The Journal of Nonprofit Innovation

An Online Journal for Reviews of Academic Research and Thought Papers on Community and Global Issues

Edition: Food Insecurity
- Latest Research (Summaries)
- Article: Food Insecurity Overview & Solutions
- Spotlights (Nonprofits & Social Impact Companies)
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About JoNI

Who We Are

The Journal of Nonprofit Innovation (JoNI) is a publication of WikiCharities, a US-based 501c3 nonprofit organization dedicated to nonprofit transparency and collaboration in partnership with Brigham Young University (BYU). JoNI is an online journal for academic research summaries and thought papers on community and global issues. We exist to help nonprofit leaders know the latest research and collaborate on their experiences.

Our Mission

The Journal of Nonprofit Innovation (JoNI) provides a way for nonprofit leaders to stay up to date on the latest research and collaborate, building a more innovative and collaborative nonprofit sector.

Submissions

For more information on how to get involved or how to submit pieces for upcoming issues, visit us online at journalofnonprofitinnovation.org.
Latest Research on Food Insecurity (Summaries)
Summary 1
Inclusive climate change mitigation and food security policy under 1.5 °C climate goal


Abstract
“Climate change mitigation to limit warming to 1.5 °C or well below 2 °C, as suggested by the Paris Agreement, can rely on large-scale deployment of land-related measures (e.g. afforestation, or bioenergy production). This can increase food prices, and hence raises food security concerns. Here we show how an inclusive policy design can avoid these adverse side-effects. Food-security support through international aid, bioenergy tax, or domestic reallocation of income can shield impoverished and vulnerable people from the additional risk of hunger that would be caused by the economic effects of policies narrowly focusing on climate objectives only. In the absence of such support, 35% more people might be at risk of hunger by 2050 (i.e. 84 million additional people) in a 2 °C-consistent scenario. The additional global welfare changes due to inclusive climate policies are small (<0.1%) compared to the total climate mitigation cost (3.7% welfare loss), and the financial costs of international aid amount to about half a percent of high-income countries’ GDP. This implies that climate policy should treat this issue carefully. Although there are challenges to implement food policies, options exist to avoid the food security concerns often linked to climate mitigation.”

Background
International efforts to address climate have inadvertently intensified the global threat to food security, primarily through the promotion of large-scale bioenergy crop production. These crops, cultivated exclusively for energy purposes and not for consumption, divert resources away from food production. Despite the noble intention of mitigating CO2 emissions, the focus on bioenergy crops is an example of a real tradeoff between climate action and ensuring a stable food supply. The issue is exacerbated by the already alarming levels of food insecurity, with approximately 795 million people at risk of hunger, predominantly in sub-Saharan Africa and southern Asia. Balancing climate change with the urgent need to alleviate global hunger poses a significant challenge, prompting researchers to explore innovative policy solutions.

Method
To address this dilemma, the study used the Advanced Integrated Assessment Model (AIM), a sophisticated computer simulation tool. This model explored diverse climate-mitigation strategies, including bioenergy crops, afforestation, and reductions in non-CO2 emissions. Researchers conducted these evaluations within the complex framework of energy, agriculture, land use, climate change, and food security.
The researchers focused on four levels of potential mitigation, ranging from a scenario with no policy interventions (serving as the control group) to ambitious goals like restricting global mean temperatures below 2 degrees Celsius or even 1.5 degrees Celsius by 2100. In addition, the study incorporated four food-security policies into their simulations: international aid, domestic reallocation, bioenergy tax, and exempting agricultural non-CO2 emissions from carbon pricing. These simulations allowed researchers to see the potential effects of various climate and food security policies—especially how those policies interplay with food security and climate change challenges.

**Takeaways**

The findings of this study illuminate the critical relationship between climate policies and food security. For example, the researchers found that neglecting food security concerns in climate initiatives heightens the risk of hunger because of the simultaneous rise in food prices and decline in global income levels.

The study identified promising policy approaches that effectively reconcile climate and food security objectives. Specifically, policies that incorporated international aid and domestic reallocation components emerged as the most effective in achieving the dual goals of climate action and food security (pg. 7). These policies not only safeguarded essential food needs but also aligned with the temperature targets outlined in the Paris Agreement. However, the researchers cautioned relying excessively on international aid, as overdependence on outside aid could render a country vulnerable to sudden shifts in foreign policy. Domestic reallocation, which could manifest as a progressive tax or similar mechanisms, emerged as another viable alternative.

In conclusion, the study emphasizes the importance of inclusive climate policy packages that integrate appropriate food security measures. By aligning these policies, nations can reach climate goals without adversely impacting food security. This nuanced approach, as highlighted in the research, serves as a blueprint for crafting effective policies that address the urgent challenges of climate change and global food insecurity simultaneously.


**Summary 2**

Can Domestic Food Production Provide Future Urban Populations with Food and Nutrition Security? – Insights from Bangladesh, Kenya and Uganda


**Abstract**

“Population growth and urbanization increasingly put pressure on our planet’s availability of areas needed for food production. The dependencies on domestically produced food are increasingly judged favorable, following the consequences of the Ukrainian war, with escalating fuel and grain prices and less accessibilities to low-income groups. It is, however, unclear whether land is domestically available. Applying a food system.
approach, the main aim of this article is to investigate spatial foodsheds and theoretical self-sufficiency for food production needed to supply increasing future populations in a selection of cities, including estimates for Dhaka in Bangladesh, Nairobi in Kenya and Kampala in Uganda. The projected foodshed scenario areas for the years 2020 and 2050 are estimated for the production of three core products currently extensively produced and consumed in the three countries. They show that it is not possible to feed an ever-increasing urban population based on domestic production alone. International trade, new technological developments and new consumer demands for less area-intensive food production systems may give solutions to the immense challenge of feeding the world’s population with nutritious food in 2050. However, to ensure fair and inclusive transition pathways for low-income groups: (1) affordability and accessibility of trade opportunities, technologies and products, (2) a common vision aiming for the SDGs, including SDG2: Zero hunger and SDG11: Sustainable Cities and Communities as well as (3) best practices in co-creation and cooperation with the most vulnerable urban and rural populations, are highly needed.

Background
The global food supply is facing unprecedented challenges, exacerbated by factors such as population growth, urbanization, and the lingering effects of the COVID-19 pandemic. By 2030, 670 million people are predicted to suffer from undernourishment, with Kenya, Uganda, and Bangladesh being particularly vulnerable. In these countries, a significant portion of the population, ranging from 74% to 82%, faces malnutrition due to limited access to affordable and nutritious food. Climate change further compounds this issue, necessitating a staggering 50% increase in agricultural production by 2050 to meet the demands of future generations. Urban food security is especially complex due to limited agricultural space, high density, and dependence on food vendors. This study focuses on devising strategies to fulfill the growing food requirements of urban centers in Uganda, Kenya, and Bangladesh. It explores the concept of spatial foodsheds, the geographical area needed to sustain a city’s food supply independently, analyzing the production of essential crops like rice, maize, plantains, and more.

Methods
This study employs a comprehensive “rural-urban food system approach” to analyze the intricate interplay of socioeconomic and climate factors across the entire food production and consumption continuum. By dissecting the complexities of food production, processing, distribution, preparation, and consumption, the research identifies gaps within the food system. The study delves into every stage of the rural-urban food chain, illuminating crucial areas that require policy interventions. Detailed analyses encompass the feasibility of supply chains, governmental support, trade dynamics, employment opportunities, climate adaptation strategies, stable financing, waste management, and justice in the food system.
Takeaways
The study pinpoints precise increases in crop production necessary to secure major food supplies in Uganda, Kenya, and Bangladesh. Projections reveal that Dhaka must increase rice production by 64%, potatoes by 30%, and vegetables by a staggering 114% by 2050 to sustain its foodshed adequately. Nairobi faces a similar challenge, requiring an 87% increase in maize production, 47% in milk, and 106% in vegetables. Meanwhile, Kampala needs to augment plantain production by 134%, cassava by 115%, and milk by 109% to meet its future foodshed needs. These findings serve as a crucial resource for key stakeholders, enabling them to proactively prepare for imminent food shortages.

The study emphasizes the importance of ensuring accessibility and affordability for low-income groups, considering existing institutional frameworks such as property rights and international trade, and integrating climate-adaptive technologies into future strategies. These considerations are essential for crafting sustainable solutions and building resilient urban food systems.


Summary 3
‘Hunger in early life’: exploring the prevalence and correlates of child food insecurity in Canada


Abstract
“Although food is a basic human right, food insecurity remains a major problem in the Global North including Canada. Children constitute a subgroup that is particularly vulnerable to food insecurity, with recent evidence showing that 1 in 6 Canadian children are food insecure. The rising rate of child food insecurity alongside its links with several adverse health outcomes reinforce the need to pay attention to its determinants. Although food insecurity is a multidimensional phenomenon shaped by diverse factors, in the Global North, including Canada, it is generally framed as a financial problem. Consequently, food policy has largely prioritized income support programs to the neglect of potentially important non-monetary factors. These non-monetary factors are also rarely explored in the literature despite their potentially relevant role in shaping policy responses to child food insecurity. Drawing data from the Canadian Community Health Survey (N=21,455 households with children) and broadening the scope of potential predictors, this paper examined the correlates of child food insecurity in Canada” (Kansanga, 2022, p. 1; Statistics Canada, 2023).

Background
Food insecurity is defined in the Canadian context as “limited access to food resources due to financial constraints” (Kansanga, 2022, p.1).
Kansaga (2022) reported that one in seven (14.6%) households experienced food insecurity in 2020, which was an increase from 12.4% in 2018. Substantial studies have been conducted on Canadian food insecurity at the household level.

Child food insecurity specifically is inadequately studied, often overshadowed by household-level investigations. At the household level, 15.6% of households with children under 18 are food insecure, compared to 10.4% without. Notably, 1 in 6 Canadian children faces food insecurity, linked to adverse health outcomes like delayed development and cognitive issues. Kansanga (2022) cites de Oliveira’s (2020) report, stating that 95% of children in food-insecure households suffer suboptimal cognitive outcomes in school settings. While the Canadian government’s poverty-alleviation efforts provide some financial support to low-income families, the issue persists. Kansanga’s (2022) research delves into non-financial contributors to child food insecurity, including a sense of belonging, living arrangements, race, and parental culinary skills, addressing gaps in current literature. Given that scholarly studies predominantly focus on the broader household level, children’s specific experiences of food insecurity are often overlooked. Kansanga emphasizes the critical nature of this research gap, especially as children are in a vital growth phase requiring adequate nutrition. The study seeks to expand the research base by examining the role of socioeconomic and social factors in the realm of child food insecurity.

**Methods**

This study utilized data from the 2017-2018 Canadian Community Health Survey (CCHS), a comprehensive national survey collecting health information from Canadians aged 12 and above. The data, obtained through electronic questionnaires (EQ) online or assisted by Statistics Canada interviewers via CATI (computer-assisted telephone interviewing) or CAPI (computer-assisted personal interviewing), excludes residents on reserves, full-time members of the Canadian Forces, and institutionalized populations. Consequently, respondents aged 17 or younger are excluded, and the analytical sample comprises 21,455 adult respondents with households including at least one child.

The CCHS gathered information from adult respondents regarding their children’s experiences of food insecurity in Canadian households, posing seven questions to measure prevalence in the last year: (1) reliance on a few kinds of low-cost food, (2) inability to provide a balanced meal, (3) children not eating enough, (4) reduction in the size of children’s meals, (5) children ever hungry, (6) children ever skipping meals, and (7) children ever not eating for a whole day (Kanzanga, 2022, p. 3).
Takeaways
Results showed children in the following household types were more likely to experience food insecurity: Minority households, single-parent homes, five or more members in a household, and/or adult household members who reported a weak sense of community belonging, poor physical and/or poor mental health status.

Financial assistance is a necessary measure to mitigate child food insecurity, but this study demonstrated other socioeconomic factors that contribute to child food insecurity. These factors include minority status, parental living arrangement, sense of community belonging, and number of siblings in a household. Financial assistance alone will not fully combat child food insecurity. Special attention should be focused on creating a sense of community belonging for immigrant and minority groups so resources can be shared among community members.


Summary 4
Enhancing Food Literacy and Food Security through School Gardening in Rural and Regional Communities


Abstract
“A qualitative case study approach with in-depth, semi-structured interviews of key school staff, and student feedback was used to assess a school kitchen and garden program in the regional area of North-West Tasmania, Australia. A detailed program description was produced to conduct a realist evaluation with a Context-Mechanism-Outcome configuration, followed by a program theory evaluation through the construction of a retrospective program logic model. Dedicated kitchen and garden spaces, knowledgeable teachers committed to the program, provision of sufficient materials and consumables, and support from the school and community were found to be the basic requirements to establish a program. Additionally, it is essential to integrate both the kitchen and garden teaching components into the school curriculum. The positive outcomes (e.g., engagement, participation, knowledge, skills, behavioral change) of the program were dependent on the underlying factors, including dedicated support of school leadership, teaching staff, and the parent body for effective student engagement in the teaching spaces and for wider
engagement from families and the community. The students’ feedback provided supporting evidence of increased food literacy with improvements in their understanding, abilities, and attitudes towards gardening, producing healthy food, and preparing food. This may further lead to enhanced food security for students’ families and the broader community.”

**Background**

People residing in rural areas often face food insecurity due to limited access to nutritious foods and lower levels of food literacy. In this study, food security is defined as, “the state where all individuals have physical, social, and economic access to adequate, safe, nourishing, and culturally appropriate food that fulfills their dietary requirements and food preferences to lead a healthy and active life” (Holloway et al., 2023). Food literacy is defined as, “a set of interrelated knowledge, skills, and behaviors to meet food needs, including planning, selection, preparation and eating, which empower individuals, households, and communities to maintain and strengthen healthy diets” (Holloway et al., 2023). Food insecurity and food illiteracy result in health concerns such as malnutrition, obesity, and cardiovascular disease.

Conducted in a rural elementary school in North-West Tasmania, Australia, this study aims to contribute to global literature by investigating the effectiveness of an elementary school kitchen and garden program in improving food literacy and security in a rural/regional community. School gardening programs extend opportunities to enhance food literacy which ultimately alleviates household and community food insecurity problems. The purpose of this study was to answer the question, “Do school-based gardening programs have potential to enhance food literacy and food security in rural and/or regional communities?”

The elementary school in this study integrated experiential learning activities into the curriculum with support from teachers, principals, staff members, and parents. Community donations provided kitchen and garden spaces, materials, and consumables. School leadership played a key role in effectively engaging students and ensuring strong participation in the study.

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**Figure 1.** Stages of the research approach used for development of the case study to assess potential of the school Kitchen & Garden program in improving food literacy of children.
Methods
This study used a case study to evaluate a primary-school kitchen and garden program in Tasmania, Australia. Two-hundred-ninety children aged 4-11 years old and who were enrolled in kindergarten to sixth grade participated in the case study and reside in a low socioeconomic area of Australia. Data was collected through interviews, observational site visits, and review of the materials which were broken into three stages as shown in Figure 1 below.

The primary school linked experiential learning activities to the school curriculum which were supported by teachers, principals, staff members, and parents during the study. Kitchen and garden spaces were provided as well as materials and consumables through community donations. Leadership within the school promoted the curriculum to effectively engage students in the study and garner strong participation.

The realist evaluation used in this study aimed to emphasize the importance of contextual factors, including exclusive kitchen and garden spaces, dedicated teaching staff, community support for materials, and program integration into the curriculum. The study’s retrospective program logic model reveals the Kitchen & Garden program's potential to enhance food literacy and security for children, families, and the broader community. Figure 2 shows the recommended program logic model for development of similar curriculum globally.

Takeaways
The study generated a "theory of change" illustrated in Figure 2, providing a framework to enhance the effectiveness of comparable school kitchen and garden programs. Holloway et al. (2023) emphasized that the success of such programs is significantly influenced by strong relationships among students, faculty, and communities. While achieving full engagement from school leadership, parents, and the community may not always be feasible, the researchers in this study highlighted the importance of developing program logic models during the initial planning stages. These models should be utilized for ongoing monitoring and evaluation.
The authors clarified that the scope of their study did not allow them to evaluate the impact school garden programs have at the family and community level and that future studies aimed at this objective are needed.


