

Consultant Names: Abhinav Kolli, Cara McMillan, Ricky Huang, and Ananya Agarwal



180Degrees
CONSULTING
— TEXAS —

Re:wild Your Campus

Qualitative Research Paper and Financial Case Study

April 29th, 2024



Contents

EXECUTIVE SUMMARY 3

MEET THE TEAM4

BACKGROUND AND OBJECTIVES5

RESEARCH PAPER.....7

RECOMMENDATIONS.....49

RISKS AND MITIGATIONS.....52

REFERENCES.....54

APPENDIX.....61



Executive Summary

In a concerted effort to pivot university campuses towards more sustainable and environmentally conscious land management practices, Texas 180 Degrees Consulting partnered with Re:wild Your Campus to produce a comprehensive document that aims to foster this transition. Since our organizations have a shared commitment to have campuses be pesticide-free, this document provides actionable insights and recommendations that guide universities through adopting and implementing organic land management practices.

The qualitative component of the research presents an in-depth analysis of the perceptions that influence our target audience's attitudes towards organic and conventional land care methods. This analysis, derived from interviews, surveys, and extensive literature reviews, explores the environmental benefits, economic implications, and social impact of adopting organic practices on college campuses. By capturing the voices and experiences of students, faculty, and administrators, the study highlights the community's growing preference for sustainable practices and the educational opportunities these practices afford.

The quantitative section complements this narrative with a financial case study centered on UT Dell Medical Center's organic land management practices. Through a comparative cost analysis, this study benchmarks the long-term financial sustainability of organic land care against conventional methods, utilizing data aggregated from multiple case studies of conventionally managed land. This financial evaluation not only underscores the economic viability of organic practices but also addresses common concerns regarding their cost-effectiveness, providing a persuasive argument for the broader adoption of these practices in university settings.

Overall, we hope this research can strengthen Re:wild Your Campus' advocacy mission and encourage other universities nationwide to participate in this environmental transformation.



Meet the Team



Abhinav Kolli

Project Lead



Cara McMillan

Senior Consultant



Ricky Huang

Senior Consultant



Ananya Agarwal

Junior Consultant

Background & Objectives

Re:wild Your Campus stands at the forefront of a nationwide initiative that champions the transformation of university campuses into harnessing organic land management practices. Their vision to eliminate synthetic pesticides by 2030 encapsulates a motivated commitment to fostering safe and vibrant educational landscapes. Through proactive collaboration with campus leaders, students, and community organizations, Re:wild Your Campus spearheads the implementation of organic land care through their unique pilot program operations. After several college success stories, they have established a remarkable program to kickstart universities in shifting away from conventional, synthetic-based pesticides and embracing organic practices. They support the initial upfront costs that come with organic land care, provide expert connections with groundskeepers, and even fund the necessary resources to manage a college pilot program. On another note, their ambitions towards educational and training programs like "Ground Up Advocacy Bootcamps" are wonderfully designed to address pesticide use and environmental justice, equipping interested students and faculty with the knowledge to nurture organic care in campus green spaces. Lastly, they have an established Green Grounds Certification, verified by sustainability experts and groundskeepers, that encourages colleges within their program to maintain organic practices.

Texas 180 Degrees Consulting complements this vision by bringing actionable insights and strategic acumen to nonprofit organizations, including Re:wild Your Campus, which strives for significant ecological impacts. As a student-run consultancy at the University of Texas at Austin, Texas 180 Degrees Consulting provides a platform for students to lend their support and expertise to nonprofits needing strategic guidance.

As a result, we at Texas 180 hope to collaborate with Re:wild Your Campus and address several challenges their organization faces on their mission to sustainable land management. After discussions with founders and project directors, we identified several pain points. For starters, college faculty often grapple with concerns over the accrued costs of initiating and sustaining organic projects, particularly when juxtaposed against conventional land care that has been the norm for years. This financial hesitancy is rooted in the perception that eco-friendly approaches have a prohibitive price tag. Likewise, college students themselves are unaware of the harmful effects of conventional, pesticide-based products. Without proper education on land care, many students will lack motivation to pursue this environmental mission. On the other hand, current



project ambassadors and groundskeepers struggle with budgeting and cost management when handling pilot projects.

To address these concerns, we have devised two key objectives to support our partnership with Re:wild Your Campus: deliver a qualitative and quantitative research framework that substantiates the long-term benefits of organic land management and craft a narrative that supports the expansion of Re: wild's pilot programs and outreach initiatives. While researching, we hoped to keep as much of our content as unbiased as possible to get as many nuanced perspectives to cover each lens: environmental, economic, and social implications. The overall project endeavors to accomplish the following:

- Provide a holistic review of over 40 environmental studies, showcasing the impact of organic practices on campus biodiversity.
- Offer an economic analysis that elucidates the long-term financial advantages of organic land management compared to conventional practices.
- Gather various university campus perspectives through surveys, reflecting on the preferences for land management and the social implications thereof.
- Present a financial case study on the UT Dell Medical Center's organic land care approach while comparing it against data from conventionally managed land.

By achieving these objectives, our research aims to equip Re:wild Your Campus with a compelling evidence-based portfolio. This will serve as an invaluable tool in persuading other colleges to adopt organic practices. Moreover, it will ensure that students step into university spaces that are not only educationally enriching but also environmentally conscious.



