- 4. Community Supported Agriculture (CSA):** Joining a CSA program allows individuals to subscribe to regular deliveries of locally grown produce, supporting local farmers and reducing food miles. CSAs like "Roots and Shoots Farm" in Ontario, Canada, offer seasonal shares of fresh, organic produce to their community members.



Planting Seeds of Action
Harvesting Solutions

5. **Food Rescue Programs:** Communities can organize and participate in food rescue programs that recover surplus food from local restaurants, supermarkets, and farms. These initiatives, like "Food Rescue US" operating in multiple U.S. cities, redirect surplus food to those in need, reducing food waste and addressing food insecurity simultaneously.

6. **Education and Awareness:** Hosting workshops, seminars, and educational events within the community can raise awareness about sustainable food practices. These events empower individuals to make informed choices about their food consumption. For instance, the "Slow Food" movement conducts various community-based educational programs worldwide.

7. **Advocacy and Policy Engagement:** Community groups can engage in advocacy efforts to influence local policies related to food systems, such as zoning regulations that encourage urban agriculture or the allocation of public funds for sustainable agriculture projects. The "Food Policy Council" in Portland, Oregon, actively engages with local government to shape food policy.

Addressing population growth and sustainable food systems at the community level not only fosters environmental stewardship but also strengthens the bonds of community engagement. These initiatives provide tangible solutions that contribute to a more resilient and equitable food system while inspiring positive change at a grassroots level.



Rasha Hasaneen

Rasha Hasaneen is an advocate for food sustainability, harnessing her heritage, network, and professional expertise to make a significant impact in the fight against food waste and support marginalized communities. As part of Trane Technologies' social innovation program, Hasaneen sponsored a project that addresses the challenge of food spoilage faced by street vendors in rural parts of India and other regions.

Through extensive field research, Hasaneen discovered that street vendors in rural India, earning less than \$5 a day, discard approximately 30 percent of their produce due to spoilage. In response, she developed a solution that directly benefits these low-income vendors while simultaneously reducing food waste.

The solution involves providing street vendors with a cart equipped with innovative passive-radiative cooling technology that operates without electricity. During the day, the cart's canopy reflects sunlight, creating a radiative cooling effect that slows down the ripening process of fresh produce. At night, the canopy can be lowered, transforming the cart into a cooler, enabling vendors to store their produce and sell it the next day, thereby improving their income.

Following a successful pilot project in Kolar, India, Hasaneen plans to expand the cooling cart initiative in 2023. By scaling up this project, she aims to have a more significant impact on reducing food waste and supporting the livelihoods of low-income street vendors.

Rasha Hasaneen's work exemplifies the intersection of innovation, sustainability, and social impact. Her project directly addresses the challenges faced by marginalized communities while simultaneously tackling the urgent issue of food waste. By providing street vendors with practical and sustainable tools, she empowers them to improve their income and reduces the amount of discarded food. Hasaneen's efforts contribute to building a more sustainable and equitable food system, one that supports access to fresh produce and helps uplift vulnerable communities.



Planting Seeds of Action
Harvesting Solutions





Nina Mannheimer

Nina Mannheimer is a dedicated advocate for food sustainability, working to transform farming systems into climate solutions. In early 2020, she embarked on a journey with Robert Gerlach and Adiv Maimon, interviewing over 100 farmers in Germany to explore the potential for transitioning to regenerative agriculture and identifying the obstacles that hinder such a shift.

Based on their findings, Mannheimer and her colleagues founded Klim, a startup that addresses three critical roadblocks to regenerative agriculture: lack of knowledge, bridge financing, and public appreciation. Klim provides farmers with a platform that offers access to knowledge, community support, and funding to facilitate the adoption of regenerative practices.

Mannheimer also collaborates with food companies that strive to make their supply chains more climate-friendly and resilient. By partnering with these companies, Klim supports the transformation of German agriculture by funding farmers' efforts. Additionally, consumers can contribute to the mission by purchasing products labeled with Klim, thereby supporting regenerative agriculture and promoting sustainability.

Looking ahead to 2023, Klim envisions expanding its operations throughout Europe, furthering its mission to enable and empower farmers to transition to regenerative agriculture practices. By providing a holistic approach that combines knowledge, community, and funding, Mannheimer's work through Klim contributes to fostering a more sustainable and resilient food system.

Nina Mannheimer's commitment to promoting regenerative agriculture and addressing the barriers to its adoption demonstrates her dedication to driving positive change in the agricultural sector. Through her efforts, she empowers farmers, educates consumers, and collaborates with food companies, all with the aim of creating a more sustainable future for agriculture and food production.