### Summary 5

**Longitudinal Trajectories of Food Insecurity in Childhood and Their Associations with Mental Health and Functioning in Adolescence**


**Abstract**

“Household food insecurity has been associated with mental health problems in children independently of family income and other confounders. It is unclear whether food insecurity during childhood is also associated with mental health and functioning during adolescence.

To evaluate longitudinal trajectories of household food insecurity during the first 13 years of life, characteristics associated with these trajectories, and the associations of the trajectories with externalizing, internalizing, substance use, and social adjustment problems at 15 years of age” (Paquin et al., 2021, p. 1).

**Background**

Thirteen percent of Canadian households reported that they had experienced food insecurity within the past year in 2017-2018. Childhood food insecurity in this study was defined as the inability to “acquire adequate food for one or more household members because they had insufficient money and other resources for food” (p. 2). The percentage of household food insecurity increased during the COVID-19 pandemic in 2020. Food insecurity increased during the 2020 COVID-19 pandemic, with affected households sharing common factors: low socioeconomic status, limited education, the presence of children, and migrant status. Children, given their rapid development, face heightened risks from food insecurity.

Food insecurity can be transient and/or recurrent; those who experience it can suffer from poor health outcomes as a result. Only a few studies have been conducted to show health outcomes in the adolescent years. The few that exist are cross sectional and limited in scope of negative outcomes (e.g., only considering misconduct or depression). This longitudinal study aimed to determine whether a correlation exists between food insecurity in childhood and mental health functioning in the adolescent years.

**Methods**

Participants of this study included 2,120 children born in 1997 and 1998 who also participated in the Quebec Longitudinal Study of Child Development (QLSCD). The study ended with 2,032 of the original participants. The children were initially assessed at five months old, and
researchers followed up annually or bi-annually until the child turned 15 years old. The study found two differing trajectories in the cohort of participants: low risk and high risk. Most children (1,959 participants [96.4%]) had a very low probability of experiencing food insecurity over the course of the study. The majority of children in the low-risk group were never exposed to food insecurity (only 102 participants).

Meanwhile, the high-risk group experienced recurrent food insecurity throughout the course of the study (73 participants [3.6%]). Within the high-risk group, 50% of the children experienced food insecurity at each age they were assessed, and 56 children (76.7%) were exposed at least twice. Household characteristics differed between the low risk and high-risk groups. The high-risk group experienced income insufficiency, single parents, lower levels of parental education, history of parental depression, and were likely to have more siblings than families in the low-risk group. At age 15, all high-risk participants self-reported additional factors experienced alongside food insecurity, including peer bullying, cannabis use, difficulties in school, depression, and anxiety.

**Takeaways**
The study found two paths of household food insecurity in children ages 1.5 to 13 years old.

- Childhood exposure to socioeconomic instability and parental mental health issues creates a high-risk trajectory that can lead to mental health concerns during adolescence.
- The presence of food insecurity early in life is associated with poorer mental health functioning during adolescent years.
- Children within the high-risk group were more likely to drop out of school, experience bullying, and use cannabis in their adolescent years.
- Supplying food-insecure families with meals helps alleviate the stress experienced with the situation, but researchers suggest broader services including psychosocial care help children/adolescents reach their academic and social potentials.

https://doi.org/10.1001/jamanetworkopen.2021.40085

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**Summary 6**
A Transition Towards a Food and Agricultural System That Includes Both Food Security and Planetary Health

https://doi.org/10.3390/foods12010012

**Abstract**
"This theoretical paper builds on a multidisciplinary framework which is structured to acknowledge the need to combine different research disciplines to understand the problems within our current unsustainable food system and be able to develop possible solutions through new innovations. Current food production methods come at an environmental cost as they generate large amounts of greenhouse gas emissions which affect biodiversity and climate change. The article shows that the problems surrounding food systems and our culture around food are multifaceted and intricate. The fact is that a growing number of citizens suffer from obesity with various consequential diseases as a result,
while a part of the population is still malnourished and dying of hunger. This paper summarizes results from some fairly new studies and different international policy reports to try to clarify how broad the problem is, which is crucial to find new pathways forward to address the problems. Through theoretical discussion, the paper identifies some of the deep underlying root causes and fundamental reasons as to why the urgent needed change is so slow.”

**Background**

In 2015, the United Nations (UN) established the 2030 Agenda, comprising 17 Sustainable Development Goals (SDGs) with 169 targets, aiming to address global challenges by 2030. Regular monitoring of these ambitious goals is crucial.

In 2020, a UN SDG Moment Meeting assessed progress since 2015, reporting on 35 targets due to insufficient data for the rest. Only six targets were on track, 24 showed minimal progress and five were moving in the wrong direction. The five targets moving in the wrong direction included climate change, biodiversity, food security, slum dwellings, and unsentenced prisoners.

Food security, one of the targets off-course, affected 828 million people in 2020, with 2.4 billion facing food insecurity. Climate change and biodiversity are interconnected with food security and both were also among the five targets veering off course. This interconnectedness is unsurprising, since the global food system is in a constant tug-of-war between food production and protecting the biodiversity and climate of our planet. For instance, supplying enough food for the world’s population requires immense amounts of water and energy that contributes to climate change. Use of pesticides and fertilizers cause land degradation that precede changes in biodiversity. Food waste and global food production is responsible for 37% of greenhouse gas (GHG) emissions. The global food system’s conflict between food production and environmental preservation exacerbates these issues, contributing to climate change, land degradation, and GHG.

This study addresses flaws in the current food systems, suggesting a multidisciplinary collaboration to break the societal "business as usual" mindset (Hoffman-Bergman et al., 2023, p. 2). Hoffman-Bergholm (2023) proposes a shift in societal attitudes toward human impact on biodiversity and climate change as the catalyst for progress in achieving the SDGs (p. 2).

**Methods**

This qualitative analysis used existing literature to compare, link, and synthesize research findings regarding food security and planetary health. Researchers conducted a literature review on the following categories:

- The relationship between biodiversity, climate change, and world food systems,
- How our current food system impacts nature,
- Changing diets and agricultural practices to promote biodiversity and health,
- Food security and how it relates to health and culture, and
- Selfishness and apathy and how they relate to the world’s top environmental issues.

The author provided a summary of recommendations for future research and
innovation to navigate toward a sustainable food system that is eco-friendly and efficient for all.

**Takeaways**

This study identifies three critical gaps: between humans and nature, science and culture, and academic and public discussions. Bridging these is essential for progress toward a sustainable future. To address the gap between humans and nature, a multidisciplinary approach is needed to promote dietary changes, reduce processed food consumption, and limit greenhouse gases. Addressing the science-culture gap requires transformative public education and interdisciplinary innovation to integrate cultural change with a sustainable food system. To tackle the education-discourse gap, informal education is crucial for reconnecting humans with nature and raising awareness of their impact on biodiversity and climate change. Ultimately, meaningful change requires more than just education; it necessitates a fundamental shift in mindset towards reconnecting with nature and understanding the environmental impact of human actions.


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**Summary 7**

Practice to Policy in Social-Ecological Systems: Food Rescue, Regenerative Agriculture, and Environmental Education


**Abstract**

“In transitioning society towards sustainability, especially in a time of political upheaval and divide, it is necessary to consider how practitioner insights can inform wide-scale decision-making across a range of contexts. Scientific knowledge can play an important role in these efforts. Research at the ‘science-policy-practice interface,’ highlights the vital role of practice in contributing to science and policy, as well as the ways policy and science can inform practice. However, important knowledge gaps remain. Through this dissertation, I have explored the relationships between science, policy-making, and practice in the context of social-ecological systems in three novel ways. The first was through a community-based research project with Boulder Food Rescue (BFR). Through this project I served in the role of community-based researcher, working with BFR to understand how program participants engaged in decision-making to support agency, food security, and organizational planning. I showed that the combination of BFR’s organizational culture and opportunities to participate in decision-making led to improvements in food..."
access for some participants. My second paper explored how relational values informed the adoption of regenerative agriculture. To do so, I interviewed farmers and ranchers practicing regenerative agriculture in the United States. I found that desires to support the health of communities, soils, and ecosystems was a primary driver for adoption among these practitioners. My third paper was a critical discourse analysis of the environmental education (EE) literature, asking how “critically aware” teaching, learning, and research may inform more inclusive EE policy narratives locally and globally. I showed that the literature can be characterized as presenting relatively little about EE in non-formal settings (e.g., communities and livelihoods), when compared with formal settings (e.g., schools). I designed each paper as an example of social-ecological research that may inform decision-making guided by practitioner perspectives. This embodies the “practice to policy” angle of my work at the science-policy-practice interface. Each paper also represents a different methodological approach at this interface. My hope is to support future efforts for more effective, wide-scale transitions to sustainability guided by the insights of local practitioners who are engaged in this work (Frankel-Goldwater, 2022, pp. ii-iii).

Background
One of the most used approaches to influence social change such as addressing food insecurity is the science-policy interface, which utilizes relationships, normative factors, and scientists’ study topic decisions. There are a few challenges to this approach. Policymakers do not use scientific knowledge sufficiently or accurately and the knowledge produced by scientists may not be directly usable. Proposed solutions for addressing these challenges include creating opportunities for local knowledge and practices to inform policy-level action and knowledge—as well as have scientists consider motivations behind policies made in their area of work. This proposed approach is known as the science-policy-practice interface.

The science-policy-practice interface emphasizes the crucial role practice has in the contribution to advising science and policy. This approach also focuses on the ways policy and science can enlighten practice. It is “a system of feedback between science, policy, and practice, whereby experiences from practice inform policymaking, policies guide the adoption and uptake of practice, and science aids decision-making across multiple scales of action.” The science-policy-practice interface suggests that science can support improvements in decision-making as well as practice. While practice offers insight into the best ways to address challenges in the social-ecological decision-making process. This interface builds on the understanding of the worker experience in their day-to-day work. It is a framework that helps reveal the knowledge gaps that can exist between policy stakeholders, science, and daily practice.

Figure 1: “A conceptual model of the science-policy-practice interface. Overlaps between circles highlight the potential synergies at each point of overlap, with the ideal at the center, where each piece of the interface informs and mutually supports the others.”
Methods
This dissertation offers three independent examples of utilizing the science-policy-practice interface while focusing on their specific problems and area of expertise. They emphasize how critical it is that scholar research draws from practice to help inform policy and decision making. All these examples are supported by qualitative data collections with the use of analytical techniques.

Paper 1 - Supporting Agency in Food Relief Program Participation: A Study of Boulder Food Rescue’s Governance and Organizational Culture
Authors: Lee Grankel-Goldwater, Lindsey Loberg, Diana M. Alvarado, Emily Cho, Susan Jurow, Pater Newton

In collaboration with the leaders of the Boulder Food Rescue, a study of participation in decision-making was made to help identify ways to improve program participant engagement in the food rescue’s organizational planning. Participation in decision-making refers to the various ways people that have experienced food insecurity can be involved in the efforts to improve food access. Research was conducted through attending 71 meetings including strategic planning meetings, sub-committee meetings, and community events as well as conducting 26 semi-structured interviews with the rescue’s No Cost Grocery Program contributor group members.

Paper 1 - Takeaways
The study found five insights that may be valuable for future scholarly and practice-oriented research:

- Opportunities for participation in decision-making can provide experiences of dignity which may lead to improved participation in a food rescue program and agency around food security.
- Community of practice and network-like initiative may be helpful in the support of participation in decision-making.
- Food relief program staff focused on participant engagement with ongoing critical reflection may support better overall practices.
- Increasing awareness of food relief program structure and function may overcome barriers to participation in decision-making.
- Community-based research offered a range of benefits, challenges, and opportunities with food systems research. (Frankel-Goldwater, 2022, pp. 61–68).

The food rescue drew participants into the decision-making process that guided policy and action or participation in decision-making by providing experiences of dignity and opportunities to access food at or near their homes. The Boulder Food Rescue’s commitment to collective action and support of participation in decision-making helped promote food access and steps to challenge the food systems status quo.

Paper 2 - What is Driving the Adoption of Regenerative Agriculture? Farmers and Ranchers in the US Describe the “Health” of People, Soils, and Ecosystems as Primary Factors
Authors: Lee Frankel Goldwater and Peter Newton

Little is known about what drives the adoption of regenerative agriculture by farmers and ranchers.
These factors have become an interest to policymakers. This paper conducted semi-structured interviews with 31 farmers and ranchers across the United Stated that self-identified as practitioners.

Regenerative agriculture aims to improve soil health and carbon sequestration. Another goal is to balance social, environmental, and economic benefits. It is thought to be an emerging social movement which is guided by values beyond economic or environmental benefits (Frankel-Goldwater, 2022). Policymakers rarely consider social, cultural, and non-material factors while making policy related decisions.

Data from the interviews were separated into relational values, economic and environmental factors for analysis. Relational values mentioned included social responsibility, generational eco-stewardship, and care for nature. 93.6% or 29 interviewees stated that they had a social responsibility to people and the earth to feed their community and support humanity’s well-being (Frankel-Goldwater, 2022, p. 85). While 64.5% talked about keeping the farm healthy for their children as well as respecting past generations and leaving the planet a better place (Frankel-Goldwater, 2022, p. 85). Profitability or the ability to earn enough money to pay for the farm and a secure lifestyle was mentioned by 71% of interviewed participants and are also important economic factors in decisions farmers make (Frankel-Goldwater, 2022, p. 88). The top environmental factors for farmers and ranchers were soil and/or land care (93.6%) and ecosystem well-being (83.9%) (Frankel-Goldwater, 2022, p. 91).

Once the analysis of the interviews was complete, it was apparent that there were additional factors that contributed to the decision to adopt regenerative agriculture by farmers and ranchers that combined, expanded upon, or did not fit into the other categories. These factors were attributed to interviewee’s worldview and morality. A few common themes that overlapped all the factor categories were detected.

The top additional factor for practicing regenerative agriculture discussed by 90.3% of the interviewees was found to be improving health of people, soil, and ecosystems through farming and related social configurations (Frankel-Goldwater, 2022, pp. 94-95). Health and/or healing was also identified by 67.7% or 21 interviewees as the primary driver for adopting regenerative agriculture on their farms and ranches (Frankel-Goldwater, 2022, p. 99).

Table 1: This is a culmination of all the tables within this section of the dissertation showing only the top results for Relational values, Economic factors, Environmental factors, and Additional factors (Frankel-Goldwater, 2022).

<table>
<thead>
<tr>
<th>Relational values</th>
<th>93.6% Social responsibility</th>
<th>71% Good life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>64.5% Generational eco-stewardship</td>
<td>58% Care for nature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic factors</th>
<th>71% Profitability</th>
<th>67.7% Livelihoods</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Environmental factors</th>
<th>93.6% Soil and/or land care</th>
<th>83.9% Ecosystem well-being</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Additional factors</th>
<th>90.3% “Health” and/or healing</th>
<th>83.9% Desire to improve conditions</th>
</tr>
</thead>
</table>

By evaluating relational values as they relate to economic and environmental well-being, researchers were able to identify the drivers for adoption of regenerative agriculture. These would have been difficult to identify by normal research inquiry. It must be noted that for scholarly researchers, relational values are difficult to discuss and use as a basis for decision-making. Observations during research for this study determined that relational values could bring insights to policy relevant topics that data on the
economic and environmental inquiry alone would not likely reveal.

**Paper 2 - Takeaways**

Policymakers can provide more effective decisions regarding policy by incorporating these “five ecosystem services leverage points:

- Visions of a good life
- Latent values of responsibility
- Justice and inclusion in the conversation
- Responsible technology, innovation, and investment
- Education and knowledge generation” (Chan, 2020 as cited in Frankel-Goldwater, 2022)

Though economic and environmental factors are crucial in shifts to sustainability agriculture, “policy must not neglect to acknowledge that the transition to sustainable agriculture will also be a cultural and social one” (Forbes, 2022 as cited in Frankel-Goldwater, 2022, p. 118).

**Paper 3 - Expanding the Global Narratives of Environmental Education: A Critical Discourse Analysis of the Literature**

**Highlights Next Steps**

*Author: Lee Frankel-Goldwater*

Locally practiced Environmental education (EE) is in constant dialogue with the globally shaped EE narratives. Both are continuously changing and influence each other across environments. These exchanges with the application of critical aware practices should influence policies and decision-making to improve marginalized perspectives.