Research Paper

This research paper presents a qualitative exploration into the nuances of land management practices, particularly comparing organic to conventional methods within the context of college campuses. It delves into the environmental, economic, and social implications, drawing from a rich set of perspectives among stakeholders including students, faculty, and administration. Through interviews, surveys, and a comprehensive literature review, the qualitative component aims to unravel in-depth insights into the preferences, attitudes, and values that shape the discourse on sustainable land management. It contextualizes the decision-making processes within academic institutions and dissects the broader cultural and societal narratives that influence these choices, which offers a thorough understanding of the motivations and implications behind various land care strategies.

On the quantitative side, the paper shifts focus to a case analysis framework, applying financial data to evaluate the cost-effectiveness of organic versus conventional land management practices. Utilizing a detailed financial case study from the UT Dell Medical Center, the analysis contrasts the long-term economic performance of organic land care with aggregated data from five conventional land management case studies. By presenting a rigorous cost analysis that encompasses installation, maintenance, and overall lifecycle expenses, the quantitative section underscores the financial sustainability of organic practices. This part of the paper not only substantiates the qualitative findings with empirical evidence but also provides a tangible financial perspective, facilitating a balanced view that educational institutions can reference when considering their land management options.



Effects and Implications of Organic versus Conventional Landscaping Practices

Comparative Study: Qualitative Meta-Analysis and Financial Case Study

University of Texas at Austin

Texas 180 Degrees Consulting

**Abhinav Koli
Ananya Agarwal
Cara McMillan
Ricky Huang**

April 26, 2024



TABLE OF CONTENTS

	Page
INTRODUCTION.....	10
LITERATURE REVIEW.....	12
METHODOLOGY.....	20
ENVIRONMENTAL IMPLICATIONS.....	27
ECONOMIC IMPLICATIONS.....	30
SOCIAL AND COMMUNITY IMPACT.....	34
FINANCIAL CASE STUDY.....	39
CONCLUSION.....	47



Introduction

A. Background on Organic and Conventional Land Management Practices

Organic land management practices emphasize the use of natural, non-synthetic materials and methods for landscaping, pest control, and soil management. These practices prioritize environmental sustainability, biodiversity, and minimizing the use of synthetic chemicals that can have negative effects on the surrounding environment and human health.

Conventional land management practices rely heavily on synthetic pesticides and fertilizers, leading to irresponsible water usage. These synthetic products, while effective in controlling pests and promoting plant growth, can have detrimental impacts on the environment and human health. Pesticides and herbicides can contaminate soil, water sources, and air, posing risks to various forms of life, including beneficial insects, birds, and aquatic organisms. Additionally, the overuse of these fertilizers can lead to nutrient runoff, overwatering, and soil erosion.

In contrast, organic land management is the use of organic pesticides and fertilizers and changing planting practices to improve soil health and water usage. Composting or recycling old matter into plant fertilizer provides essential nutrients for plant growth while improving soil water retention and aeration. Additionally, organic practices often involve the use of natural pest control methods, such as introducing beneficial insects or employing integrated pest management (IPM) techniques, which combine different methods to manage pests.

Furthermore, numerous studies have linked exposure to certain synthetic pesticides and herbicides to various health concerns, including cancer, reproductive problems, neurological disorders, and respiratory issues. These potential risks highlight the importance of adopting sustainable and responsible land management practices, particularly in sensitive areas such as college campuses, where students, faculty, and staff spend significant amounts of time.

Organic land management practices help provide a solution to these issues. These practices may require more labor-intensive methods and potentially higher initial costs, however, they offer long-term benefits in terms of environmental preservation, biodiversity promotion, and reduced health risks.



B. Importance of Sustainable Land Management on College Campuses

College campuses tend to have expansive green spaces and diverse ecosystems, giving them the ability to play a crucial role in promoting sustainable land management practices. Many colleges and universities also have established sustainability goals and commitments, and adopting environmentally responsible land management practices is a tangible step toward achieving these objectives. By transitioning to organic land care, campuses can eliminate the use of synthetic pesticides and chemical fertilizers. Sustainable land management practices also align with the growing global emphasis on environmental sustainability and mitigating climate change.

Implementing sustainable land management practices on college campuses reduces the college's ecological footprint while providing valuable learning opportunities for students, faculty, and staff. These practices can contribute to the preservation of local biodiversity, decrease water usage, and reduce air pollution. Incorporating organic land care practices on college campuses can also have long-term benefits that reach beyond the institution's borders.

Furthermore, the implementation of sustainable land management practices on college campuses can serve as a model for other institutions, organizations, and even residential communities. By demonstrating the feasibility and benefits of these practices, campuses can inspire and influence broader adoption of sustainable land management approaches.

C. Purpose of the Comparative Study

The primary purpose of this research paper is to provide a comprehensive analysis of organic and conventional land management practices on college campuses, with a particular focus on their environmental, economic, and social impacts. By examining these practices through a multifaceted lens, the paper aims to inform and encourage institutions of higher education to adopt more sustainable and responsible land management strategies.

By examining the various aspects of land management, this research paper aims to inform and encourage institutions of higher education to adopt organic land care practices. Through a thorough understanding of the issues at hand, college campuses can make informed decisions that align with their commitment to environmental sustainability and lead to a sustainable future.

Literature Review

A. Introduction

Organic land care is an overlooked yet highly important concept to consider as society moves toward more sustainable practices. When it comes to land management, aesthetics tend to be prioritized, and many believe that an optimal appearance can only be achieved through the use of synthetic pesticides, fertilizers, harsh chemicals, lots of water, and non-native plants. However, as the scientific world has become more aware of the need for environmental research over the past few decades, data has increasingly supported the conclusion that holistic, organic practices that mirror nature as closely as possible produce the best possible outcome for the environment, the bank account, and the aesthetic appeal.