Planting Seeds of Action
Harvesting Solutions

Dr. Asmeret Asefew Berhe

Dr. Asmeret Asefew Berhe, a soil biogeochemist, political ecologist, professor, and researcher at the University of California, Merced, is making significant contributions to our understanding of the impact of climate change on the planet, starting from the ground up. Her research focuses on investigating the effects of various environmental conditions, such as fire, erosion, and climate change, on soil processes, particularly the capacity of soil to store carbon. By studying these dynamics, Dr. Berhe provides essential insights into how soil plays a vital role in regulating the Earth's climate.

Dr. Berhe's work is of critical importance as it highlights the intricate relationship between soil health and climate change. Through her research, she sheds light on the consequences of environmental disturbances on soil carbon storage and the potential feedback loops that can either exacerbate or mitigate climate change. Her findings deepen our understanding of the role of soil in carbon cycling and offer valuable insights into developing effective climate change mitigation and soil management strategies.

As a soil biogeochemist and political ecologist, Dr. Berhe's interdisciplinary approach also considers the sociopolitical dimensions of soil management and the implications for local communities and ecosystems. By examining the intricate connections between soil health, environmental conditions, and societal factors, she contributes to more holistic and sustainable approaches to land management and climate resilience.

Dr. Asmeret Asefew Berhe's research is instrumental in advancing our understanding of the critical role that soil plays in regulating the Earth's climate. Her work not only deepens our scientific knowledge but also informs policy decisions and land management practices. By investigating the impacts of climate change on soil processes, Dr. Berhe's research contributes to the broader effort to address climate change and foster sustainable land use practices that prioritize soil health and carbon sequestration.



Planting Seeds of Action
Harvesting Solutions

Governments Addressing the Calls

Addressing the pressing issues of population growth and sustainable food systems at the government level is crucial for enacting comprehensive and systemic change. Governments have the power to shape policies, regulations, and incentives that can significantly impact food production, distribution, and access. Here are key strategies and examples of how governments can address these issues:

- 1. Policy Development:** Governments can formulate policies that promote sustainable farming practices, reduce food waste, and ensure equitable access to nutritious food. For instance, the European Union's Common Agricultural Policy (CAP) aims to support sustainable agriculture by incentivizing environmentally friendly practices and providing financial support to farmers who implement them.
- 2. Research and Innovation Funding:** Governments can allocate resources for research and innovation in agriculture, encouraging the development of more sustainable farming techniques and technologies. The United States Department of Agriculture (USDA) funds research projects aimed at improving agricultural sustainability, including soil health and crop resilience.
- 3. Subsidy Reform:** Governments can reform agricultural subsidies to prioritize sustainable practices over resource-intensive ones. Shifting subsidies away from monoculture crops and towards regenerative agriculture, as seen in some Scandinavian countries, promotes environmentally responsible farming.
- 4. Food Safety and Labeling:** Implementing food safety standards and clear labeling requirements can help consumers make informed choices about the sustainability and nutritional value of the food they purchase. The "Organic" label, regulated by the USDA in the United States, is an example of a labeling system that supports sustainable agricultural practices.



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Harvesting Solutions

5. **Public Procurement:** Governments can use their purchasing power to support local, sustainable food producers. Programs like the Farm to School initiative in the United States encourage schools to source fresh, locally grown produce for school meals, supporting both local farmers and healthy eating habits.

6. **Land Use Planning:** Urban and regional governments can adopt land use planning policies that encourage urban agriculture, reduce sprawl, and protect agricultural land from development. Cities like Vancouver, Canada, have incorporated urban agriculture into their city planning to enhance local food production.

7. **Food Security Programs:** Governments can implement food security programs to ensure that vulnerable populations have access to nutritious food. The Supplemental Nutrition Assistance Program (SNAP) in the United States provides financial assistance to low-income individuals and families to purchase food.

8. **International Cooperation:** Governments can engage in international agreements and partnerships to address global food security and environmental challenges. The Paris Agreement, for example, includes provisions related to sustainable agriculture and reducing greenhouse gas emissions from the agricultural sector.

Addressing population growth and sustainable food systems at the government level involves a holistic and coordinated approach. By enacting policies, regulations, and initiatives that prioritize sustainability, governments can contribute significantly to the global effort to create more resilient, equitable, and environmentally responsible food systems.