Through the analyzing the titles and abstracts of 683 articles published in ten major EE journals between January 2005 and August 2022 using qualitative coding and analytical memoing, a range of practices, contexts, forms of knowledge production and motivations were identified across the articles (Frankel-Goldwater, 2022, p. 122). A gap in the literature was discovered due to EE in non-formal settings including livelihoods and disaster preparedness were seldomly represented. To improve representation of diverse perspectives that influence global EE narratives, scholarship on non-formal critically aware EE should be expanded.

The trends for education on sustainability are as follows:

- “ESD seen as hegemonic and not living up to its ideals
- Trying to guide sustainability education to be more aware of non-dominant perspectives
- A sense that sustainability education is a viable framework for achieving social change” (Frankel-Goldwater, 2022, p. 145)

**Paper 3 - Takeaways**

There are several valuable insights that could help policymakers as they make decisions including:

- Consider EE research focused on non-formal settings
- Both international and national organizations create policy and implement educational programs
- Improve awareness of lessons from critically aware EE research especially non-dominant forms of knowledge production (e.g., Indigenous ways of knowing)
- Expand understanding of the range of context EE takes place in are essential to the next steps
- Integrate social mandates of sustainability to live up to global environmental policies and goals (Frankel-Goldwater, 2022, pp. 171-172)

Environmental education (EE) applied on the local level and global narratives are constantly influencing each other. Without applying critical awareness while making policy decisions, EE perspectives and practices that are not aligned with global narratives can be disregarded.
Final Key Takeaways
From these three papers the following determinations regarding how the use of the science-policy-practice interface can improve policy making were made.

- **A combination of organizational culture, program structure, and opportunities to participate in decision making** can lead to improvements in dignity and program access.
- Relational values that are not usually considered while making policy ended up being primary factors for the adoption of regenerative agriculture.
- More critically aware research should focus on EE in non-formal settings applied at the local level to support inclusion of education and policy created on the global level.


Summary 8
A Comprehensive Evaluation of Food Security in China and Its Obstacle Factors


**Abstract**
“China’s food security has attracted global attention as the various drivers of its instability and uncertainty have intensified. This study developed a new framework for food security evaluation in China by analyzing its availability, distribution, utilization, vulnerability, sustainability, and regulation. The entropy weight method (EWM) and the matter-element extension model (MEEM) were combined to examine China’s food security status between 2001 and 2020. Additionally, an obstacle degree model (ODM) was used to investigate the key factors functioning as obstacles to food security. The results show that China’s overall food security improved greatly but experienced a slight downward trend in 2003. The main obstacles initially entailed grain distribution but then spread to vulnerability- and sustainability-related issues. Ultimately, the key factors restricting China’s food security were the amount of fertilizer application per unit sown area (AFA) and the grain self-sufficiency rate (GSR). The next 40 years could be the most critical period for ensuring China’s food security, which incorporates demographic, climate change, and resource shortage factors. China appears to be implementing its national strategies through sustainable farmland use and agricultural technology innovation to facilitate the high-quality development of its grain industries and strengthen its food security. This study provides
an overall picture of China’s food security and can serve as a reference for those concerned with China’s future national security.”

Background
Measures of national security and prosperity necessarily include food insecurity, which this article defines as the ability for all individuals to access sufficient amounts of safe, nutritious food to maintain a healthy lifestyle. China houses one-fifth of the world’s population, making it especially important for the country to include sustainable methods in their food security policies. Food security for China also includes adequate land and environmental conditions, agricultural success, and addressing poverty.

The goal of this paper is to evaluate China’s food security status (especially with historical trends), examine the obstacles China is presently facing and must face, and suggest policies to address said obstacles.

Methods
Food security is a difficult condition to measure with a single index, in the same way economists index economic conditions like consumer price index (CPI). Historically, scholars have tried to use one evaluation index, such as evaluating a country’s food security based on a proportion of malnourished individuals. An evaluation index ranks the performance of certain similar objectives or ideas for easy quantitative comparison. However, these indices have historically failed to fully capture the scope and specificity of food security.

This study’s evaluation index system includes 22 factors of food security, organized into 6 sections: availability, distribution, utilization, vulnerability, sustainability, and regulation. This study uses this evaluation index system in the context of China’s grain outputs—cereals, beans, tubers, etc.

Takeaways
China’s Food Security: Historical Trends
Over time, China’s food security and production have exhibited a generally upward trajectory with some fluctuations. In 2003, for instance, designated areas for grain production dipped down to a record low of 100 million hectares. This circumstance, the researchers muse, likely stemmed from high international food prices. Following 2003, China’s food security and production increased substantially, leading to a stable grain market and reserves (pg. 6).

China’s Obstacles
Despite progress, China faces challenges. In 2020, the obstacle of grain availability rose to 24.6% from the previous two-decade average of 15%.

China’s infrastructure and grain transportation has improved over the years, reducing food distribution obstacles from 28.9% in 2001 to 9.4% in 2020 (pg. 9). This decrease is likely because of China’s robust recent investment in railway and highway. According to the National Bureau of Statistics of China, the mainland had 5.2 million kilometers of highway built by 2020, with the capacity to freight approximately 75 million tons of grain.
Extreme environmental disasters such as drought have also impacted China’s food security. Most notably, climate change has led to shortage in food supply and uneven distribution of water across the mainland.

Finally, and most importantly according to the researchers, the long and damaging use of harmful fertilizers on the soil has led to poor soil conditions. In 2019, for instance, farmers’ use of chemical fertilizers on agricultural land exceeded 55 million tons—more than triple the global average use of fertilizer.

Policy Recommendations
Two key recommendations are proposed to enhance China’s food security. Firstly, developing policies aimed at decreasing dependency on imports, especially for crops like soybeans, wheat, and corn, would stabilize food security and bolster domestic production. China is largely self-sufficient in its grain production comprehensively, but with more specific crops like soybean the country relies heavily on imports. For instance, in 2020 China imported 73% of its soybean from neighboring countries (Vietnam, Pakistan, Thailand, and Cambodia). Other crops such as wheat and corn are also dependent on foreign powers to supply.

Secondly, addressing the excessive use of fertilizers and pollutants through soil testing, promoting natural fertilizers, and popularizing healthy soil practices are vital steps to improve soil quality and ensure long-term agricultural sustainability. These recommendations are vital for securing China’s food future and fostering sustainable agricultural practices.


Summary 9
Predicting the Potential Impact of Emergency on Global Grain Security: A Case of the Russia-Ukraine Conflict


Abstract
“Global emergencies have a profound impact on exacerbating food insecurity, and the protracted Russia-Ukraine conflict has emerged as a significant driver of a global food crisis. Accurately quantifying the impact of this conflict is crucial for achieving sustainable development goals. The multi-indicator comprehensive evaluation approach was used to construct a grain security composite index (GSCI). Moreover, econometric model was used to predict the potential impacts of the conflict on global grain security in 2030 under two scenarios: with and without the Russia-
Ukraine conflict.’ The results conclude that global food prices reached unprecedented levels as a consequence of the conflict, leading to notable fluctuations in food prices, especially with a significant surge in wheat prices. The conflict had a negative impact on global grain security, resulting in a decline in grain security from 0.538 to 0.419. Predictions indicate that the influence of the conflict on global grain security will be substantially greater compared to the scenario without the conflict in 2023–2030, ranging from 0.033 to 0.13. Furthermore, grain security will first decrease and then increase under the sustained consequences of the conflict. The achievement of the 2030 sustainable development goals will encounter significant challenges in light of these circumstances.”

Background
The article explores the profound impact of national and international emergencies on food security and the United Nations’ sustainable development goals (SDGs). The article particularly focuses on crises like the 2008 economic downturn, the 2011 Syrian civil war, the 2019 COVID-19 pandemic, and the 2022 Russia-Ukraine conflict and their impact on SDGs. These crises have led to issues such as diminished crop production, labor shortages, surging food prices, inadequate food supply, limited accessibility, and trade disruptions.

Given the significance of Russia and Ukraine in global food production and export, this study specifically delves into the aftermath of the recent Russia-Ukraine conflict. Both countries are major suppliers of wheat, corn, and barley, making up substantial portions of the global supply. Russia, the fourth-largest wheat supplier (10.2% of global supply), and Ukraine (2.09%) play significant roles. Ukraine produces 1.8% of corn worldwide, and Russia produces 1.34%. Russia ranks second in global barley production (13.25%), while Ukraine contributes 4%.

Russia and Ukraine are important players in the global food supply, so a conflict involving both parties should be carefully evaluated so we can understand the impact on future supply.

Several measures, including the Global Hunger Index, try to quantify and measure something as complicated as food security. However, a multidimensional approach is most appropriate, rather than relying on one indicator. This study divides the term food security into four dimensions or characteristics: availability, access, stability, and utilization. Like other studies, these researchers define food security as a state where all individuals have sufficient “physical, social, and economic” access to safe and nutritious foods that can sustain a healthy, active lifestyle. Food security as a research topic encompasses everything, from the macro level of national and international supply to the calories in individual crops.

Methods
Researchers conducted a comprehensive evaluation of global food security, focusing on grain security indicators of 86 countries from 2001 to 2022, including Russia and Ukraine. Using a grain security evaluation indicator system, they built a Grain Security Composite Index (GSCI). The study compared food security scenarios with and without the Russia-Ukraine conflict, utilizing predictive modeling to forecast a world without the conflict. This approach provided insights into the impact of the conflict on food security trends.
Takeaways
With the Russia-Ukraine Conflict:

• Record High Food Prices: Food prices, particularly for cereals, wheat, and corn, soared significantly, with wheat experiencing the most substantial increase. The conflict, compounded by damages to Ukraine’s infrastructure and blockades, and Western sanctions on Russia, exacerbated these price hikes.

• Market Uncertainty: The conflict led to market fluctuations, causing sharp increases and decreases in food prices.

• Dietary Shifts: Individuals globally shifted from nutrient-rich foods to processed foods due to resource constraints and higher costs.

Without the Russia-Ukraine Conflict:

• Slight Growth in Grain Security: The model predicted a modest increase in grain security without the conflict, contrasting with a downward trend in the presence of the conflict.

• Impact on SDGs: Both scenarios exhibited a decline and subsequent increase in achieving SDGs. However, the decline was more significant in the presence of the conflict, hindering international efforts to attain the 2030 SDGs, particularly in the realm of food security.

In conclusion, the Russia-Ukraine conflict significantly jeopardizes global grain security, leading to substantial price hikes, market uncertainty, and dietary shifts. These factors, coupled with hindrances in achieving the 2030 SDGs, emphasize the urgent need for countermeasures by governments and international organizations to secure future global grain supply and promote food security.


Summary 10
Ensuring Food Security, Converting Urban Industrial Buildings for Indoor Agriculture: The Call for Urban Indoor Agriculture


Abstract
"Outdated food production models result in the continued disconnect between communities and vital nutrition. Poverty and a lack of food awareness perpetuate the effects of food insecurity within communities. These effects are most evident in urban areas where fresh produce is out of reach for large swaths of the population. Connecting communities back to the food they eat will benefit cities and residents economically, socially, and environmentally. Farming with the community in the community will empower a broad urban population. Urban areas pose several challenges to food production, such as a lack of open space and a high volume of..."
environmental contaminants. Indoor agriculture serves as a promising solution. Communities facing high poverty levels commonly exist near the city's industrial areas. Repurposing Industrial buildings to serve as indoor farming facilities promises to benefit the communities most affected by food insecurity. There is a lack of information on the qualifying characteristics of a building to serve as an indoor agricultural facility and the complex conversion process. Creating a resource to aid new farm owners in selecting and converting existing buildings is vital to the widespread adoption of this technology. This model is applied to existing industrial buildings using Rochester, New York, a typical Northern Industrial City, as proof of concept.” (Whittaker, 2023).

**Background**

The connection between people and their food is vital to being healthy. Quality nutritious food is unavailable to a huge percentage of the population due to the physical distance between the location where people live and the area where food is produced. High population communities that have limited access to healthy and affordable food are defined as food deserts according to the U.S. Department of Agriculture. A large percentage of these communities are lower-income households with inadequate public transportation and limited access to affordable healthy groceries. Bringing the farm back to these communities to provide more affordable nutrition is one way to empower them.

Current forecasts show that by 2050, over 60% of the global population will live in cities (Kathrin, Specht, et al., 2015 as cited by Whittaker, 2023, p. 8). The drawbacks to traditional farming practices include large land area consumption, reduced biodiversity, overdrawn soil nutrients, increased pest vulnerability, and weather dependence. For example, in 2008 a storm surge flooded and destroyed 1.3 million acres of cropland which devastated annual corn yields (Nordahl, 2009 as cited by Whittaker, 2023, p. 9). A problem with today’s farming practices is that crops are harvested well before peak ripeness to allow for transportation from farm to cities which results in a shorter shelf life and accidental spoilage.

**Indoor Agriculture**

Returning farms to the areas where people live can minimize or eliminate long transportations, decrease supply volatility, increase community resilience and self-sufficiency, and provide community opportunities through education and employment.

Indoor agriculture use:
- Vertical spaces which reduce the need for large acreage
- Closed systems where resources can be recycled multiple times
- Unsuitable plants for compost or are burned for energy (Whittaker, 2023)
Suitable indoor crops:
- Leafy greens
- Cucurbitaceae (i.e., cucumbers, melons, squash, and gourds)
- Peppers
- Tomatoes,
- Fruits
- Micro-greens
- Herbs
- Miscellaneous

Challenges of Indoor Agriculture
- Higher initial capital requirements, up to 100 times higher than traditional farms
- Production costs are higher (e.g., electricity, water, labor, packaging materials, fertilizers, seeds, lighting replacement, etc.)

Benefits of Indoor Agriculture
- Smaller agricultural footprints
- Higher yields
- Reduced supply chains
- Shorten length of time from farm to consumer
- Reduced food waste due to spoilage
- Connects people to healthy and affordable nutrition

Takeaways
Building Candidate Matrix
The purpose of this research is to create a tool to help individuals interested in converting an existing industrial building into an indoor farm facility. The building candidate matrix has been designed to be compact, simple, and intuitive. The matrix can compare 13 potential properties and evaluates 14 characteristics. Six characteristics of the matrix (Figure 1) pertain to the building location, which factors in the broader context of a site and quantify the farming project needs as well as maximize social impact. The other eight facets (Figure 2) analyzed relate to the site and building (Whittaker, 2023). They were chosen to analyze a building’s suitability for indoor farming. The matrix inputs requirements are fact or figures and qualitative rankings. There are embedded formulas, process, rank, and grade data included in the digital tool that will help identify the building most suitable for indoor farming.

Indoor farms are an essential part of the answer to reducing global food insecurity.
Every farming method has its strengths and drawbacks. The solution to global food insecurity requires diverse food production methods including indoor farms, community farms, background farms, greenhouses, and traditional farms.

Summary 11

Artificial Intelligence Powered Personalized Agriculture


Abstract

“The integration of Artificial Intelligence (AI) in agriculture has shown the potential to improve crop selection and enhance sustainability practices. In this study, we aim to investigate the benefits and feasibility of using AI-powered personalized recommendations for crop selection and sustainability practices in the context of agroecology. We propose to lay the foundation for an agricultural recommendation engine that considers several parameters that influence yield and presents the best crop(s) to sow based on the model’s output. We aim to examine this recommendation engine’s impact on agriculture’s sustainability and to evaluate its effectiveness and accuracy. Our ultimate goal is to provide a comprehensive understanding of the potential benefits and challenges of using AI-powered recommendations in agriculture and to lay the foundation for the development of a practical, effective, and user-friendly recommendation engine that can help farmers make informed decisions about their crops and improve the long-term sustainability of agriculture.” (Tetala, 2023, p. ii).

Background

Artificial Intelligence (AI) has huge potential to transform agriculture, especially for small farm holders in developing countries through improved crop yield and reduced waste. The purpose of this research is to explore the connection between technology and agriculture.

The results will help begin to develop a scalable user-friendly system that can provide recommendations to farmers based on provided data.