The goal of the following literature review is to summarize the existing research and provide easily digestible data to support the overarching claim that organic practices are preferable to inorganic land management. We have reviewed academic journals, research papers, local and national government ordinances, case studies, gardening articles, and more. The reviewed data is organized and will be discussed in the following order: benefits of organic land care, common standards and regulations for organic care, economic and environmental costs of pesticide use, and global trends in organic agriculture.

B. Overview and Benefits of Organic Land Care

Nature-based land care revolves around the adoption of sustainable practices rather than dependence on synthetic products. Key strategies include planting native flora, eliminating invasive species, abandoning chemical usage, transitioning to electric equipment, reducing lawn areas, and supporting pollinator habitats. The growing demand for nature-based land care services far exceeds the current supply, indicating strong business opportunities in this sector. Organic land care, as advocated by NOFA, prioritizes soil health, biodiversity, and human and ecosystem well-being. NOFA standards emphasize the avoidance of synthetic chemicals and the promotion of natural management strategies. Concerns over synthetic pesticide use highlight risks such as cancer, birth defects, and hormonal disruption, particularly with chronic, low-level exposure and chemical combinations. Organic land care advocates for minimizing pesticide use through ecological methods and natural alternatives like microbial and botanical pesticides while weighing the risks versus benefits in lawn and turf management.



A study comparing farming practices and costs in California reveals distinct differences between organic and conventional methods. Organic practices rely on cultural methods and allowable supplements, while conventional methods heavily utilize synthetic inputs. Each crop presents unique challenges, with organic producers employing cover crops and compost for fertility management while conventional growers rely on synthetic fertilizers. While organic methods may require more labor, particularly for hand weeding, conventional systems often depend more on herbicides. Despite higher initial costs, organic land care yields savings over time, with studies showing reductions of over 25% compared to chemical-intensive methods once soil health improves.

Chemical land management focuses on treating symptoms with synthetic pesticides and fertilizers, whereas organic management prioritizes soil health and prevention through cultural practices and natural inputs. Despite potential initial higher costs, organic land management offers long-term savings due to reduced reliance on expensive inputs. Additionally, organic practices mitigate external costs, such as health risks and environmental harm associated with chemical approaches, making organic management economically viable in the long run.

Nature-based land care, including organic methods advocated by NOFA, offers a sustainable alternative to conventional agricultural practices. By prioritizing soil health, biodiversity, and ecosystem well-being, nature-based approaches address environmental concerns while presenting economic opportunities for farmers. Transitioning to organic land care not only reduces reliance on synthetic inputs but also fosters resilience and profitability in agricultural systems. Embracing nature-based principles is essential for building a more sustainable and resilient food system for future generations.

C. Organic Land Care Standards and Regulations

The literature reviewed highlights a diverse array of initiatives and programs aimed at promoting organic land care practices and mitigating the adverse impacts of pesticide usage on soil health and biodiversity. From national standards and certification programs to local ordinances and grassroots initiatives, there is growing momentum towards fostering sustainable and regenerative land management practices. By integrating soil health considerations, promoting organic practices, and empowering stakeholders with knowledge and resources, these efforts contribute to building resilient and ecologically sound communities for generations to come.



The National Organic Program (NOP) plays a pivotal role in establishing national standards for organic agricultural products in the United States. Through its certification process, NOP ensures that farms and businesses adhere to stringent organic regulations, thereby promoting consumer trust and transparency in organic labeling. Recent rulemaking initiatives aimed at strengthening oversight and enforcement of organic production and handling further underscore the commitment to upholding organic integrity. Additionally, initiatives like the Transition to Organic Partnership Program (TOPP) provide crucial support to transitioning and existing organic farmers, fostering a vibrant organic agriculture sector.

The ordinance enacted in Portland, Maine, exemplifies local efforts to prioritize environmental and public health in land management practices. By restricting the use of pesticides and fertilizers for turf, landscape, and outdoor pest management, the ordinance aims to safeguard waterways and natural resources while promoting sustainable land care practices. Clear definitions, oversight mechanisms, and enforcement measures outlined in the ordinance underscore the city's commitment to fostering healthy and resilient communities.

Maryland's pioneering efforts in organic land care represent a significant milestone in pesticide reduction strategies. Collaborative initiatives between governmental agencies and landscaping firms have successfully transitioned public grounds to pesticide-free organic care, showcasing the feasibility and benefits of organic practices in mitigating pesticide runoff and protecting environmental and public health. Sustained government support and ongoing advocacy efforts underscore the momentum toward widespread adoption of organic land care practices in Maryland and beyond.

Initiatives in New York aimed at promoting sustainable land care practices offer valuable resources and guidance to homeowners, residents, and landscaping professionals. Cornell's Lawn Care Without Pesticides and Harvard's Sustainable Landscape Management programs exemplify holistic approaches to lawn and landscape care, emphasizing soil health, natural nutrient cycles, and adaptive management strategies. By empowering individuals and professionals with knowledge and tools for sustainable land management, these initiatives contribute to building resilient and ecologically sound communities.

The Oregon Tilth Accredited Organic Land Care Program represents a collaborative effort to promote sustainable landscaping practices and professional accreditation. By training and accrediting Organic Land Care Practitioners, the program seeks to elevate standards and promote organic land care practices that support ecosystem and human health. Emphasizing the



optimization of soil health, renewable materials usage, and consideration of wider social and ecological impacts, the program embodies the principles of sustainable and regenerative land management.