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Christiana Figueres

Christiana Figueres is a prominent figure in the field of climate change and sustainability. After leading a climate-change nonprofit organization for eight years, she assumed the role of Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) in 2010. Figueres took on this challenging position at a critical juncture, following the disappointing outcome of the 2009 Copenhagen summit, where global leaders failed to reach a comprehensive agreement on climate change.

Known for her unique sense of optimism and determination, Figueres sought to bring a fresh perspective to the climate-change negotiations. She aimed to shift the talks away from what she referred to as "the political trash can" and create an environment conducive to collaboration and progress. Her efforts paid off when she successfully orchestrated the historic Paris Agreement in 2015, which saw nearly all countries commit to taking action to combat climate change and limit global warming.

One of Figueres' notable contributions to the climate-change discourse was her focus on the gender dimension of the issue. Alongside other women involved in the negotiations, she shed light on the disproportionate impact of climate change on women and the importance of including women's perspectives and experiences in climate policies and initiatives.

Beyond her work at the UNFCCC, Figueres continues to advocate for climate action and sustainability. She is currently writing a book that outlines the actions and strategies needed in the next decade to effectively address climate change. Her expertise and leadership have made her a respected voice in the global effort to create a more sustainable and resilient future.

Regarding food sustainability, Figueres recognizes the crucial role that agriculture and food systems play in climate change. She emphasizes the need for sustainable farming practices, reduced deforestation, and the promotion of plant-based diets as key strategies to mitigate greenhouse gas emissions and ensure food security for future generations. By highlighting the interconnectedness of climate change and food systems, Figueres contributes to the broader conversation on achieving a sustainable and equitable future for all.



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Vandana Shiva

Vandana Shiva, also known as the "Seed Warrior," is an esteemed ecologist, physicist, and activist who has dedicated her life to improving the well-being of the planet. As the founder and director of the Research Foundation for Science, Technology and Natural Resource Policy, as well as the founder of Navdanya, her work has centered around challenging the dominance of big agriculture and advocating for farmers' rights to create a more sustainable and equitable food system.

Shiva strongly believes in the importance of biodiversity and the preservation of traditional farming practices. She has been a vocal critic of the corporate control and consolidation of the agricultural industry, expressing concerns about the impact of such control on human health and food security. Shiva advocates for the empowerment of small-scale farmers, the protection of traditional seeds, and the promotion of organic and agroecological farming methods.

Her efforts to combat the negative impacts of industrial agriculture have garnered significant attention and respect. Shiva emphasizes the need to shift towards regenerative and sustainable practices that prioritize the health of ecosystems, farmers, and consumers. By challenging the monopoly of a few large corporations over the food system, she strives to create a world where diverse and resilient agricultural practices flourish, benefiting both human communities and the environment.

Shiva's activism extends beyond the realm of agriculture. She has been a prominent voice in various global movements, including those advocating for environmental justice and indigenous rights. Through her work, she highlights the interconnectedness of social, environmental, and economic issues, emphasizing the need for holistic and sustainable solutions.

Vandana Shiva's unwavering commitment to challenging the status quo and advocating for a more just and sustainable food system has earned her widespread recognition and acclaim. Her work has inspired countless individuals and communities worldwide, sparking conversations and actions that promote biodiversity, protect farmers' rights, and enhance the resilience and well-being of our planet.

Planting Seeds of Action

Harvesting Solutions

Sunita Narain

Sunita Narain, an accomplished environmental-policy researcher since 1982, has dedicated her career to finding practical solutions to a wide range of environmental challenges. Her work has garnered numerous accolades, recognizing her contributions to issues such as rainwater harvesting, tiger conservation, and air-pollution mitigation. Narain's approach has always been rooted in a focus on actionable solutions to environmental problems.

One of Narain's significant concerns is the lack of representation of minority voices from the Global South in the global climate change dialogue. She emphasizes the need for inclusivity, asserting that climate change should be viewed as a more inclusive issue that addresses the rights of all individuals to development and access to clean energy. According to Narain, it is crucial for politicians and media in countries like India to prioritize climate change, especially as the impacts, such as floods and devastation, become increasingly apparent. She believes that leaders from developing nations must raise their voices on the global stage to urgently reduce emissions.

Narain holds a strong belief in the potential for humanity to address the challenges of climate change. She asserts that by highlighting the immorality of the impact on vulnerable communities, people will come to understand the urgency of taking action. Despite the daunting nature of the battle against climate change, Narain maintains hope that significant progress can be made.