The use of AI and machine learning to analyze large amounts of data and make accurate predictions to provide farmers with tailored recommendations and solutions is referred to as AI-powered personalized agriculture. Analysis of information related to weather patterns, soil quality, and crop growth as well as other variables is required to give farmers personalized suggestions about cultivation techniques, seed variety selection, soil type, and crop rotation. A dynamic algorithm will be built using this data to consider different scenarios and determine the yield performance, sustainability, and profitability of various crops. Machine learning techniques analyze this data, the unique conditions and constraints provided for individual farms including any specific needs and goals to provide accurate and relevant recommendations. The user interface should give farmers the option to input their own data about their farm or rely on information gathered about their location to receive generalized recommendations. The Figure 1 diagram shows the information required by the AI-power system during the agricultural cycle.

A personalized agriculture application can benefit farms through improved productivity, cost savings, better decision-making, access to

![Figure 1: This diagram is a visual representation of the type of information required from farmers within the agricultural cycle so the AI-powered personalized agriculture system can provide the most accurate recommendations (Tetala, 2023, p. 14).]
markets, customized recommendations, enhanced sustainability, improved record-keeping, access to expertise, and increased efficiency. The ability to analyze large amounts of data and generate recommendations that may not have been considered by a human advisor.

However, this system is not meant to replace the expertise of a human. It is crucial to have the generated recommendations to complement an agricultural expert’s knowledge and experience. If needed, experts should validate and adjust recommendations as required by a farmer’s local conditions.

![Diagram](image)

**Figure 2:** This is a high-level Farmer’s activity diagram with AI components of the proposed AI-powered personalized agriculture application (Tetala, 2023, p. 89).

**Method**

**Implementation Case Study: Krishi Mitr**

Based on the proposed AI-powered personalized agriculture system, the Krishi Mitr mobile application was developed to provide crop recommendations to farmers in India. By requiring minimal user-data entry, the application was made accessible to semi-literate and literate farmers. This data was supplemented with data from Krishi Mitr’s cloud databases which contained data from the Local Government Directory, Soil Health Card, TerraClimate data, Open Weather API, Agriculture Contingency Plans, ICAR-Soil Test Crop Response Studies, List of Fertilizers, Integrated Fertilizer Management System, Cost of Cultivation/Production & Related Data, Package of Practices, API for Current Daily Price of Various Commodities from Various Markets, and Variety-Wise Prices of Various Agricultural Commodities (Tetala, 2023, p. 138).

The algorithm used in the application prioritized sustainable cultivation through crop recommendations that require minimal chemical fertilizers. The foundational Krishi Mitr application proved to have a positive impact in addressing some of the challenges faced by farmers in India (Tetala, 2023).

**Takeaways**

- **The proposed agriculture recommendation application can effectively guide small farmers in making informed decisions** about cultivation techniques, seed varieties, soil types, crop seasons, and crop rotation.
- **Key factors in small farmers’ crop cultivation decision-making such as local weather conditions, resource availability, market demand, and individual preference were identified and integrated into the application.**
- **Useful data sources included weather data, soil quality data, market data, and data on previous crop yields.**
- **The proposed application design can meet the unique needs and resources of small farmers in different regions and contexts.**
- **Increased crop yields, improved soil health, and reduced resource waste are some of the benefits from using the application to guide decisions.**
• The application can be integrated with existing agricultural extension programs as well as other small farmer support services.

• **In-person training sessions**, user manuals, and online tutorials proved to be effective application user training methods.

• By providing recommendations that **prioritize soil health, biodiversity, and ecological sustainability**, the application promotes sustainable and regenerative agricultural practices (Tetala, 2023, pp. 136–137).

Research and Thought Papers
Overview of Global Food Insecurity and Solutions

By Lakell Archer & Angie Holzer, EdD, WikiCharities

Did you know? According to the World Health Organization (2023), there are currently 735 million people facing hunger. This number has risen by 122 million, which used to be 613 million in 2019.

735 million people face hunger - that’s an increase of 122 million since 2019 due to multiple crises
Introduction & Overview of Food Scarcity in the Global Space

The World Health Organization states that there are approximately 2.4 billion people who do not have constant access to food, that is 29.6 percent of the global population. Within this group, there are 900 million people who are facing severe food insecurity (World Health Organization, 2023). According to Our World in Data (Ritchie, Rosado & Roser, 2023), one in ten people do not have enough food to eat.

Approximately 30% of people in the world do not have constant access to food - WHO, 2023.

1 in 10 do not have enough food to eat - Our World in Data, 2023.

What is food insecurity? Food insecurity is simply based on not having enough food. This can involve the quantity of food or having inadequate quality and diversity of food (Ritchie, Rosado & Roser, 2023). There are several factors causing food insecurity, which can range from food not being available in the community to someone not being able to afford buying the food that is available. (See 6 Contributing Factors to Food Insecurity below). Food insecurity could also mean having an “unequal distribution of food between household members” (Ritchie, Rosado & Roser, 2023). More about the specific factors will be discussed later in this article.

What is a food crisis? “A food crisis occurs when levels of acute food insecurity and malnutrition rise sharply at local or national levels, raising the need for emergency food assistance” (Global Network Against Food Crises, 2023). It is more likely to see food crises among populations that are already suffering from malnutrition and food insecurity, and also where the contributing factors are present that raises the vulnerability, according to the Global Report on Food Crises (2023).

“By working together with governments and NGOs, they have already made inroads on adaptation policy, innovation and finance”- Global Food Security Index, 2022.

What is needed? What is needed to improve food security is to help food systems become more resilient during turbulent times (Global Food Security Index, 2022), that can bounce back through shocks and disruptions. “Climate change is a threat multiplier,” and “access to water is at risk as nations endure warmer temperatures” (Global Food Security Index, 2022). Irrigation infrastructures need improvements. These infrastructures have remained largely unchanged for the past 11 years, says the Impact.Economist.com, which creates the Global Food Security Index (2022). The soil quality also needs to be addressed to improve organic content that is often low quality. Investments must be made to increase levels of organic carbon in the soil to “stabilize soil structures, reduce erosion, improve soil fertility, and enhance the ability of soil to hold water” (Global Food Security Index, 2022).

“Solutions involve -
1) managing natural resources more effectively,
2) ensuring access to water and
3) high-quality soil, and
4) scaling quickly to meet the needs of farmers and the food system.”

“Ultimately, all stakeholders need to work together to build a robust and resilient food system that can withstand wider stresses and shocks amid a demand for more food on limited land amid a warming climate.” Global Food Security Index, 2022

Nonprofits and solutions: It’s important to include local nonprofit organizations in finding solution to improve food insecurity in a community. “A key part of (improving food insecurity systems) comes from stakeholders such as governments, multilateral and NGOs. They can
use humanitarian, trade, economic and social protection tools to offset the impact of short-term shocks.” “By working together with governments and NGOs, they have already made inroads on adaptation policy, innovation and finance” (Global Food Security Index, 2022).

**Solutions need to include nonprofit organizations to make a larger impact.**

What countries are ranked top and bottom for the overall food security environment in 2022? Six of the bottom ten scoring nations in 2022 come from Sub-Saharan Africa (see Table 1), while Sub-Saharan Africa being the lowest overall by region (see Table 2).

How is food insecurity measured? The Food and Agriculture Organization (FAO) of the United Nations measures food insecurity with eight questions. These eight questions start by asking whether the person worries about not having enough food and moves to more severe questions (Ritchie, Rosado & Roser, 2023).

### Overall food security environment: the top- and bottom-ranking countries in 2022

<table>
<thead>
<tr>
<th>Best performers</th>
<th>2022 score</th>
<th>Weakest performers</th>
<th>2022 score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>83.7</td>
<td>Syria</td>
<td>36.3</td>
</tr>
<tr>
<td>Ireland</td>
<td>81.7</td>
<td>Haiti</td>
<td>38.5</td>
</tr>
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<td>Norway</td>
<td>80.5</td>
<td>Yemen</td>
<td>40.1</td>
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<td>France</td>
<td>80.2</td>
<td>Sierra Leone</td>
<td>40.5</td>
</tr>
<tr>
<td>Netherlands</td>
<td>80.1</td>
<td>Madagascar</td>
<td>40.6</td>
</tr>
<tr>
<td>Japan</td>
<td>79.5</td>
<td>Burundi</td>
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<td>Canada</td>
<td>79.1</td>
<td>Nigeria</td>
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<td>Venezuela</td>
<td>42.6</td>
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<tr>
<td>United Kingdom</td>
<td>78.8</td>
<td>Sudan</td>
<td>42.8</td>
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<td>Portugal</td>
<td>78.7</td>
<td>Congo (Dem. Rep.)</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 1. Source: Impact.Economist.com, (Global Food Security Index, 2022)

### Overall GFSI 2022 scores, by region

In 2022, besides Sub-Saharan Africa, all regions performed above the global average, with North America leading the index.

Table 2. Global Food Security Index, 2022.
8 Questions to Measure Food Insecurity

1. During the last 12 months, was there a time when you (or any other adult in the household) were worried you would not have enough food to eat because of lack of money or other resources?

2. Still thinking about the last 12 months, was there a time when you (or any other adult in the household) were unable to eat healthy and nutritious food because of lack of money or other resources?

3. And was there a time when you (or any other adult in the household) ate only a few kinds of foods because of a lack of money or other resources?

4. Was there a time when you (or any other adult in the household) had to skip a meal because there was not enough money or other resources to get food?

5. Still thinking about the last 12 months, was there a time when you (or any other adult in the household) ate less than you thought you should because of lack of money or other resources?

6. And was there a time when your household ran out of food because of lack of money or other resources?

7. Was there a time when you (or any other adult in the household) were hungry but did not eat because there was not enough money or other resources for food?

8. Finally, was there a time when you (or any other adult in the household) went without eating for a whole day because of a lack of money or other resources? (Ritchie, Rosado & Roser, 2023)

Contributing Factors to Food Scarcity

Food insecurity arises from a multitude of factors such as economic instability, conflict, climate change, extreme weather events, and population displacement (FSIN and Global Network Against Food Crises [GRFC], 2023). The 2023 GRFC showed:

- 258 million people in 58 different countries/territories suffered from food crises and/or acute food insecurity in 2022.
- In 2022, food insecurity saw its fourth consecutive year of escalation. In 2021, the numbers were substantially lower with 193 million food insecure people in 53 countries.

- Economic instability was the primary factor in food insecurity for 27 out of 58 countries/territories.
- Conflict and insecurity ranked as the second significant driver of food insecurity, impacting 19 out of 58 countries.
- Extreme weather events were the main cause of food insecurity in 12 of the 58 GRFC countries/territories. Examples of extreme weather events include droughts, floods, tropical storms, and cyclones.
- Many countries/territories had limited capacity to address food insecurity due to the lingering financial vulnerabilities present after the COVID-19 pandemic.
- The 2022 Ukraine war exacerbated economic instability and food insecurity leading to:
  - Currency depreciation, higher food prices, and inflation, further exacerbating global food insecurity.
  - Increase in food prices prompting global restrictions on food and fertilizer exports.
  - Restricted access to Ukrainian sea ports which led to a reduced global supply of essential food items like wheat, maize, and sunflower oil. These restrictions increased transit times and freight costs, worsening food insecurity.

This section delves into specific contributing factors, providing detailed insights, and emphasizes the distinct impacts on each region.

“Recovery from the global pandemic has been uneven, and the war in Ukraine has affected the nutritious food and healthy diets. This is the ‘new normal’ where climate change, conflict, and economic instability are pushing those on the margins even further from safety.”

- Director-General, QU Dongyu, World Health Report, 2023
6 Contributing Factors to Food Insecurity

1. Climate Change. "Climate change is a long-term change in the average weather patterns that have come to define Earth’s local, regional and global climates. These changes have a broad range of observed effects that are synonymous with the term" (NASA, 2023). Climate change is associated with alterations in weather patterns, including decreased rainfall leading to drought and, conversely, increased precipitation. According to the Environmental Protection Agency (EPA) (2023), numerous observed climate changes can be attributed to elevated levels of greenhouse gases (GHG) in our atmosphere, a consequence of human activities. As these GHGs accumulate, they contribute to a warming of the climate, resulting in increased evaporation. This process can lead to drought in certain regions, erratic rainfall patterns, and, subsequently, floods during intense storms.

2. Extreme Weather. Extreme weather includes earthquakes, drought, floods, cyclones, hurricanes, and erratic rainfall brought on by climate change. The following sections highlight regions at geographical risk from this phenomenon and discuss the impact climate change and extreme weather patterns has on food security.

- Earthquakes:

  Turkey-Syria (February 6, 2023) Two consecutive earthquakes (7.9 and 7.7 magnitudes, respectively) destroyed 140,000 square miles of land, leaving 1.5 million people homeless (Wikipedia, 2023b). The death toll was 59,259 people while 12.1 million people were already suffering from hunger and the earthquakes intensified food insecurity due to substantially damaged infrastructure. The Syrian republic had already endured over a decade of economic instability due to conflicts prior to the earthquakes (World Food Programme [WFP], 2023b). Internal displacement of 6.7 million people hindered access to food and income.

  Haiti (2021): Haiti experienced a 7.2 magnitude earthquake in 2021 killing 2,248 people and leaving 650,000 people in need of humanitarian assistance. Pre-existing political and economic disruptions related to other natural disasters in the area (hurricanes, floods, and droughts) led to food insecurity for 4.3 million Haitians. Humanitarian groups provided $8 million in emergency food assistance after the earthquake (USAID, 2022).

- Drought:

  Madagascar (September, 2022): Madagascar experienced a three month surge in food insecurity, increasing by one million people over that span of time. 8.8 million people were food insecure prior to the surge. The surge was attributed to severe droughts affecting crop and livestock production. The region’s vulnerability to recurrent natural disasters, such as cyclones and floods, exacerbates the issue of food insecurity in this region (Fayad, 2023).

3. Conflicts & Wars

4. Economic Instability

5. Urbanization & Land Degradation

6. Displacement from Homes
Yemen (2022): Yemeni citizens are highly dependent on agriculture for food and income. Moderate to severe droughts in the early 2022 had a widespread negative impact on food security. Yemen’s agriculture sector supplies only 15-20% of its staple food needs despite being the backbone of Yemeni livelihoods (World Bank, 2023).

Somalia (2020-2023): Recently endured the longest drought period in the last 40 years (2020-2023 Horn of Africa drought, Wikipedia, 2023a). Six million Somalis are projected to experience severe hunger. Food insecurity is exacerbated by regional conflict (WFP, 2023a).

- Floods:

Yemen (2022): The 2022 drought was unfortunately followed by extreme rainfall that triggered floods in the latter half of the year, leaving 17 million people (or about 60% of the population) facing a crisis level of food insecurity (World Bank, 2023).

Pakistan (2022a): Flooding from June through October in 2022 resulted in the deaths of 1,739 people. The floods caused $14.9 billion of damage resulting in $15.2 billion of economic losses. Over 2.1 million people were left homeless (Center for Disaster Philanthropy, 2023). “9.4 million acres of crops were destroyed, and more than 1.1 million farm animals perished” (Prevention Web, 2023).

- Hurricanes:

Guatemala, El Salvador and Honduras (2020): In 2020, Hurricanes Eta and Iota hit these three countries within a two-week span. “The storms triggered massive landslides and flooding that wrought destruction and affected more than 2.4 million people in Guatemala” (Prevention Web, 2023b). Food security was negatively impacted through 130,000 hectares of damaged agricultural land. 1.8 million Guatemalans were already food insecure prior to the hurricanes. Homes, livestock, water systems, and infrastructure received approximately $777 million in losses and damages. 3.3 million Guatemalans (20% of the country’s population) experienced crisis levels of food insecurity. That number increased by 600,000 people as of May 2022.

- Erratic rainfall:

Malawi (March, 2023): There are 3.8 million (20%) of Malawi’s population who experience crisis levels of food insecurity due to low yields of crop productions. Ninety percent of Malawi’s agricultural land relies on consistent rainfall to produce and harvest crops. Agriculture is the primary source of export earnings in Malawi with nearly 25% of the country’s total domestic crop production derived from it (Le Roux, & Yeboua, 2023).