In Idaho, initiatives led by Soil Foodweb Consultant Todd Harrington showcase the feasibility and benefits of organic land care practices. Through biological treatments and organic management strategies, landscapes have been established without the use of chemicals, fertilizers, pesticides, or herbicides. The success of these initiatives underscores the potential for organic land care to mitigate environmental harm and promote landscape resilience, serving as a model for sustainable land management practices.

D. Economic, Environmental, and Health Costs of Pesticide Use

Pesticides have long been integral to modern agricultural practices and are praised for their efficacy in pest control and crop yield enhancement. However, emerging evidence points to their significant drawbacks, including adverse effects on ecosystems, human health, and economic sustainability. This literature review aims to explore the multifaceted impacts of pesticide use, encompassing its effects on soil microorganisms, economic disparities within the pesticide sector, public health implications, environmental consequences, and regulatory oversight gaps.

Pesticides exert profound effects on soil microbial communities, disrupting vital ecological processes and compromising soil health. Studies have demonstrated that commonly used pesticides, such as herbicides and insecticides, substantially reduce the abundance and activity of soil bacteria, fungi, and actinomycetes. Herbicides like dimethachlor and linuron are particularly detrimental, altering microbial composition and enzymatic activity. Understanding these interactions is crucial for sustainable agriculture.

A critical analysis of the pesticide sector's economic landscape reveals a significant disparity between costs and benefits. Despite substantial investments in chemical-intensive agriculture, the economic returns fall short, with the costs of pesticide use outweighing the profits generated. Reallocation of funds towards organic farming practices could offer a more economically viable and environmentally sustainable alternative.

Pesticide exposure poses significant risks to human health, with mounting evidence linking synthetic pesticide use to a range of acute and chronic illnesses. Strong correlations exist between pesticide exposure and childhood cancers, with pets, particularly dogs, facing elevated

cancer risks. The economic burden of pesticide-related health issues underscores the urgent need for proactive public health interventions and regulatory reforms.

Pesticides pose grave environmental threats, permeating soil, water, and air ecosystems with deleterious consequences for biodiversity and ecological integrity. Synthetic fertilizers and pesticides contribute to water pollution through runoff, contaminating rivers and water bodies and disrupting aquatic ecosystems. Furthermore, indiscriminate pesticide use leads to the loss of beneficial insects and birds, exacerbating pest infestations and ecological imbalances. Urgent calls for policy changes have emerged to mitigate pesticide pollution and support ecologically sustainable land management practices.

One of the most pressing challenges in pesticide regulation lies in addressing the regulatory oversight gap and advocating for policy changes to safeguard soil biodiversity and ecosystem health. Despite mounting evidence of pesticide harm to soil organisms, regulatory frameworks often prioritize short-term economic interests over long-term environmental sustainability. Urgent calls for action have emerged from the scientific community, urging regulatory agencies to reassess pesticide risks and incorporate soil health considerations into pesticide regulation. Synthetic fertilizers and pesticides have indeed revolutionized modern agriculture, yet their widespread use comes at significant costs to environmental and human health. This essay delves into the multifaceted impacts of synthetic chemical use, exploring their effects on ecosystems, human health risks, and alternative organic land care practices.

Synthetic chemicals, including fertilizers and pesticides, pose significant environmental threats, leading to water pollution and disrupting delicate ecosystems. Runoff from agricultural fields laden with synthetic chemicals contaminates rivers and water bodies, endangering aquatic life and compromising water quality. Moreover, these chemicals disrupt ecosystems by killing beneficial insects and birds, leading to larger pest infestations and biodiversity loss. Petroleum-based fertilizers exacerbate the issue by encouraging abnormal plant growth, disrupting the natural balance of ecosystems.

The health risks associated with synthetic pesticide exposure are profound, with numerous studies linking them to childhood cancers like leukemia and non-Hodgkin's lymphoma. Pets, especially those exposed to weedkillers like 2,4-D, face twice the risk of cancer, highlighting broader implications for animal health. Overuse of synthetic pesticides can also create resistance to pests, worsening infestations, and posing health risks to humans and animals alike.

Despite these risks, viable alternatives and practices for organic land care exist that mitigate the need for synthetic chemicals. Pruning and protecting plants can reduce reliance on synthetic pesticides, while natural predators like ladybugs offer effective pest control solutions, promoting ecosystem balance. Additionally, soil testing, composting, and careful plant selection foster healthy soil and minimize synthetic chemical use, laying the foundation for sustainable agricultural practices.

Furthermore, the economic and environmental costs of pesticide use underscore its unsustainability. Conventional pesticide-based crop production incurs annual costs that far exceed the economic benefits generated from yields, highlighting the inefficiencies of chemical-intensive agricultural practices. Moreover, environmental costs, including soil, water, and air contamination, biodiversity loss, and pollinator decline, emphasize the urgent need for a transition to more sustainable agricultural methods. Embracing organic farming practices offers a promising solution to eliminate toxic chemical use in agriculture, protect human and environmental health, and promote a sustainable food system.