Regarding food sustainability, Narain's work contributes by advocating for sustainable agricultural practices and addressing the environmental impacts of food production and consumption. She recognizes that food systems play a crucial role in climate change and its impacts on both people and the planet. Narain's emphasis on clean energy access aligns with the need to promote sustainable energy use in agriculture, reduce greenhouse gas emissions from food production, and ensure food security for all.

Sunita Narain's contributions to environmental policy and her commitment to finding practical solutions have made her a respected figure in the fight against climate change. Her efforts to amplify the voices of marginalized communities and advocate for inclusive climate action contribute to building a more equitable and sustainable future. By addressing the interconnections between climate change and food sustainability, Narain's work contributes to the broader effort to transform our food systems and mitigate the environmental impacts of agriculture.



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Conclusion

In conclusion, the multifaceted challenges of population growth and sustainable food systems demand action at every level of society, from the individual to the community and government. The collaborative efforts of individuals, empowered by knowledge and guided by principles of sustainability, are the building blocks of positive change. Communities, through their shared initiatives and commitment to local solutions, create resilient and interconnected networks that bolster sustainability. Finally, governments wield the power to enact systemic change through policies, regulations, and resource allocation.

In the spirit of Mercy and Catherine McAuley, our collective responsibility to address these issues is illuminated. The values of compassion, justice, and service that they embody compel us to act not out of obligation but out of genuine care for the well-being of all individuals, particularly those most vulnerable to the consequences of environmental degradation and food insecurity. As we unite across these levels of society, we realize that our actions ripple outward, influencing not only our immediate communities but also shaping the global landscape of food sustainability and social equity.

By addressing these challenges with empathy, commitment, and an unwavering dedication to a more sustainable and just world, we pay homage to the enduring legacy of Mercy and Catherine McAuley. Through these collective efforts, we are not merely seeking solutions but also forging a path towards a future where every individual, every community, and every government embodies the spirit of mercy in every action taken, creating a world that is truly equitable, sustainable, and compassionate.

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CONCLUSIONS

A NOTE FROM THE AUTHOR

"Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems" has taken us on a journey through the intricate web of challenges posed by a growing global population and the need for sustainable food systems. Throughout this guide, we have explored historical and regional trends in population growth, dissected the complex challenges facing food sustainability, and illuminated the opportunities that lie within these challenges. We've delved into the impact of population growth on agricultural practices, land use, water resources, greenhouse gas emissions, biodiversity, climate change, and social equity.

Crucially, we've highlighted the pivotal role that women play in addressing these challenges, aligning with the spirit of Mercy and Catherine McAuley, who championed gender equity and social justice. Women, as stewards of the land and nurturers of communities, have been at the forefront of sustainable farming, conservation, and resilience-building efforts.

Moreover, we've woven the United Nations Sustainable Development Goals (SDGs) into the fabric of our exploration, recognizing that addressing population growth and sustainable food systems is integral to achieving these global objectives, especially those related to ending hunger, promoting gender equality, and mitigating climate change.

Our guide has also provided practical examples and recommendations for individuals, communities, and governments to contribute meaningfully to the solutions. From reducing food waste to promoting agroecological farming, from implementing inclusive policies to fostering technological innovations, we've illustrated that positive change is within our reach.

As we stand at the crossroads of these critical issues, let the legacy of Mercy and Catherine McAuley guide our actions. Her compassion, justice, and commitment to service call us to seek not only solutions but also a more compassionate and equitable world. Together, we can harness the power of collective action to forge a harmonious relationship between our growing global population and the essential need for sustainable food systems. "Harvesting Solutions" invites you to join this collective journey towards a future that nourishes all, and in doing so, honors the spirit of mercy that underpins our shared commitment to a more sustainable and just world.

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APPENDIX 1

Mercy Discussion Guides

Welcome to the Mercy Discussion Guides for the project "Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems." In these discussion guides, we will explore the critical issues surrounding population growth and its impact on the sustainability of our global food systems. Drawing inspiration from the compassionate values and teachings of Catherine McAuley, the founder of the Sisters of Mercy, we will delve into the challenges and opportunities that arise from this complex relationship.