Burundi (October, 2023): Burundi is considered one of the world’s most vulnerable countries to the impacts of climate change and extreme weather due to a combination of factors, such as its geographic location, as well as political and social considerations (Interactive Country Fiches, 2023). In October 2023 Burundi began to see intense rainfall resulting in strong winds and flooding. Agriculture is the primary source of livelihood in Burundi and the erratic and extreme swings in the weather resulted in floods that destroyed crops, soil, and infrastructure. A report posted on reliefweb.com on September 27, 2023 showed that 1.2 million people have faced severe food insecurity due to crop production shortfalls linked to the erratic rainfall and destruction of agriculture in Burundi.
• **Cyclones:**

**Mozambique (Feb & March, 2023):** Mozambique experienced two encounters with Tropical Cyclone Freddy, causing tremendous flooding and damage to infrastructure and agriculture (OCHA Service, 2023b). Afterwards, the number of people experiencing severe acute food insecurity surged from 400,000 to 3.15 million as of May 2023. Additionally, 227,336 acres of crops were destroyed, exacerbating the challenges faced by Mozambique in ensuring food security. Madagascar and Malawi were also highly affected by Cyclone Freddy.

3. **Conflicts and Wars:** Conflicts and war can cause food insecurity through disruption of economic activities, destruction of agriculture, and displacement of large amounts of people, further restricting food supplies and livelihoods (National Geographic, 2023).

• **Russia-Ukraine War (2022-present):** Russia’s invasion of Ukraine shocked global agricultural markets, affecting the most vulnerable populations the hardest (Center for Strategic & International Studies, 2023). Closure of imports and exports through the Black Sea shocked the global food system. There are 349 million people across 79 countries facing acute food insecurity (Center for Strategic & International Studies, 2023).

• **Nigeria:** An estimated 17 million Nigerians were critically food insecure in 2022 (OCHA Services, 2023a). The primary driver of food insecurity in Nigeria is conflict and security threats. Herder-farmer conflicts over access to agricultural resources such as land and water spark violent and destructive clashes that disrupt economic activities and deteriorate livelihoods (Olanrewaju, 2023). The Boko-Haram insurgency caused over 30,000 deaths in 2016 and was the main cause of internally displaced persons within Nigeria. The ongoing insurgency inhibits farmers from accessing their land to perform critical farm operations—further contributing to food insecurity in the area.

• **Haiti:** Conflict/insecurity was the main driver of acute food insecurity in Haiti (GRFC, 2023). “In 2022, gang violence reached extremely high levels especially in urban areas, disrupting markets and the movement of people and goods, thus severely hindering economic activity” (GRFC, 2023). Approximately 20,000 Haitians have been forced to flee their homes and barricades were built for protection that limits access to food, water, and fuel. From Sept 2022-February 2023, it was estimated that 19,200 Haitians were in catastrophic levels of food insecurity.

• **Palestine:** Already trying to recover from the 2022 flooding, the Israel-Hamas attacks on October 7, 2023 further complicated food security in this region.
The ongoing hostilities restrict agricultural activities and access to farming resources (GRFC, 2023). Conflicts led to a reduction in national food production and increase in food imports. “Acute food insecurity is likely to further deteriorate over the coming months, if the economic and political crisis further worsens, compounding the effects of the 2022 flooding” (WFP and FAO, 2023). As of August 2023, there were 1.84 million people suffering from food insecurity of which 1.1 million were severely food insecure; Ninety percent of these people lived in Gaza (World Food Programme, 2023d). After the Israel-Hamas conflict in October 2023, the food security situation has dramatically worsened.

- **Bangladesh and Myanmar:**
  “Conflict/insecurity was the primary driver of acute food insecurity in Bangladesh and Myanmar, where a total of 16.5 million people in both countries faced high levels of acute food insecurity. Worsening and widespread insecurity, mass displacement and movement restrictions on people throughout 2022 affected their ability to make a living or produce or access food” (GRFC, 2023).

- **Jordan, Libya and Algeria:**
  Approximately 20 million people in these three countries are living with moderate to severe food insecurity due to forcible displacement of populations (GRFC, 2023).

- **Yemen:**
  “Nine years of conflict in Yemen have led to the collapse of economic activities, erosion of livelihood opportunities and incomes, and extremely high levels of forced displacement, depriving people of the resources to cope with or to withstand additional shocks… violence continued to constrain humanitarian access in the most affected areas” (GRFC, 2023).

4. **Economic instability**

- **Venezuela:** “Years of hyperinflation, rampant corruption, economic mismanagement, and a lack of economic diversification have taken a heavy toll on Venezuela” (Reid, 2023). The Venezuelan national economy gradually collapsed starting in 2016 due to significant declines in oil prices, a natural resource the country relied heavily on for economic stability. The decline in oil prices coupled with inadequate government investments and political unrest left Venezuelans struggling with dire shortages of food, medicine, and other necessities. “As of August 2023, over 7.7 million Venezuelans have left the country since 2014” (World Vision, 2023).

- **Colombia, Dominican Republic, El Salvador, Guatemala, Honduras and Nicaragua:** “In Colombia, Dominican Republic, El Salvador, Guatemala, Honduras and Nicaragua, reduced income opportunities eroded households’ purchasing power amid increasing macroeconomic challenges, exacerbated by the ripple effects of the war in Ukraine. Low-income households that rely on the informal sector continued to be negatively impacted by the persisting economic impacts of the COVID-19 pandemic and severe weather hazards, mostly in Guatemala and Honduras” (GRFC, 2023).

- **Haiti:** “As of December 2022, annual food inflation was particularly high in Haiti, estimated at 47.7 percent, and in Colombia at 27.8 percent, while in the other four countries it ranged between 10 and 16 percent, limiting economic access to food” (GRFC, 2023).

- **Afghanistan and Sri Lanka:** “Economic shocks were the primary driver of food insecurity in Afghanistan – shifting from conflict for the first time in the history of the GRFC – and in Sri Lanka. In these countries, 26.18 million people faced high levels of acute food insecurity” (GRFC, 2023).

- **Economic shocks were considered the primary driver of food insecurity in Djibouti, South Sudan and Sudan, where a total of 19.59 million people faced high levels of acute food insecurity” (GRFC, 2023).
Ghana and Sierra Leone: “Steep currency depreciation and rampant inflation, notably in Ghana and Sierra Leone, had a negative impact on household purchasing power” (GRFC, 2023).

“Economic shocks are projected to be the main driver of acute food insecurity in most of these countries/territories as national economic resilience has been severely undermined by a slow recovery from the COVID-19 pandemic, further exacerbated by the war in Ukraine” (GRFC, 2023).

Extreme weather, economic instability, and conflicts/wars are all intertwined, often creating a vicious cycle of problems regarding food security. For example, conflicts can lead to economic slumps, which, in turn, affect food security. Similarly, extreme weather events can exacerbate existing economic vulnerabilities, leading to food insecurity. Addressing food security in the face of these challenges requires holistic approaches that consider the interconnected nature of conflicts, extreme weather, and economic shocks. It involves not only providing immediate relief but also addressing the root causes and building resilience within communities to withstand future shocks.

Extreme weather, economic instability, and conflicts/wars are all intertwined.

5. Urbanization & Land Degradation.

Urbanization, which is the concentration of human populations into discrete areas, transforms land for residential, commercial, industrial, and transportation purposes (United States EPA, 2023). Even small-scale urban development can significantly impact ecosystems.

“Urbanization contributes to the transformation of agrifood systems by reshaping spatial patterns of food demand and affecting consumer preferences, changing how, where and what food is produced, supplied and consumed. These changes are affecting agrifood systems in ways that are creating both challenges and opportunities to ensure everyone has access to affordable healthy diets” (Food and Agriculture Organization of the United Nations, 2023a).

Urbanization increases people’s income and spending power, prompting increased and diverse food consumption in cities. Although the rising demand for food in urban areas creates economic opportunities, such as jobs and higher incomes, the Food and Agriculture Organization of the United Nations (2023a) argues that the positive implications are not outweighed by the negative impacts of urbanization. Elevated demand for larger quantities of food strains agricultural resources, causing adverse environmental effects. It is important to note that increased food production does not guarantee equitable distribution between urban and rural populations. Food insecurity arises when certain high-demand food items become inaccessible to certain populations due to elevated costs or disruptions in the food supply chain.

“The process of urbanization, and the related increase in impervious surfaces, affects other types of land use and land cover, triggering a series of effects on the environment, which results in it being the main cause of land degradation” (Assennato et al., 2022).

Urbanization is closely linked to the issue of land degradation. The Global Environment Facility (GEF) (2023) defined land degradation as, “the deterioration or loss of the productive capacity of the soils for present and future use.”

Land degradation resulting from urbanization gives rise to the following issues (GEF, 2023):

- Loss of fertile soils
- Adverse impact on water balance
- Increase in surface water runoff (leading to flood risk)
• Loss of biodiversity contributing to climate change.

“Evidence suggests during the last 6-7 decades over 35 percent of arable land has been degraded due to human induced activities” (Gupta, 2019). Additionally, 20% of cultivated areas, 30% of forests, and 10% of grasslands are suffering from various degrees of land degradation which has **adversely affected the income of approximately 1.5 billion people** (Bai et al., 2008 as cited in Gupta, 2019).

The challenges associated with urbanization and land degradation intersect, amplifying the issue of food security. To illustrate, urbanization contributes to land degradation which exacerbates climate change, creating a cyclical relationship (Olsson et al., 2019). As previously mentioned, climate change results in extreme weather patterns, significantly affecting food security and frequently causing the displacement of people from their homes - a topic further discussed in the following paragraphs.

6. **Displacement from Homes.**

“The displacement of human populations refers to the relocation of large numbers of people from their homes” (Understanding Global Change, 2023). Displacement could stem from any of the following situations (Understanding Global Change, 2023):

• Environmental disasters
• Climate change affecting agricultural livelihoods
• Inequitable social and political systems (wars and conflicts) that fail to offer protection, access to food, clean water, and healthcare for citizens

While numerous other micro-level factors can contribute to displacement, our focus will be on the correlation between weather patterns, conflicts, economic instability and their impact on population displacement and food security.

Reynaud and Falkowitz (2023) suggested **a global pattern exists that connects conflicts, natural disasters, food insecurity, and displacement.** Their research highlighted the following four factors:

• Countries facing both disaster and displacement due to conflict/war **tend to have the worst levels of food insecurity.**
• Displaced individuals often become **trapped in repetitive displacement**, leading to deepening food insecurity.
• Displacement sites/shelters are often located in **remote areas** far from markets and accessible food.
• Separation from homes and livelihoods causes **deterioration in living standards**, reducing access to food, and creating difficulties in meeting basic needs.

Smith (2022) expanded on this correlation, highlighting that displacement increases the likelihood of poverty. Smith described the difference between refugees and internally displaced people (IDPs) using the following characteristics:

**Refugees** (Smith, 2022):

• Refugees voluntarily leave their countries due to fear of persecution based on race, religion, nationality, political opinion, or participation in specific social groups.
• Conflict, violence, and ethnic/religious intolerances are the leading drivers of people becoming refugees.
• Out of all of the refugees in the world, 68% are from Syria, Venezuela, Afghanistan, South Sudan and Myanmar.
• Three of these countries (Syria, Venezuela, and Sudan) rank among the bottom ten in global food security (Global Food Security Index, 2022).

**Internally Displaced People** (Smith, 2022):

• Displaced within their home country.
• The two major causes of IDPs are in-country fighting and/or natural disasters.
• The Democratic Republic of the Congo (DRC), Colombia, Syria and Yemen contain the most IDPs globally.
• Three of these countries (DRC, Syria, and Yemen) are present in the bottom ten performing nations in food security (Global Food Security Index, 2022).
• The total number of IDPs reached an all-time high of 59.1 million across the world at the end of 2021 (Reynaud and Falkowitz (2023)).

Displacement results from a complex interplay of environmental, social, and political factors. The correlation between weather patterns, conflicts, and economic instability underscores the global pattern identified by researchers like Reynaud and Falkowitz (2023), linking displacement, natural disasters, food insecurity, and conflicts together. The consequences of displacement are diverse, impacting food security, poverty levels, and living standards for affected populations. A global effort is needed to create sustainable solutions that alleviate the suffering of displaced populations.

6 Solutions & Innovative Ideas to Food Insecurity

Here are five solutions and action items that can be adopted and considered by governments, communities and countries as they work to improve the food insecurity concerns around them.

1- Engage NGOs in Community Programs.
2- Invest in Small-Scale Farmers.
3- Support Female Farmers.
4- Targeted Public Policies, Investments and Action.
5- Permaculture and Sustainable Food Systems.
6- Better Understanding Urban and Rural Trends.

1- Engage NGOs in Community Programs. The Global Food Security Index (2022) states that nonprofit organizations need to be involved when creating a community plan to reduce food insecurity in any community or country. They often have roots in a community that can offset the impact of short-term shocks that frequently accompany a country that already struggles with a solid infrastructure of support. Nonprofits, together with other stakeholders, such as governments, can help create a more effective way to create solutions in their community.

“By working together with governments and NGOs, they have already made inroads on adaptation policy, innovation and finance” (Global Food Security Index, 2022).

2- Invest in Small-Scale Farmers. We need more investments in small-scale farmers, including access to inputs and technologies, and access to finances to set up agribusinesses. “Investments are urgently needed to install, improve or expand small irrigation instructors to ensure a sufficient food supply in a way that is resilient to unpredictable weather events” (Global Food Security Index, 2022). It’s important to help small-scale farmers manage their natural resources more effectively and help them improve their ability to “access water and high-quality soil” (Global Food Security Index, 2022).

“Small-scale producers are part of the solution.”

“A world without hunger is possible. What we are missing is the investments and political will to implement solutions at scale. We can eradicate hunger if we make it a global priority. Investments in small-scale farmers and in their adaptation to climate change, access to inputs and technologies, and access to finance to set up small agribusinesses can make a difference. Small-scale producers are part of the solution. Properly supported, they can produce more food, diversify production, and supply both urban and rural markets - feeding rural areas and cities nutritious and locally grown food” (World Health Organization, 2023).

President, Alvaro Lario, IFAD (International Fund for Agricultural Development)

“Agriculture can help reduce poverty, raise incomes and improve food security for 80% of the world’s poor, who live in rural areas and work mainly in farming.” (Heifer International, 2022, World Bank Overview, 2023).
80% of the world’s poor live in rural areas and work mainly in farming.

3- Support Female Farmers. “The weak status of women farmers drives food security down over time. Women are key players in agriculture, but they often lack access to inputs, and without a strategy to support them their inclusion, agency and resilience is challenged more when shocks affect the system” (Global Food Security Index, 2022, pg 14). While each region is different in their commitment in supporting female farmers, the United States has a strong commitment (getting 100 on the GFSI score), while the Middle East and North Africa only scored 3.3 (see Table). However, it’s surprising that Europe only has a 13.5 score, lower than Sub-Saharan Africa.

Rural women play an essential role in global food production, due to the fact that they are a quarter of the world’s population. Women also make up 41% of the world’s agricultural workforce, and those numbers are higher in developing countries. “In South Asia and sub-Saharan Africa, 60% of women work in agriculture” (Heifer International, 2022).

What Challenges Do Women Face in Farming?

- Unequal access to opportunities, finances, tools, education and markets. Even though women play an important role in farming, they do not have equal access to opportunities, investments, tools, education and markets. “They also have less say, if any, in decision-making around household spending and the land on which they work” (Heifer International, 2022). Due to these challenges, farms run by women produce 20-30% less than farms run by men, says the United Nations Food and Agriculture Organization.

- Land Rights. Another challenge is women landowners make up less than 15% of the world’s owners, making it hard for them to make decisions about the land.

Why Support Female Farmers? “Women typically invest more of their earnings in their families and communities than men” (Heifer International, 2022). Families and communities benefit more with female farmers because they invest in better food, education, and health care.

Women typically invest more of their earnings in their families and communities than men.

If women farmers were given the same opportunities and resources as men, production could increase between 2.5-4%, which would lead to a decrease of 12-17% of malnourished people in the world (World Food Programme, 2023e). This would raise approximately 150 million people out of poverty and hunger.