The economic disparity within the pesticide sector further underscores its unsustainable nature. Studies reveal that costs associated with pesticide use in Europe are twice as high as profits generated by the industry, indicating systemic economic inefficiencies. Urgent calls for reallocating funds towards transitioning to organic farming have emerged, offering a more efficient use of agricultural funds while addressing societal costs associated with pesticide use. Additionally, significant health impacts of synthetic chemicals, including pesticides, underscore the need for policy interventions to protect public health. Chemical exposures cost the U.S. economy approximately \$340 billion annually, equivalent to 2.3% of GDP, highlighting the economic burden of pesticide-related diseases. Urgent policy interventions, such as reducing exposure through informed consumer choices and promoting organic farming practices, are essential to mitigate health risks and reduce economic burdens associated with pesticide use. The environmental and health impacts of synthetic chemical use in agriculture are significant and multifaceted. By harming human, environmental, and economic health, pesticides have proven themselves to be much less efficient and beneficial than organic alternatives. Next, we will see how the growth of organic initiatives is impacting the global stage.

E. Global Trends and Initiatives in Organic Agriculture

The global agricultural landscape is witnessing a significant shift towards more sustainable and organic practices in response to mounting concerns over the environmental and human health



impacts of conventional farming methods. This literature review explores key trends and initiatives in organic agriculture, highlighting the benefits, challenges, and potential pathways for sustainable management.

Pesticides have long been relied upon as essential tools for pest control and crop protection in agriculture. However, their widespread use has raised serious concerns about environmental contamination and human health risks. Studies suggest that pesticides pose significant threats to soil health, water quality, and biodiversity while also contributing to the development of pesticide resistance in target pests. Moreover, pesticide exposure has been linked to a range of adverse health effects in humans, including cancers, reproductive disorders, and neurological impairments. In light of these risks, there is a growing call for sustainable management practices and stricter regulations to minimize pesticide use and mitigate its impacts on the environment and public health.

The European Union (EU) has taken proactive steps to address the environmental and health risks associated with pesticide use through its Farm to Fork Strategy, which aims to achieve a 50% reduction in pesticide use and risk. However, achieving these targets poses significant challenges, as evidenced by a recent study on approved synthetic pesticides. The study suggests that meeting reduction goals may require severe restrictions on pesticide usage, highlighting the need for re-evaluation of approved pesticides and exploration of alternative strategies. Moreover, pesticides with wide-ranging applications continue to pose risks to humans and ecosystems, underscoring the importance of comprehensive risk assessments and data availability to inform regulatory decisions.

The adoption of natural organic fertilizers in lawn care has been limited despite growing concerns about the harm caused by synthetic chemicals. Challenges in selling natural organic programs to consumers include higher costs and the preference for quick results associated with synthetic fertilizers. However, research suggests potential benefits of natural organic fertilizers, including increased microbial activity and disease suppression. Transitioning to natural organic lawn care involves evaluating existing lawn quality, conducting soil testing, and prioritizing proper maintenance practices such as organic fertilization and pest management. While widespread adoption of natural organic lawn care programs remains limited, growing interest in organic methods reflects a broader shift towards sustainable land management practices. Organic farming practices have experienced a surge in popularity worldwide, reaching 71.5 million hectares across 180 countries by 2018. This growth is driven by high consumer demand for organic products and significant economic incentives for farmers transitioning to organic



practices. Major economies like the U.S., Germany, and France lead this growth, underscoring the economic viability of organic agriculture. Moreover, organic farming promotes biodiversity, soil health, and natural resistance to foodborne pathogens, offering solutions to environmental degradation and health risks. Scientific studies support its efficacy in yield production, farmer profitability, and environmental protection, further bolstering the case for widespread adoption of organic farming practices.

In conclusion, the literature reviewed highlights the global trends and initiatives in organic agriculture, emphasizing the need for sustainable management practices, stricter regulations, and greater investment in organic research and education. By embracing organic farming methods, we can build resilient agricultural systems that protect the environment, promote human health, and ensure food security for future generations.

Methodology

A. Qualitative Research Approach

The qualitative research approach in the study is designed to comprehensively explore the environmental, economic, and social impacts of organic versus conventional land management on college campuses. This methodology was chosen to delve into complex, multifaceted issues that require understanding subtle contextual factors that quantitative data alone cannot provide. By incorporating a wide array of perspectives, qualitative research allows for in-depth insights into how various stakeholders, such as students and faculty, perceive and interact with land management practices. These insights will be crucial for a thorough analysis in the discussion and conclusion sections provided later in the report.

Our study utilizes a meta-analysis approach for the qualitative side, aggregating data from existing studies and literature reviews to gain a wide range of perspectives on land management practices. This method is complemented by testimonials, survey results, and questionnaires targeted at various campus stakeholders like students, faculty, and administrators. These elements are framed within theoretical frameworks like stakeholder-centered research and ecological systems theory, which guide our analysis of the interactions between human behaviors and environmental outcomes. The comprehensive approach allows us to systematically explore the social, economic, and environmental dimensions of land management.

1. Literature Review and Initial Meta-Analysis

The foundation of our qualitative analysis is built upon conducting a comprehensive literature review to gain an understanding of current research related to the study. Initially, we shortlisted an array of 47 articles and documents that had been previously studied in a meta-analysis conducted by members of Re:wild Your Campus. Additional articles found during discussions with other project founders of the Re:wild pilot program were also included in our Excel. In order to find key sources, we systematically cataloged resources by category and derived three key takeaways from each article, particularly emphasizing those with significant relevance or startling statistics that could reinforce our discussion about organic versus conventional practices from a non-biased perspective. Moreover, we tackled these takeaways in a way that highlighted our study's three lenses: environmental benefits, economic implications, and social impacts/community engagement. This process helped identify significant gaps in existing studies



to better understand the broader implications of what organic and conventional practices are present and how they are effectively implemented.