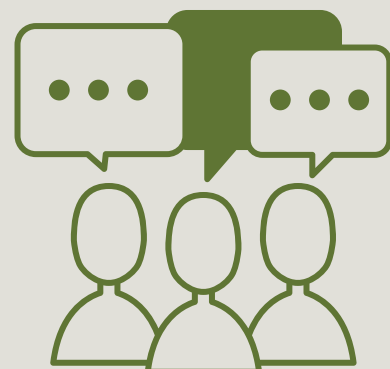
Catherine McAuley was a visionary leader known for her deep compassion, dedication to social justice, and commitment to serving those in need. The Sisters of Mercy, following in her footsteps, have continued her legacy by addressing societal challenges and advocating for change. With a focus on addressing the pressing issue of sustainable food systems in the face of population growth, these discussion guides aim to foster thoughtful and compassionate dialogue among participants.

The Mercy Discussion Guides are designed to be a resource for educators, community leaders, and individuals interested in exploring these critical topics. Each guide provides an overview of the topic, key questions for reflection and discussion, and suggestions for further exploration. These guides aim to facilitate meaningful conversations, encourage critical thinking, and inspire participants to take action in their own communities.

We invite you to embark on this journey of exploration and discovery as we examine the relationship between population growth and sustainable food systems through the lens of mercy and compassion. Together, we can cultivate innovative solutions and work towards a more just and sustainable future for all. Let us draw inspiration from Catherine McAuley's teachings and be agents of positive change in our world.

Discussion Guide 1: Drawing inspiration from the compassionate spirit of Catherine McAuley we seek to explore the ways in which mercy can guide our understanding, actions, and solutions in promoting equitable access to nutritious food while nurturing and sustaining the Earth's resources. Through thoughtful reflection and theological exploration, we aim to ignite dialogue, foster empathy, and inspire transformative action that aligns with the principles of mercy and social justice.

Discussion Guide 2: aims to foster critical thinking, analysis, and meaningful discussions in a class room as we examine the impacts, trends, and potential solutions surrounding the intersection of population growth and food sustainability.



Discussion Guide:

Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems

1. How does population growth intersect with issues of social justice, inequality, and access to resources?
2. In the spirit of mercy, how can we approach the issue of population growth with compassion, empathy, and a commitment to ensuring the well-being of all individuals, particularly those who are most vulnerable?
3. How can the principles of mercy guide us in finding innovative and inclusive solutions to address the challenges posed by population growth, while prioritizing the dignity and rights of every person?
4. How can we approach the issue of population growth with a deep sense of stewardship for the Earth and its resources, understanding that sustainability and care for the environment are integral to the mercy mission?
5. What does it mean to approach food sustainability from a place of reverence and gratitude, recognizing the interconnectedness of all living beings and the Earth's resources?
6. How can we cultivate a deeper awareness of the impact our individual and collective food choices have on the health of our planet, the well-being of future generations, and the interconnected web of life?
7. How can the principles of mindfulness and intentionality guide us in creating more sustainable food systems, fostering a sense of connection and responsibility towards the Earth and all its inhabitants?
8. How can the spirit of mercy inspire us to view food sustainability as an act of compassion, recognizing the interconnectedness between human well-being, ecological balance, and social justice?
9. How does the intersection of food sustainability and population growth prompt us to question our understanding of abundance, scarcity, and the delicate balance between human needs and ecological limits?
10. How can our contemplation of the intersection between food sustainability, population growth, and the spirit of mercy lead us to imagine and co-create a more just and sustainable future, where the principles of mercy guide our actions, relationships, and stewardship of the Earth's resources?

Discussion Guide:

Harvesting Solutions: Examining the Relationship between Population Growth and Sustainable Food Systems

1. Analyse the challenges and issues that arise from rapid population growth.
2. Evaluate the environmental impact of population growth, including resource consumption and pollution.
3. Identify regions or countries experiencing rapid population growth and explore the reasons behind it.
4. Define food sustainability and justify its importance in today's world.
5. Elaborate on the environmental challenges associated with current food production practices.
6. Discuss possible future scenarios regarding population growth and its implications.
7. Explore strategies to promote local and regional food systems for enhanced food sustainability.
8. Demonstrate how technology and innovation can contribute to sustainable food production and distribution.
9. Review initiatives and programs aimed at promoting food sustainability at both global and local levels.
10. Explain how the concept of "food miles" contributes to discussions on food sustainability.
11. Assess the potential social and economic impacts of food insecurity resulting from population growth.
12. Examine how population growth affects food production and agricultural practices.
13. Discuss the role of education and awareness in addressing the challenges of a growing population through sustainable food systems.
14. Identify ethical considerations in ensuring equitable access to food for a growing global population.
15. Explore how individuals and communities can actively promote sustainable food practices amidst a growing population.