4- Targeted Public Policies, Investments and Action. Policy makers and investors need to create policies that establish a healthier food environment for growing healthy foods and giving the community better access to healthy food systems. Public policies and finances need to include nonprofit organizations, which often are
established in the community (see Solution 1: Engage NGOs in Community Programs).

“Child wasting remains unacceptably high and there has been no progress in reducing child overweight. We need targeted public policies, investments and actions to create healthier food environments for all.” - Dr. Tetris Adhanom Ghebreyesus, WHO Director-General

The World Health Organization in their 2023 report on food insecurity said that everyone working to reduce hunger, food insecurity and malnutrition, which includes governments, needs to better understand the trends of people moving to urban areas. (See Solution 6: Better Understanding Urban and Rural Trends).

5- Permaculture and Sustainable Food Systems. Empowering individuals and communities to grow their own healthy food can be a great way to help with food insecurity, allowing these communities to be more resilient to the contributing factors mentioned in this article to impacting food security. “Permaculture is a design system for ecological and sustainable living, integrating plants, animals, people, buildings, and communities” (Permaculture Gardens, April 2023).

The Economic, Environmental, and Social Benefits of Permaculture

Jim Gale, the founder of Food Forest Abundance states that “by implementing permaculture practices, communities can create self-sustaining food systems that mitigate the potential for food scarcity and build self-reliance, communities, and capital.” Jim goes on to say that “permaculture is more than just a farming technique; it’s a holistic approach that provides numerous economic, environmental, and social benefits. By mimicking natural ecosystems, permaculture minimizes waste, conserves resources, and creates regenerative systems that can provide for generations to come.”

6- Better Understanding Urban and Rural Trends. “Urbanization is driving changes in agrifood systems” (World Health Organization, 2023). By better understanding the trends of people increasingly living in urban areas, we can create communities that are more self-sustainable. Understanding urban and rural trends is also important in helping communities create policies, laws and ultimately a sustainable infrastructure for food production. By 2050, 7 out of 10 people will be living in cities (World Health Organization, 2023).

Moderate or severe food insecurity affects 33% of adults living in rural areas and 26% in urban areas - based on a new study of eleven countries.

While food insecurity impacts more people in rural areas than urban, a more complex perspective is needed in making the connection between rural and urban areas. There is also a higher consumption of highly processed foods being consumed in peri-urban and rural areas.

Children’s malnutrition (according to World Health Organization, 2023):

- **Child stunting** is higher in rural areas (35.8%) compared to urban areas (22.4%)
- **Overweight children** in urban areas (5.4%) compared to rural areas (3.5%).
- **Wasting food** is higher in rural areas (10.5%) compared to urban areas (7.7%). Sesi Technology, a company in Ghana founded by Isaac Sesi, has developed innovative technology tools for farmers and businesses across the agric value chain. They provide tools such as the GrainMate (Grain Moisture Meter) to help African farmers increase productivity, yield and profit. This happens by finding a solution to measure moisture content, reduce post-harvest losses during storage and increase productivity. This allows farmers to have more seeds to plant and produce more crops, increasing their income (Sesi Technology, 2023). See Spotlights at the end of this month’s publication for more information about Sesi Technologies.
Key Takeaways on Food Insecurity

“Solutions (for global food insecurity) involve -
1. managing natural resources more effectively,
2. ensuring access to water and
3. high-quality soil, and
4. scaling quickly to meet the needs of farmers and the food system.”
(Global Food Security Index, 2022).

➔ As climate changes continue, extreme weather will continue to impact countries around the world along with conflicts. We need to support ways to help countries and communities to become more resilient in the food system.
➔ Nonprofits need to be part of the solution. Better outcomes are being seen when including NGOs in projects, programs and community plans.
➔ Invest in nonprofit organizations who support small-scale farmers, specifically female farmers.
➔ By investing in female farmers,
  • production will increase,
  • malnourished people will decrease in the world and
  • Estimated 150 million less people will be hungry and in poverty.

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References


Thought Paper

Reducing Food Scarcity: The Benefits of Urban Farming

By S.A. Claudell, WikiCharities, Emilio Mejia, INSEAD

Abstract: Urban farming can enhance the lives of communities and help reduce food scarcity. This paper presents a conceptual prototype of an efficient urban farming community that can be scaled for a single apartment building or an entire community across all global geoconomics regions, including densely populated cities and rural, developing towns and communities. When deployed in coordination with smart crop choices, local farm support, and efficient transportation then the result isn’t just sustainability, but also increasing fresh produce accessibility, optimizing nutritional value, eliminating the use of ‘forever chemicals’, reducing transportation costs, and fostering global environmental benefits.

Imagine Doris, who is retired. She grows enough lettuce in her apartment to feed herself and 3 other families in a vertical planter that is multiple layers high and 2 layers deep. She grows the lettuce all year long. Local farms grow larger crops with different soil requirements. Others in her apartment building grow enough other vegetables to feed themselves and others. Together they have created sufficient food for all members of the apartment complex to eat a healthy diet every day.
Introduction
Access to fresh and nutritious produce is a pressing concern in urban areas. A conceptual urban farming project is scalable and can be implemented by non-profit organizations worldwide, and gain support of local farms and businesses. By combining innovative farming techniques, efficient resource management and community engagement, it also creates a more sustainable and equitable food system. Efficient urban farming is an innovative approach to address food security challenges. Harnessing the potential of urban spaces can create an equitable food system with global benefits.

Benefits of Urban Farming
The central aim of the project is fivefold:

a) **Enhance accessibility:** Substantially increase the availability of fresh produce to all people living in urban areas irrespective of their socioeconomic status or geographic location.

b) **Optimize nutritional value:** Provide guidance on sustainable farming practices that maximize the nutritional value of fruits and vegetables grown.

c) **Eliminate ‘forever chemicals’**: Develop alternative strategies for fertilizer and pest control that eliminate the use of harmful chemicals and minimize environmental impact.

d) **Reduce transportation costs:** Minimize the time and cost associated with transporting harvested food items to consumers, thereby reducing carbon emissions and increasing efficiency.

e) **Solicit ongoing feedback:** Regularly poll participants, representing a variety of cultures, disciplines and ages to make nimble changes based upon requested improvements.

Sustainable Farming Techniques
The implementation of sustainable farming techniques inside apartments, businesses and single-family dwellings is foundational. While green, leafy lettuce can be grown in volume at farms, the harvesting, cleaning, packaging, shipping, store handling, etc. ... the total cost of a nutritious salad is enormous, not to mention the amount of waste at every step. Instead, tenants can employ techniques such as vertical farming, probiotics for soil, hydroponics, aquaponics, and rooftop gardens. These methods leverage limited urban spaces efficiently, reduce water consumption, and enhance crop productivity while promoting year-round cultivation.

Nutritional Optimization Strategies
To promote population health, it is necessary to optimize the nutritional value of the produce grown. This means that the community (large or small) must coordinate which tenants will grow each crop with the space available as well as determine high nutritional value crop selection, soil requirements, and organic farming practices to reduce chemicals. Additionally, as urban farming scales, communities should consider integrating agroforestry systems which promotes biodiversity and provides a wide range of nutrient-rich fruits and vegetables.

Elimination of ‘Forever Chemicals’
To eliminate the use of harmful chemicals such as some fertilizers and pest control agents, there are urban farming alternatives such as organic compost, biopesticides, and integrated pest management techniques. There is a need for more research and development of sustainable solutions that minimize environmental contamination and prioritize human health.

Recycled Containers
Commercial farming, at sale, involves a lot of waste, particularly of non-recyclable seed and soil...
containers. Urban farming should employ plastic color-coded containers by crop type and for reuse. QR coded pots and containers allows for online collection of data like yield, crop failure alerts and easy transport and testing of produce. This allows local farms and nurseries to grow seedlings efficiently and deliver to the distribution centers and then back to the individual grower.

### Reduced Transportation Costs

For small, fresh vegetables, reducing the shipping and waste creates enormous benefits in efficiency. Coordination of transportation creates locally scheduled pick-up and drop-offs. A driver would be assigned to a given sector and would have the right containers with seedlings to deliver to an apartment while at the same time picking up the already harvested produce which would then be delivered to the closest distribution center and empty pots returned to the nursery to begin new seedlings. Again, color-coded cards with QR or barcodes linked to the data analytics database would be used for information collection and analysis.

### Data Analytics

The extensive use of advanced data analytics to ensure the quality, quantity and nutrition value of all food grown and distributed. The use of these analytics tracks the consumption and needs of any given vegetable or fruit to ensure optimal nutritional balance for every individual and family.

When the delivery person simultaneously picks up and delivers new seedlings to Doris, he/she scans in the numbers of units delivered and received and is credited to Doris’ account. Adjustments can be made based upon this data to ensure every individual and family has easy access to the foods they need to be healthy and without want.

### Online Instruction

Online video tutorials and non-verbal visual instructions on how to care for each plant type, based upon its location and sunlight exposure. Tutorials should include:

- Water and nutrients a specific plant need
- Visuals on healthy growth versus stunted or unhealthy plants
- Recipes and ideas for healthy meals
- Local cost-effective cooking methods
- Meal plans created by nutritionists taking into consideration the chronic diseases like diabetes or high cholesterol. Doris will have her own personal meal plan to proactively manage her diabetes.

### Local Nurseries

There would be local nurseries and hydroponic starter locations so that Doris and her neighbors can be given plants that have already germinated and are ready to be fed and maintained until they are mature enough to be harvested and sent to the local distribution centers.

These nurseries would also be linked to the data analytics team using the QR codes for immediate information on how much of each plant to grow and feedback on nutrition and health of the mature plants. The nurseries will adapt quantities and types of plants based on relevant metrics from the data analysis.

### Researchers, Educators and Biolab Testing

In a collaboration with experienced researchers, local schools, colleges and the community, plants could be regularly tested at a local university biolabs based upon statistical random sampling. They could also address any concerns local growers and farmers might have about their plants’ health providing both commercial and non-profit support. The plants will be tested for...
nutritional value as well as for any known destructive elements detrimental to overall plant health. This lab would be run by trained biostatisticians, botanists, and agricultural engineers, and all data collected will be added to the plant database.

**Climate Control**

Since urban farming is needed in all locales, climate can be both a benefit and a challenge. For example, in colder climates, dwellings need to be heated for the benefits of the inhabitants and benefits the plants. This will reduce the need for heating many greenhouses large enough to feed the local population, ensure that fresh fruits and vegetables are available year-round, and eliminate the need for long distance transportation of at least a portion of what the local community needs to eat and stay healthy. Government, engineers and universities can evaluate the installation of solar panels and smaller wind turbines to create the necessary electricity to run the heating, lighting, and other needs to keep people and plants in good health.²

**Local Distribution Networks**

There needs to be strategies for local distribution networks that reduce the time and cost associated with typical large commercial transportation of harvested food items. It is important to establish a community-supported agriculture (CSA), farmers’ markets, and food cooperatives as means to directly connect producers with consumers, fostering a sense of community and strengthening local economies.³

**Global Environmental Benefits**

Urban farming projects hold significant potential for creating global environmental benefits. There is a positive impact by using urban farming to mitigate climate change, reduce food waste, conserve water resources, and promote biodiversity. By adopting sustainable farming practices on a global scale, this prototype seeks to contribute to a more environmentally conscious and resilient planet.

**Conclusion**

The conceptual prototypes presented in this paper are meant to provide a framework for nonprofit organizations to implement urban farming projects worldwide. By enhancing fresh produce accessibility, optimizing nutritional value, eliminating ‘forever chemicals,’ reducing transportation costs, and fostering global environmental benefits, this project aims to address pressing food security challenges while promoting sustainability and equity. Ongoing research is recommended and collaboration between organizations, governments, universities, and communities are crucial to translating this conceptual prototype into practical and impactful urban farming initiatives appropriate for a wide variety of cultures.

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**GET INVOLVED**

Join an international “Urban Farming” WhatsApp chat group by emailing your WhatsApp number to urbanfarming2023@gmail.com.

This group will be focused on sharing ideas, solutions and frustrations to work towards ending food scarcity in your community. This group aims to have monthly Zoom meetings to increase dialogue. All meetings are conducted in English, with opportunities to expand to other languages in the future.
A Vision for a Food-Secure Future Through Permaculture

By Jim Gale, CEO/Founder, Food Forest Abundance

Abstract: In response to the pressing challenges of food security, sustainability, and resilience, Food Forest Abundance, led by visionary CEO Jim Gale, emerges as a beacon for permaculture-based agriculture and community development. This editorial explores the organization’s pivotal role in advocating for a future where individuals, families, and communities thrive through sustainable practices and localized food systems. Central to Food Forest Abundance mission is the conviction that permaculture principles can revolutionize our approach to food security, health, and wellness by uniting agricultural and community leaders.

The catalyst for this movement was the World Farmers Market Coalition report, revealing the tangible economic, environmental, and social benefits of farmers markets. Amidst the pandemic aftermath, the surge in popularity of farmers markets underscores a growing recognition of the importance of resilient, healthy, and sustainable food systems.
Jim Gale emphasizes the historic opportunity for people to contribute to a producer-oriented food system. At the core of Food Forest Abundance’s mission is the belief that cultivating personal food forests not only enhances individual well-being but also liberates communities from dependence on large-scale agriculture and government.

The paper outlines eight core benefits of integrating a permaculture mindset into our culture, encompassing economic, environmental, and social dimensions. From creating regenerative systems to empowering marginalized groups in agriculture, permaculture emerges as a holistic approach that addresses the multifaceted challenges facing modern agriculture.

Food Forest Abundance’s vision extends beyond theory to practical implementation, providing guidance and strategies for communities seeking to establish self-sustaining food systems. Their collaboration with partners and initiatives like the Freedom Farm Academies exemplify a commitment to education and empowerment, fostering a collective journey toward a healthier, more sustainable future.

In conclusion, Food Forest Abundance stands at the forefront of a transformative food revolution, offering hope and tangible solutions for a future where food security is not just assured but abundant and regenerative. Jim Gale’s vision paves a path that individuals, families, and communities can collectively tread towards a future defined by health, sustainability, and resilience.

**Food Forest Abundance Presents a Vision for a Food-Secure Future Through Permaculture**

In an era where food security, sustainability, and resilience have taken center stage, Food Forest Abundance, a prominent advocate for permaculture-based agriculture and community development, is leading the charge towards a future where individuals, families, and communities can thrive through sustainable practices and local food systems. This visionary organization aims to unite agricultural and community leaders in embracing permaculture principles that can revolutionize our approach to food security.

The wake-up call came with the first World Farmers Market Coalition report, a groundbreaking study that unveiled the tangible economic, environmental, and social benefits of farmers markets. These benefits encompass preserving biodiversity, providing opportunities for youth in agriculture, and empowering women. In the aftermath of the pandemic, farmers markets have experienced a surge in popularity as people increasingly recognize the significance of a resilient, healthy, and sustainable food system.

Jim Gale, the visionary founder of Food Forest Abundance, emphasizes the importance of this moment in history: “Now more than ever, people...”
have the opportunity to embrace and contribute to a producer-oriented food system that promotes resilience, health, and sustainability. We can witness firsthand the strength and potential of a robust local food system by visiting a farmers market as one example."

At the heart of Food Forest Abundance’s mission is the belief that growing your own food forests not only brings greater health and wealth to families but also offers freedom from dependency on big agriculture and big government. By implementing permaculture practices, communities can create self-sustaining food systems that mitigate the potential for food scarcity and build self-reliance, communities, and capital. There are eight core benefits of incorporating a permaculture mindset into our culture:

1. The Economic, Environmental, and Social Benefits of Permaculture
Permaculture is more than just a farming technique; it’s a holistic approach that provides numerous economic, environmental, and social benefits. By mimicking natural ecosystems, permaculture minimizes waste, conserves resources, and creates regenerative systems that can provide for generations to come.

2. Applying Permaculture Principles to Create Sustainable Food Systems
Permaculture principles can be applied to design and maintain food systems that are not only sustainable but also highly productive. By working with nature rather than against it, permaculture offers innovative solutions to some of the biggest challenges facing agriculture.

3. Empowering Youth, Women, and Prison Systems in Agriculture
Permaculture opens doors for empowerment by providing opportunities for youth, women, and even prison systems to engage in meaningful agricultural work. These initiatives can transform lives and communities, offering a path to self-sufficiency and financial independence.