Certain studies even revealed growing evidence of increased long-term benefits related to organic practices, contrary to the popular belief that conventional practices assured cheaper, effective land care. As a result, this study aims to focus on synthesizing these findings from the literature review and extrapolate more qualitative factors that could reinforce whether organic practices are more effective than conventional practices. We utilized these previous sources as a robust framework to work off of, which ensures that any new academic findings or data discovered can be seamlessly integrated. Overall, the literature review strengthened the rigor of our analysis and created a clear motivation/linkage between our new findings and the argument of organic versus conventional practices, ensuring a coherent narrative to draw conclusions from.

2. Widespread Surveys and Student/Faculty Testimonials

On the other hand, to complement our literature-based insights with current opinions and experiences, we conducted a widespread survey among college students and faculty members. The stakeholders primarily consisted of University of Texas at Austin students and faculty members, Austin-adjacent college students, and affiliate faculty members spearheading agriculture work at their respective universities. This target audience ensured that we got a large, unbiased perspective on the concerns or benefits related to organic practices or conventional practices. While each survey was filled, we collected personal information related to their role on campus, which assisted us in segmenting responses appropriately (one section for students and another section for faculty/administrators). While administering the survey, we collected personal information to appropriately segment responses by role—students versus faculty/administrators—allowing us to tailor questions to the experiences relevant to their specific roles and insights on land care management.

To ensure the integrity and usefulness of our survey results and testimonials, each question was carefully drafted to be neutral and unbiased, avoiding language that may lead respondents towards a particular answer. The survey design underwent multiple revisions with input from Re:wild Your Campus members and experts within our Texas 180 Consulting Organization before releasing the form. This ensured that each question captured authentic insights into our target demographics' true perceptions of land care. Likewise, the questions discretely aligned with our study's objectives to evaluate the environmental, economic, and social benefits of either land management practice. By employing open-ended questions and nuanced scenarios, we were



able to delve deeper into subjective experiences and complex attitudes of participants regarding organic or conventional practices. Ultimately, the responses provided critical insights that inform us of broader discussions and decisions about sustainable land management on college campuses. These insights were seamlessly integrated with our qualitative data and findings from the literature review.

B. Financial Case Study - Quantitative Research Approach

The quantitative research approach in our study complements the qualitative insights by assessing and comparing measurable financial outcomes of organic versus conventional land management practices. This approach is essential for validating the subjective perceptions and narratives gathered through qualitative methods using empirical data. By conducting a case study that includes a direct comparison between UT Dell Medical Center, which employs organic land care practices, and a conventionally managed area near UT Austin's campus, we aim to quantitatively evaluate financial factors and budgeting practices from either practice. This method will allow us to not only confirm or challenge anecdotal claims about organic practices but also quantify their benefits or detriments through decades of long-term data. Given a variety of data, our case study will primarily focus on water quality, soil quality, cost-saving strategies, costs incurred from fertilizers and pesticides, and more that will be discussed in later sections. The results of this comparative study will provide solid empirical evidence to support our overall conclusions about how effective and sustainable organic land management is on college campuses.

Our case study is rooted in a theoretical framework of ecological modernization theory. EMT posits that environmental protection and economic growth can be reconciled and that advancements in technology and regulatory practices can enhance environmental health alongside long-term economic benefits. Applying this framework, our case study reveals whether organic land practices, which have typically been seen as environmentally benign alternatives to conventional methods, can also align with long-term economic sustainability while contributing positively to environmental health. We position our research to assess how modern ecological practices identified by the current UT agriculture department, Re:wild Your Campus pilot program administrators, and existing literature review sources affect financial factors and land care management. This framework supports our investigation into practical trade-offs and synergies between both conventional and organic land care management practices.

C. Selection of Audiences/Field Studies

1. *Target Audiences for Surveys*

In order to ensure a robust understanding of all the perceptions and impacts on land management practices, our survey was strategically divided into sections targeting distinct groups: students and faculty. This separation allowed us to tailor questions that are most relevant to experiences of each group.

For students, we reached out to a wide spectrum, including those from the University of Texas at Austin, members of environmental student organizations, students randomly selected among non-environmental student organizations unaware of land care issues, and students from colleges adjacent to Austin. By adhering to a mixed-methods approach, we could enrich our understanding of student perspectives across different lenses.

Likewise, we applied a similar strategy among faculty and project directors involved in the Re:wild Your Campus pilot program. Our outreach extended to faculty members from the University of Texas at Austin's agriculture department, like Jim Carse and Justin Hayes, as well as those from adjacent college campuses. This ensured a comprehensive scope of academic and administrative perspectives from those who support organic practices and those who do not to gain, again, an unbiased understanding of faculty opinions. Recognizing that faculty members often balance environmental aspirations with fiscal realities, we tailored our inquiries to explore how financial limitations and budgeting concerns influence their attitudes towards and implementation of land management practices. This distinction in survey structuring acknowledges the differing priorities between the current generation of students, who may hold more progressive views on environmental change, and faculty, who navigate with practical constraints of budgeting and policies. This nuanced understanding adds a dimension to our analysis, allowing us to assess the feasibility and sustainability of adopting organic practices.