4. Promoting Biodiversity and Preserving Natural Resources
One of the cornerstones of permaculture is the promotion of biodiversity. By creating diverse and resilient ecosystems, permaculture practices help protect and preserve our natural resources, ensuring a healthier planet for all.

5. The Role of Individuals in Agriculture and Empowerment through Permaculture
Permaculture emphasizes the power of individuals to make a difference in agriculture. It offers an avenue for people to become active participants in their food production, connecting them more intimately with the land and the food they consume.

6. Building Resilience and Reducing Vulnerability to Food Scarcity
Permaculture is a key strategy for reducing vulnerability to food scarcity by strengthening local food systems. It ensures that communities have the resources and knowledge to withstand shocks and challenges.

7. Strategies for Implementing Permaculture Practices at the Community Level
Implementing permaculture practices at the community level is not just a dream but a practical reality. Jim Gale and Food Forest Abundance offer guidance and strategies for communities looking to create their own self-sustaining food systems.

8. The Importance of Collaboration and Education through Freedom Farm Academies
Food Forest Abundance is not alone in this mission. They actively collaborate with partners, and through initiatives like the Freedom Farm Academies, they educate and empower...
individuals and communities to take control of their food security and well-being.

Food Forest Abundance is at the forefront of a food revolution that aims to transform the way we think about agriculture, food security, and community development. With permaculture as their guiding star, they offer hope and practical solutions for a future where food is not just secure but abundant and regenerative. Jim Gale's vision is not merely a dream; it's a path that individuals, families, and communities can walk together toward a healthier and more sustainable future.

Jim Gale Bio: Jim Gale, a seasoned explorer, and entrepreneur, embarked on a global journey backpacking through 37 countries, living with the Maasai, and immersing himself in Hawaiian island life. At 29, he set ambitious goals, including retiring in three years, achieving success with the creation of a billion-dollar mortgage company. Following his mortgage success, Jim spent a year living on a boat and later relocated to Costa Rica, where he delved into building eco-villages and discovered the transformative power of permaculture. This revelation became a catalyst for his new mission: to bring the concept of permaculture to every household worldwide, thus creating Food Forest Abundance.

References


Exploring The Relationship Between Nonprofit Management Education Programs And Their Local Nonprofit Sector

By Elise Lael Kieffer, PhD, Nonprofit Leadership Studies, Murray State University

Abstract: This study sought to explore the relationship between nonprofit management education programs at institutions of higher education with nonprofit organizations in their local communities. Using a pragmatism methodology, I conducted interviews with directors of nonprofit management education programs and with corresponding nonprofit partners in their local communities. While research exists exploring the impacts and influences of nonprofit academic centers on their local sector - specifically regarding the training of practitioners - there is much less available in published literature exploring the actual effects of nonprofit management education programs on their local communities. This study begins what must be a more expansive exploration into the unique perspectives of practitioners working with and in proximity to nonprofit management education programs. The question guiding this inquiry was: In what ways do nonprofit management education programs work to affect the capacity of local community nonprofit organizations? The answer, like much in the broader nonprofit sector, varies dependent on the particular resources available at the institution.
Introduction

This study explored relationships between nonprofit management education programs at institutions of higher education with nonprofit organizations in their communities. Using a pragmatism methodology, interviews were conducted with directors of nonprofit management education programs and with corresponding local nonprofit partners.

While research exists exploring the impacts and influences of nonprofit academic centers on their local sector (Weber and Brunt, 2022; Weber and Long, 2021b; Long, 2001), there is much less available exploring actual effects of nonprofit management education programs on their communities. This study begins a more expansive exploration into the unique perspectives of practitioners working with and in proximity to nonprofit management education programs.

Conceptual Framework - Sequence of Targeted Impacts (STI)

Long (2001, p. 3) introduced the Sequence of Targeted Impacts, illustrated in Figure 1, as the journey toward moving academic nonprofit programs out of their hallowed halls and into direct impact with communities. As Nonprofit Management Education (NME) programs move up the triangle, they increase in direct community impact. This framework is especially relevant for a pragmatic study because it is functional and informative, and the ultimate findings are directed toward implementing change toward greatest impact.

Following past research (Weber and Long, 2021), this study was designed to move up the triangle to discover if capacities at community organizations have increased as a result of partnerships with NMEs. Kieffer (2020) conducted a study of nonprofit arts organizations and specifically excluded those working in the same community as institutions of higher education. This exclusion was based on the expectation that colleges and universities work within their communities and provide substantial resources and support to their communities.

This current study continued that assumption but intended to examine the relationship by including voices from the other side. Expecting that institutions of higher education do participate within their communities, this study examined that impact, deliberately seeking the perspective of the nonprofit organization. The goal of these interviews was to explore this question:

Research question: In what ways do nonprofit management education programs work to affect the capacity of local community nonprofit organizations?

![Figure 1: Sequence of Targeted Impacts (Long, 2001, p.3).](https://scholarsarchive.byu.edu/joni/vol3/iss4/1)
Literature Review

Nonprofit Management Education (NME)
Nonprofit management education (NME) emerged as an academic discipline in the 1990s. The goal was to educate future nonprofit practitioners in the unique aspects of nonprofit management and leadership. With the development and increase in prevalence of nonprofit centers housed at academic institutions, interactions with communities have evolved (Weber and Long, 2021b).

The W. K. Kellogg program invested in many nonprofit academic centers, seeing the benefit of supporting a resource center able to provide direct resources for nonprofits at a local level (Larson and Morehead, 2001). Larson and Morehead (2001) found that what often contributed to the establishment of a nonprofit center was individual faculty members at institutions. Their interests and pursuits led to establishing a base of support for a nonprofit academic center at their institutions.

The inclusion of nonprofit management education, as a course of study, is increasing in higher education institutions. The growth and impact of these institutions has been studied by researchers, particularly with regard to the influence and impact of Nonprofit Resource Centers (Weber and Brunt, 2022; Weber and Long, 2021b; Long, 2001).

NME Community Outreach
Mirabella and Renz (2001) referenced the increase in nonprofit organizations utilization of local colleges and universities as resources for training and expertise. NME programs responded through increased outreach. Their study addressed those efforts between 1990-2001. They found that, beyond academic degree programs, universities and colleges were increasingly reaching out to their local nonprofit sectors and community-based groups through various offerings intended to educate, train, and increase capacity.

Lynton and Elman (1987) wrote about the need for universities to move beyond the classroom and into the real world, but their emphasis was on preparing students for their lives after their degree attainment, rather than on the actual influence of the university on the community. Also, as a text from 1987, the information is not considered current.

Lelle, Fear, and Sandmann (1998) studied the growing movement of community outreach from universities. They noted that from 1990, and over the next decade, the integration of outreach moved from the edges of academia into the mainstream of accepted pedagogy. Twenty years later, relationships and interaction between local communities and institutions of higher education are considered the expected norm. However, they found that at private, liberal arts colleges, this trend is less emphasized. “Unlike state universities and community colleges that are chartered to serve defined, distinct, and known geographic areas, the geographic service area of private liberal arts colleges is self-determined” (Lelle, Fear, and Sandmann, 1998, p. 52).

Later, Maurrasse (2001) defended the necessity of university/community partnerships and provided instructive guidance on how those collaborations could work toward strengthening communities while also benefiting universities. There is very little research from the past twenty years exploring the nature of university-community partnerships or the influence of universities on their communities.

Despite the growth of NME programs internationally and the growth of the nonprofit sector as a whole, few have asked how those institutional programs education of future nonprofit leaders is actually influencing or affecting the sector. This study aims to begin the inquiry and open the conversation for further discussion and exploration into the impact of NME on their local communities.

Methodology
Qualitative inquiry explores the “why” behind phenomena. Rather than establishing causality or providing broadly generalizable results, as in quantitative research, qualitative inquiry paints in depth, detailed pictures of specific experiences (Creswell, 2012). In this study, the qualitative methodology is justified because impact in the nonprofit sector cannot always be understood.
only through quantitative data. A nonprofit professional who perceives that their work became more manageable after support from their local NME program might have a story to tell that is not explained through numbers alone. Those perceptions are what I sought to understand.

**Pragmatism**

This study approached the research question using a pragmatism methodology. Pragmatism supports a value of usefulness, necessitating researchers to scrutinize the practical relevance of their findings and purposes (Garrison, 2008), with the goal of pragmatic research being to inspire or inform change. Pragmatism allows us to make connections, comparing and contrasting, valuing all voices and mediating between them (Kieffer, 2018). This will become especially important as we explore the interactions between educator and practitioner stakeholders (Dewey, 1910). "Instead of demanding harmony, pragmatism recognizes difference in emphasis and belief by taking an explicitly pluralistic approach," (Whetsell & Shields, 2011, p. 476).

Pragmatism, as theorized by William James observed the history of philosophy as a “clash of temperaments” between the “tough minded” and the “tender minded” (Hookway, 2013, p. 2). He considered pragmatism to be a mediating philosophy, capable of building bridges and between disparate sides (Kieffer, 2018). Conflicts perceived as unsolvable, can be solved with a pragmatic approach, according to Dewey. He asserted that pragmatism should be recontextualized to be applicable in different contexts, eras, and places (Garrison, 2008, p. 1).

Hookway (2013) identified the critical importance of experience as a vital tool useful for learning and interacting with our environments in such a way that we meet needs and find common ground. It is in these interactions between stakeholders that pragmatism can guide us. “The rich understanding of experience and science offered by pragmatists may show how to find an objective basis for the evaluation and criticisms of institutions and practices” (Hookway, 2013, p. 14).

Through the lens of pragmatism, we can accept that different stakeholders hold distinct “truths” about priorities. These different “truths” might not be the same, but they can both be true and searching for that truth can open the way for commonality and agreement. Nonprofit academicians and practitioners have different day-to-day lived experiences, but both are true, valid, and relevant. Dewey relied on words such as coherence, whole, integration, complete - words we could use now to describe the integration of the different aspects of the nonprofit field (Leddy, 2016). These terms imply unity of purpose but also clearly denote individuality within a whole. Value judgments served, for Dewey, as a way to reassess and renegotiate courses of action toward problem solving. Nonprofit organization exist to solve problems and meet needs (Anderson, 2014).

In extensive research and publication over years, Shields has applied pragmatism to the field of Public Administration, a field defined by its arms of research and practice, often at odds and rarely communicative (Shields, 2008; Shields, 2005; Shields, 2004; Shields, 2003; Shields, 1996; Whetsell & Shields, 2011; Whetsell & Shields, 2011). “By connecting problem and participation with inquiry, learning, pluralism, and uncertainty, classical pragmatism provides an explicit framework for participation that adds depth to the doing, making, and theorizing of the field” (Shields, 2008, p. 216). Because the field of study for nonprofit leadership and management is closely linked to the field of study for public administration, the same qualities that make it beneficial for public administration problem
solving serve as we seek to understand the nature of the nonprofit sector (Mirabella and Wish, 2001).

In pragmatism, multiple truths are the foundation of beginning research, but the distinction in this line of inquiry is that the real truth, the practical truth, will rise to the fore through testing and functional usage. In this way, what is true in one scenario, might not hold true in another where settings, population, or other circumstances differ. Pragmatism recognizes that values are grounded in feelings and feelings form our truths. Recognizing that give and take is required for one story to be told while another remains untold (Seigfried, 2008). When feelings and passions conflict, a way must be found to acknowledge perspectives that we do not share, otherwise we run the risk of blindly asserting what seems obvious from our point of view and a failing to recognize our own hidden biases” (Seigfried, 2008, p. 148).

Wells (2000) wrote this of the philosophy of pragmatism, “I began to understand that reality was not a collection of hard facts. While reality might seem like a snapshot of things in an external world, I learned that it was actually a creature of social interpretation and construction (p. 352).

Whetsell & Shields (2011) described four key principles of pragmatism, that it is practical, pluralistic, participatory, and provisional. It is practical in its specific pursuit of narrowly applicable portraits of specific phenomena. It is participatory in its mandate to incorporate diverse voices and experiences into the inquiry. Pragmatism is pluralistic in its focus on experience, consequences, context, and problems. “By connecting problem and participation with inquiry, learning, pluralism, and uncertainty, classical pragmatism provides an explicit framework for participation that adds depth to the doing, making, and theorizing of the field” (Shields, 2008, p. 216). Instead of demanding harmony, pragmatism recognizes difference in emphasis and belief by taking an explicitly pluralistic approach,” (Whetsell & Shields, 2011, p. 476), seeing those pluralistic influences and voices as sources of strength.

Finally, pragmatism is provisional, ever changing to be adapted to new applications. John Dewey described it as “A universe of experience is the precondition of a universe of discourse” (1969-1991, p. 74) He, along with James (1907) affirmed that truth is validated, verified and becomes true through a process of reflection. Pragmatism listens to all truths, tests them, and concludes that the most functional is “the truth”. The identified truth is then always subject to reassessment, reappraisal, and recontextualization (Garrison, 2008).

Application
In this study, I utilized the philosophy of pragmatism as a mediator between Nonprofit Management Education (NME) programs and their nonprofit community partners (NCP). Through the lens of pragmatism we can accept that both NMEs and NCPs hold distinct “truths” about priorities of their organizations and missions. The nature of individuality within the community resonates with the NME and NCP in which both seek individual goals but also direct those goals toward a common, mutually beneficial, goal - a strong nonprofit sector. Value judgments served, for Dewey, as a way to reassess and renegotiate courses of action toward problem solving (Anderson, 2014). Pragmatism can guide NMEs as they serve the needs of myriad communities and organizations. Pragmatism allows us to accept individuality, the NCP, and selective interests within a pluralistic community, the broader jurisdiction of the NME.
(Garrison, 2008). There can be a mutual recognition of difference and cross-border dialogue.

**Participant Selection.**

The first criterion for participation consideration in this study was that institutions had to be members of the Nonprofit Academic Centers Council. While there are certainly nonprofit education programs in operation that are not members to this professional affiliation, it provided a first winnowing in the selection process.

The second selection criterion was that the NME programs not be part of a program that houses or is accompanied by a Nonprofit Resource Center (NRC). Programs with NRC are the specific focus of a current study by Long and Weber.

Recognizing the phenomenon that different regions of the U.S. have their own, sometimes unique, concerns, obstacles, and opportunities (Kieffer, 2020), all NACC members were then sorted into geographic location and international organizations from the United States were eliminated. Future research could incorporate the international perspective but as multiple nations are represented in NACC membership and the U.S. itself is geographically diverse, eliminating the participants based outside the U.S. was a reasonable next step.

There are a variety of valid ways to divide the geography of the United States but in an effort to create a functional sample size while still adhering to commonly accepted geographic regions utilized by the U.S. Census Bureau, the categories in Table 1 were established (Census, n.d.).

One institution from each region was chosen at random and the director of their NME was interviewed for this study. Each NME participant then referred a NCP who best represented their program’s influence on their local nonprofit sector. I recognize that NME participants are likely to recommend the participation of organizations who speak favorably of them, however, as this study sought to explore the interactions between NMEs and NCPs, a generally positive affiliation was preferred as the NCP would have sufficient experience with the NME to provide feedback.
Using the geographic regions defined by the U.S. Census provided potential for nine participants. Each of those NME participants referred one NCP participant bringing the total number of participants to 18 (N=18). NME participants were not given any guidance on the type of NCP to refer. Thus, NCP participants came from across the diverse field of nonprofit practice.

**Methods.**
This study was exempt from IRB due to the nature of the inquiry and status of participants. I conducted virtual interviews with each participant using Zoom and Google Teams (depending on the preference of the participant). With both technologies, meetings were recorded and automatically transcribed for subsequent analysis. When citing direct quotes from participants, the following structure is used: Participant abbreviation, transcript page number, year of interview. For example: NC (participant identifier), p2 (page two of the transcript), 2022 (year of the interview).

**Pragmatic Identity Analysis Technique.**
Relying on the pragmatism lens to construct interview protocols and then conduct interviews, questions were designed to uncover decision-making behavior, organizational (or institutional) values, and individual personality influences. Questions sought to uncover connections and patterns between strategies and identities by encouraging reflection, narrative experiences, anecdotes, and interactive discussions with the researcher (Levitan, Mahfouz, and Schussler, 2018). The researcher asked open questions and encouraged narrative examples, rather than short answers. Follow-up questions were asked when appropriate to understand specific experiences or strategies described by the participant. Interviews were then transcribed coded utilizing the STI as a framework for understanding both practitioner and educator strategies and experiences.

**Results: Applying the Sequence of Targeted Impacts (STI)**
One immediate finding resulting from interviews was the importance of geography. Utilizing participants from different regions of the country allowed a pattern to emerge. The NMEs that were located in more populous urban settings boasted considerably less direct interaction with their local nonprofit sector. The interactions of which they spoke were student-focused, including internship and service-learning opportunities. One likely reason for this absence of interaction with their local practitioners is that those programs in urban settings rely heavily on other organizations already interacting with their local sector. Nonprofit support organizations such as statewide alliances provide technical training for practitioners, making duplicate services through the university unnecessary and an unwise use of resources.

NMEs in more rural locations, on the other hand, talked about more direct interaction between their programs and the nonprofit sector around their universities. These communities did not boast proximity to nonprofit support organizations that could provide assistance to local practitioners. In the absence of these alliances, NMEs at universities in rural communities felt compelled to provide those opportunities through their programs.

**Currency of Curricula – foundation, level five**
The foundation of the STI is currency of curricula. All of the participants were members of NACC, resulting in an agreement of necessary topics, best practices, and themes for an appropriate and complete education in Nonprofit Management.

**Responsiveness and Availability of Education Programs – level four**
The next level of the STI is responsiveness and availability of education programs. As these NMEs are part of colleges or universities, they are most responsive and available to student needs. The first, and most common response to questions about community interaction from both NME and CP participants was “interns” and “service-learning.” The next most frequent response from NMEs was that help was provided in an as-needed, project-oriented, or consulting capacity.

**Competencies of Volunteers and Staff Leaders - level three**
At level three, this study began a deeper exploration on the relationship between NMEs and NCP through competencies of volunteers and
staff leaders. For all of the NME participants, improving the competencies of volunteers and staff leaders at local nonprofits came in the form of practitioner training sessions. One recurring theme from NMEs was that they were doing as much as they could with their current resources. “Most of the interaction with the local sector is through me and what I’ve made it,” (L, p2, 2021). “When I became director we focused our relationships with nonprofits” (NC, p2, 2022).

From the NCP participants there was a communicated lack of understanding on the part of NCPs as to what the university could actually do for them. Many of the interactions between NME and NCP were initiated and driven by previous relationships, “Historically we’ve brought in nonprofits that faculty are already connected to into classrooms for learning projects” (S, p3, 2021).

A frequently mentioned impact on the local sector for every participating NME was the release of qualified professionals into the nonprofit marketplace in the form of their programs’ graduates. “One of our graduates just became the executive director of [a local food distribution nonprofit]. They hire our interns and our graduates and, basically, our alumni and students are running their whole organization” (UC, p4, 2022).

NCP also benefit from the utilization of university students during their course work. “Two years ago we had a county with a very high surge within the heroin epidemic and our marketing and evaluation class helped develop a highly effective awareness campaign” (L, p6, 2021). While this project is certainly valuable to the organization, educational for the student, and beneficial for the community, the question should be asked whether the services provided by students are actually increasing the capacity at the organization. Could the organization function without student labor? If removing student labor decreases organizational capacity, then what has been the actual long-term effect of NMEs been on their NCPs? This concern was addressed by one NME participant, “They [our students] don’t sit down and tell them what to do either right or wrong. It’s a forward looking to build a longer-term capacity, not helping them meet a short-term need. We aren’t trying to help them get “X” done, but trying to help them build that capacity to carry on, after we’re no longer engaged with them” (NC, p.7, 2022).

Quality of Life in Communities - level one
Only one community of participants (NME and NCP) provided support for this level of interaction. Therefore, this study did not achieve substantial information informing the top of the STI. The collaborative nature of the university, public, and nonprofit sector in that one community presented an opportunity for exploring the quality of life in communities with thriving NME and NCP partnerships.

While public/nonprofit/NME partnership was not the object of this study, as this community’s relationship between sectors came to light, it was promising as a potential model for future research.
and application. Those participants expressed many of the same sentiments as all other NME and NCP participants. However, their relationship had reached the level that exemplified a clear demonstration of reaching the top level of the STI (quality of life in communities). “The entire focus of our partnership is to help mobilize the intellectual capital and resources of the university with helping us to address community needs…we realized that there were a lot of nonprofits doing a lot of great work that can never attract larger funding sources…so this was an attempt for us to actually undergird and support those organizations through social and economic vitality as a way to help them build their capacity” (VB, p2, 2022).

Pragmatism, as a mediating philosophy, was introduced as the lens for this study largely because of its acceptance of individual truth and its requirement of incorporating diverse voices. In this community, this partnership seems to succeed because of that inclusion of diverse community voices, “One of the things we’ve been very careful with in this partnership is the understanding that we work to uplift and amplify community-based voices and organizations. The university isn’t coming in with a savior mentality and I think that is why our partnership has been so successful” (VB, p3, 2022).

Both that NME and NCP shared the sentiment that their relationship was entirely mutually beneficial, “both to the community residents and organizations who have participated, but also to the university because a lot of times it’s the students who are working alongside of us and that enables them to really understand community-based work…so yeah, I would have to say it’s been mutually beneficial for both the community, our organization’s capacity, and the university, as well.” (VB, p5-6, 2022).

However, by the time of this publication, leadership had changed in all three of those participating sectors and the mutually beneficial collaboration no longer exists. This further reinforces the finding that much of the interaction between NMEs and their NCPs is driven by individual personality, rather than by institutional mandate or directive.

Conclusions and Future Explorations

The question guiding this inquiry was: In what ways do Nonprofit Management Education programs work to affect the capacity of local community nonprofit organizations? The answer, like much in the broader nonprofit sector, varies dependent on the particular resources available at the institution, and is largely driven by individual personalities. However, these findings do result in guidance for NME programs regarding how they interact with their local nonprofit sector. Evidenced in the many interactions with participants was the need for continued listening on the part of NME faculty. Stretched between the needs of students and the requests of local practitioners, it is important for NME administrators and faculty to listen to the myriad stakeholders to ensure that best outcomes are achieved by all parties. This study also reinforces the pragmatic notion of continual review of programs and solutions. What worked before may not work still, and what was never before necessary may be necessary now.

In order for interactions between NMEs and NCPs to result in improved quality of life in communities, those interactions must become institutionalized. Rather than being driven by individual personalities and relationships, interactions should be incorporated into the broader curriculum and focus of NME programs. With this change, impact on local communities
would not ebb and flow so dramatically through changes in leadership and faculty composition.

This study only begins the exploration of the influence and effects of NME programs on their local communities. Further research should more deeply explore the benefits and detriments of working with and near NME programs. Guiding questions appropriate for further study include: Are resources more or less available for nonprofit organization working in NME program communities? Do practitioners feel more or less supported than their counterparts in communities without NME programs? Answering these questions then finally leads to inquiry regarding the quality of life (level one of the STI) for residents in communities with NME programs.

Nonprofit Resource Centers (NRC) were specifically excluded from this study because their existence provides the framework by which NMEs (both students and faculty) can support the work of local organizations. A natural thought trail resulting from this study leads to the value of NRCs at institutions of higher education. While NME programs serve to benefit students, equipping them to enter the sector and be successful, the mandate for Nonprofit Resource Centers is focused on their local organizations. The marriage of the NME and the NRC serves both students, and the wider community.

Further research could seek to understand specific strategies that encourage the efforts of both NMEs and NRCs discussed through these interviews. These are expected to include, but not be limited to, requiring student involvement with nonprofit organizations during their coursework. This can be done as service learning, internships, or guided class projects. Other methods of integration will be eagerly explored. Institutionalizing these strategies could serve to provide stability and longevity of NME/NCP interaction even through and following staff turnover. As a study conducting utilizing pragmatism, it requires continued review, reassessment, reevaluation, and adaptation to remain accurate, relevant, and true.

References


Spotlights:
(Nonprofits, Social Impact Companies & Partnerships)
Spotlight 1 (Nonprofit)
Care for Life

HQ: Arizona, USA
Operating in: Mozambique, Guatemala, Sudan
Mission: Empower families in extreme poverty across the globe to achieve self-reliance, one community at a time.
Vision: Instill hope, promote self-reliance, & alleviate suffering.

Promote Self-Reliance & Alleviate Suffering

Sustainable Development Model: Care for Life’s mission, development initiatives, and principles form the sustainable development model. Each portion of the model illustrates a key component of Care for Life’s (CFL’s) strategic design to achieve family and village self-reliance.

Family Preservation Program: The Care for Life Family Preservation Program addresses food security in several ways listed below.

1. Helping families develop agriculture projects: Families are invited to attend classes on proper agriculture processes. A local leader is trained to assist and mentor each family. Care for Life Staff visits weekly to train and assist with the family’s agriculture project to ensure success.

2. Educating families on small business development to help food security: Individuals are invited to attend business classes and are encouraged to start a small business. They receive a certificate upon completion of the program. The families can join a credit savings group that allows them to borrow a small amount to start a business. Families are mentored and advised on managing their businesses to ensure success.

3. Literacy Program: For those who are illiterate and would have difficulty in the typical business classes, Care for Life provides a literacy program that includes literacy related to agriculture and small business. These classes are very successful in helping families develop projects that address food security.

4. Nutritional education and intervention. Community classes are taught on health and nutrition. The Care for Life Health Supervisor identifies families in the villages with nutritional needs and meets with them for instruction. Local leaders are trained to identify malnutrition and other health needs. A pictorial health booklet is provided to each family that discusses health and proper nutrition.
General Needs:

- Funds for seeds and gardening tools
- Fund to support our staff in training and educating the families in the villages we are helping.
- We have 2 new villages starting in 2024 that we need funding for
- We have plans to open a Project in Guatemala in 2024
- We are also working on a project in the DRC, Dominican Republic of Congo.

Impact

Story #1 - Clara, The Soda Lady: Clara started doing business in 2011, selling soda. In 2022 she had the opportunity to participate in the business classes offered by Care for Life. Since participating in the classes, she says she has seen major changes in her soda business. The classes helped her to improve the management of her business. Now the business is growing a lot, increasing its Stock buy 100%. She previously worked with one box of soft drinks, now works with ten boxes and sells much more than before. In this context, her life has changed a lot. With this growth, she has solved many of life’s difficulties for her and her family. They no longer suffer from a lack of food and other necessities. Clara now advises others to attend the same classes.

Story #2 - Regina, The Beet Lady: Regina has had several successful gardens after participating in the gardening classes offered by Care for Life. She decided to try something new with the encouragement of the Care for Life agriculture supervisor. Beets are not commonly available, but Regina found out they are very popular and profitable. Regina could not keep up with the demand this year while selling produce from her garden. It can be scary to try something new, but the Family Preservation Program has taught Regina self-confidence as she works towards self-reliance. Because of the success with the beet crop Regina’s family is in a much better financial situation. They have started construction on a new brick home to replace their mud home.

WikiCharities Profile:
www.wikicharities.org/nonprofit/USA/86-1017788
Spotlight 2
Sesi Technologies

HQ: Ghana
Operating: Throughout Africa
Founder: Isaac Sesi

Who is Sesi Technology (About): Located in Kumasi, in the middle of Ghana, Sesi Technologies is made up of young people from diverse fields, working together to fulfill a big purpose – to create and live in a world where poverty and hunger does not exist.

Technology by Africans for Africans.

Mission: Our mission is to lead the way to no poverty and zero hunger in emerging markets by empowering farmers and businesses with affordable technology solutions.

Measure Grain Moisture Content with Ease.

Product Details:
Grain Moisture Meter: GrainMate Grain Moisture Meter enables farmers, aggregators, feed producers and commodity traders to easily measure the moisture content in grains before buying, storage, or feed preparation to help reduce losses.

Moisture Testing Made Easy

With GrainMate Moisture Meter, grain farmers, aggregators, commodity traders, feed producers and warehouse operators can measure the moisture content in their grains with ease.

Knowing whether your grains are well dried helps you reduce post-harvest losses and aflatoxins in your grains.

GrainMate can measure the moisture content of up to 7 different commodities including corn, rice, soybeans, sorghum, millet, groundnut and wheat with more commodities on the way.
For Commercial Farmers & Smallholder Farmers:

- **Commercial Farmers** - Effective Solutions for Commercial Farmers and Agribusinesses. Our range of technology-enabled solutions help agribusinesses reduce losses, increase productivity and earn more. Post-harvest losses, whether during the storage, transportation, marketing or processing of grains significantly impact the profits of agribusinesses; from commercial farmers, aggregators, feed producers and even warehouses. Fortunately, our technology-driven solutions can help agribusinesses reduce losses, maximize productivity and increase their income. From grain moisture testing solutions to warehouse monitoring solutions, even to a digital platform which helps agribusinesses buy and sell grains, we have solutions that work.


  **The FarmerPack Process**

  We work with our partners to identify farmer-based organizations (FBOs) and enroll farmers within the group into FarmerPack.

  ![Diagram of FarmerPack Process]

  - **Training**
  - **Farm input**
  - **Threshing services**
  - **Storage bags**
  - **Moisture meters**
  - **Drying services**
  - **Warehousing services**
  - **Market access**

  **How it works**

  1. We identify, register and onboard farmers into FarmerPack.
  2. Farmers receive training in post-harvest management and how to use the technologies included in the pack.
  3. Farmers receive products and services at different stages within the season.
  4. We provide market access and help farmers set their produce at premium prices.
  5. Farmers pay for the products and services they receive from FarmerPack in cash or with part of their harvest.

Post-harvest losses occur at different points of the value chain. No single product or service can solve the problem and provide lasting value farmers need to break out of the cycle of poverty.

Our FarmerPack model combines several post-harvest management products and services with access to premium markets to help smallholder farmers reduce losses, maximize productivity and increase their income.

**Founding Story:** Our story began in March 2018, when our founder, Isaac Sesi decided to commercialize the output of a research project he worked on as a Research Engineer at his former university, KNUST.

He had led a small team to locally redesign and improve a grain moisture meter that had been developed by Dr Paul Armstrong, an agricultural researcher at the US Department of Agriculture under the Feed The Future Post-harvest Loss Innovation Lab.

After learning about the pressing global problem of post-harvest losses and realizing the impact this simple technology could make in the lives of smallholder farmers, he decided to found Sesi Technologies to put this technology in the hands of the 33 million smallholder farmers in Sub-Saharan Africa.

**Impact - Helping Farmers in Africa:**

“Seeing the farmers we work with succeed and empowered to enjoy lasting prosperity is why we do what we do. Over the last three years, we have empowered thousands of farmers with knowledge tools and technologies to help them reduce losses and increase productivity.” - Sesi Technologies

**Website:** [https://sesitechnologies.com](https://sesitechnologies.com)

**Our Impact in Numbers**

- 1500+ Smallholder farmers trained
- 37 Farmer-based organizations recruited
- 600+ Grain/tribe Moisture Meters In use
- 300+ Mt of grain protected with ZeraFly bags
Submissions

Call for Submissions
We are currently accepting articles, thought papers, and potential nonprofit spotlights for our journal. All submissions should be sent through our ScholarsArchive portal. Links can be found on our official website, www.journalofnonprofitinnovation.org/submissions.

Latest Research (Summaries)
We are looking for articles that use innovative thinking and approaches to community and global issues. Have you done research in a specific area? Are you an expert in a certain field? We want to hear from you!

Research & Thought Papers
We are looking for thought pieces from nonprofit leaders that have first-hand experience with community and global issues. Share your experiences and give us your thoughts on a specific topic!

Nonprofit & Partnership Spotlights
Is your nonprofit doing noteworthy things that you want others to know about? Spotlight your nonprofit in our journal! Note: To spotlight your nonprofit, you must be WikiCharities validated.

Upcoming Issues in 2024
- Charitable Giving
- Artificial Intelligence & Data
- Health
- Partnerships & Collaboration

Submission Deadlines
Visit our website for up-to-date information on deadlines. www.journalofnonprofitinnovation.org