2. *Field Studies for Financial Case Study*

Our research sought to investigate the long-term financial and managerial benefits of organic versus conventional land management practices. The best approach, we believed, was to have a specific focus on land managed by Dell Medical and compare it to conventionally managed land. Known for its exemplary use of organic practices, Dell Medical has been a beacon of sustainable growth for over a decade. We worked directly with Justin Hayes and Jim Carse, main



groundskeepers of the area, on the project to gather pertinent data to explain what organic fertilizers, pesticides, and practices are implemented and their effects on overall land vegetation at Dell Medical. Hence, this land served as the primary point of comparison for the case study to evaluate the economic efficiency of organic land management strategies.

Since we had a lack of field equipment and time to conduct experiments and aggregate similar data on conventionally managed land, we employed a meta-analysis of previously done case studies. We looked into five distinct ones, each detailing various aspects of conventionally managed land. These case studies were meticulously selected based on how comprehensive their data was regarding the several key metrics we hoped to identify: installation costs, maintenance practice effectiveness like aeration and irrigation, fertilizing and soil amendments, and direct labor costs. This broad spectrum allowed us to cover the typical range of activities/expenses involved in conventional land care, which could be used in direct comparison with Dell Medical.

After conducting the meta-analysis, we synthesized the collected data into an averaged unitary value representing conventional land management practices. This was achieved by calculating the mean of each cost and practice metric across all the selected studies, which established a standard baseline for comparison. Now, we could directly evaluate the economic and environmental sustainability of organic land management. This comparison, as a result, ensured a fair and unbiased approach since we considered multiple sources of conventional lands to compare (reducing the chance of inflated or deflated metrics from any particular source).

D. Data Collection Methods

1. Interview Questions for Students

In our surveys, we designed a set of interview questions aimed at gauging college students (mostly University of Texas at Austin students) on their familiarity and perspectives regarding organic and conventional land management practices. The questionnaire began with basic inquiries such as, *"How familiar are you with the terms 'organic fertilizers' and 'inorganic fertilizers'?"* and *"Do you think organic land management is more or less expensive than using inorganic pesticides and practices?"* These initial questions served to assess the baseline understanding of students and set a contextualization on how educated their following responses are for the remainder of the survey.

The interview questions progressively addressed more complex issues by introducing relatable scenarios and probing student opinions on environmental, social, and economic implications (the three analytical lenses of the study). For instance, questions like, *"If you were attending a university where water fountains were contaminated with pesticide residues, how would that make you feel?"* and *"Do you believe that the use of chemical fertilizers and pesticides on campus could have any impact on your health or the health of the local ecosystem?"* were designed to elicit emotional and health-related responses that provided deeper insights into the students' priorities. It also helps set the stage by encouraging students to imagine themselves in scenarios that may have unknowingly affected them then or in the past.

Lastly, we finish off with questions that support or relate to the cause of Re:wild Your Campus and organic land care management. For instance, we probed them to see whether they would *"support initiatives on policies that promote the use of organic fertilizers and environmentally-friendly pest management practices on campus."* This helps us explore whether the questionnaire had an impact on their mindset of land care management and whether they would support sustainable practices. Overall, this structured approach ensured that we captured a comprehensive spectrum of student opinions.

2. Interview Questions for Faculty

On the other hand, we hoped to understand the differing perspectives of faculty members and groundskeepers managing college lands from student perspectives. Hence, we crafted a series of questions tailored to them, particularly focusing on their financial acumen and personal experiences with organic versus conventional methods. If there were faculty members who responded that were unsure of current agricultural practices (like professors), we allowed them to respond with "N/A" to particular questions.

Faculty members were first asked to evaluate the cost-effectiveness of organic land management compared to conventional practices by asking questions like, *"Do you think organic land management is more or less expensive than using inorganic pesticides and practices?"* Similar to the student's section approach, this question aimed to gauge understanding of the economic dimensions of land care. Further inquiries such as, *"How important is sustainability research to the university, in your opinion?"* and *"What sustainability initiative on UT campus is most important to you as a faculty member?"* were designed to assess the priority placed on sustainability within a university context and identify initiatives they value most. Our current questions were directed initially towards UT campus professors and faculty, but we have the

liberty to alter these questions to target other college campuses that Re:wild Your Campus hopes to target as well.

The questionnaire continued into asking practical experiences of faculty with organic methods. For example, we asked, *"In your experience, what were some of the most significant benefits or positive outcomes observed after switching to organic products?"* and *"Were there any unexpected challenges or drawbacks that arose from using organic products that you had to address?"* These aimed to uncover real-world impacts and challenges encountered in the transition to organic practices. By understanding both positive and negative outcomes, we could gather an unbiased, balanced view of the implications of adopting sustainable practices in a university setting.

3. Survey Collection Strategies

We utilized Google Forms to distribute and collect survey responses efficiently. This platform was primarily chosen for its ease of use and familiarity among our target audiences. It also has robust data management capabilities that allow us to capture automatically generated pie charts, tables, and metrics of aggregated quantitative data and some qualitative responses. All responses were automatically recorded in Google Sheets, which could facilitate thematic analysis. Moreover, it was much simpler to collect testimonials from open-ended questions through this process, especially for the social and community impacts section.

Moreover, we believed it was critical to make the form reusable and editable to include new questions that Re:wild Your Campus members would appreciate asking. Future strategies could include incentivizing participation through gift cards or raffle systems to enhance survey participation and diversify respondent pools. Our current approach, while slightly effective, simply asked student organizations and faculty via word-of-mouth and social media to fill out the form. By encouraging new mediums of requesting survey responses, we can retrieve more comprehensive data to include in future studies related to this topic.

Environmental Implications

A. Introduction

In today's agricultural landscape, the choice between inorganic and organic land practices carries significant implications for environmental sustainability. While inorganic methods often rely on synthetic chemicals like Roundup and fertilizers containing phosphates and nitrates, organic approaches prioritize natural processes and ecosystem health. This section delves deeper into the environmental costs associated with inorganic practices compared to organic alternatives, highlighting the detrimental effects of chemicals, water pollution, and the numerous benefits of organic land care.

B. Issues with Inorganic Land Care

Inorganic land management relies heavily on synthetic chemicals, including glyphosate-based herbicides like Roundup. Glyphosate, classified as a probable human carcinogen by the International Agency for Research on Cancer (IARC), has been linked to adverse effects on soil microbiota and biodiversity. Moreover, the widespread use of chemical fertilizers containing phosphates and nitrates contributes to nutrient runoff, leading to the eutrophication of water bodies and harmful algal blooms. According to the United States Geological Survey (USGS), nitrate contamination affects approximately 4.5 million people in the United States, primarily in agricultural regions.

The environmental impacts of inorganic farming extend beyond chemical contamination to water pollution and overuse. Inorganic agriculture often relies on intensive irrigation practices, particularly in arid regions, exacerbating water scarcity and depleting freshwater resources. The cultivation of water-intensive crops like inorganic peaches further exacerbates this issue, leading to aquifer depletion and soil salinization. Moreover, the runoff of chemical fertilizers and pesticides into waterways poses significant threats to aquatic ecosystems, disrupting food webs and compromising water quality.

C. Organic Land Care Overview and Benefits

In contrast to inorganic methods, organic land care emphasizes sustainable practices that promote soil health, biodiversity, and ecological resilience. Organic farming relies on natural inputs such



as compost, cover crops, and crop rotation to enhance soil fertility and structure. Studies have shown that organic soils exhibit greater microbial diversity and carbon sequestration potential compared to conventionally managed soils. According to research published in the journal *Science Advances*, organic farming systems can sequester up to 26% more soil organic carbon, mitigating greenhouse gas emissions and climate change impacts.

Furthermore, organic agriculture promotes biodiversity by minimizing chemical inputs and preserving natural habitats. By prioritizing native plants and beneficial insects, organic farms provide essential ecosystem services such as pollination and pest control, reducing reliance on synthetic pesticides. According to the Food and Agriculture Organization (FAO) of the United Nations, organic farming supports higher levels of biodiversity, including birds, insects, and soil organisms, compared to conventional agriculture.

Organic land management offers numerous benefits across multiple dimensions, including human health, environmental sustainability, and economic resilience. By eliminating synthetic pesticides and fertilizers, organic farming reduces chemical exposure for farmers and consumers, thereby mitigating risks of pesticide-related illnesses and environmental contamination. According to a meta-analysis published in the *British Journal of Nutrition*, organic crops have higher levels of beneficial antioxidants and lower pesticide residues compared to conventionally grown crops.

Moreover, organic agriculture fosters rural livelihoods by promoting diversified farming systems and enhancing market access for small-scale producers. A study conducted by the Organic Trade Association found that organic farms create more jobs per acre than conventional farms, contributing to rural economic development and community resilience. Additionally, organic farming practices reduce dependency on costly external inputs, such as synthetic fertilizers and pesticides, thereby enhancing farm profitability and long-term sustainability.

D. Organic Practices on College Campuses and Financial Viability

The issue of inorganic land care holds particular relevance for college campuses, which serve as educational institutions and community leaders in sustainability. By adopting organic land management practices, campuses can demonstrate a commitment to environmental stewardship and inspire positive change among students, faculty, and surrounding communities. Integrating organic gardening and landscaping initiatives into campus curricula provides hands-on learning opportunities and fosters ecological literacy among students.



Furthermore, college campuses can serve as living laboratories for sustainable agriculture and ecological restoration, conducting research and outreach activities that promote organic practices. By showcasing the benefits of organic land care, campuses can influence broader societal attitudes and policies toward more sustainable food and land management systems. Additionally, organic landscaping initiatives contribute to campus aesthetics, biodiversity, and resilience to climate change, enhancing the overall campus environment and quality of life for students and visitors alike.

Lastly, organic agriculture has proven to be economically viable for every type of landscape, ranging from personal lawns to large agricultural projects. While minimal research has been done on organic land management on college campuses, research from similar landscapes can be applied to prove that organic landcare is a logical alternative to conventional land practices. Natural turf and organic management can help universities cut costs in many different ways. Firstly, natural turf often uses less water than nonnative varieties of grass, leading to water savings of more than 50%. In an agricultural setting, organic farms spent, on average, \$111 less than non-organic farms per acre. A cost comparison study completed by Beyond Pesticides shows that organic land management can yield overall savings of over 25% percent due to the decreased need for constant inputs. On the other hand, landscapes managed conventionally require constant inputs of fertilizers, pesticides, large amounts of water, and expensive labor dedicated to helping the non-native landscape survive. Additionally, a study by BASIC found that the EU spends 2.3 billion euros in subsidies for pesticide producers while they only generate 900 million euros in profits. Pesticides are making less and less sense for society, and this includes college campuses. On a human health level, another study found that endocrine-disrupting chemicals, including pesticides, cost the U.S. economy approximately \$340 billion annually due to associated issues like obesity, cancer, and reproductive dysfunctions. Overall, the economic benefits of less resource-intensive organic land far outweigh expensive and unhealthy conventional methods.

In conclusion, the environmental costs of inorganic land practices, characterized by chemical reliance and water pollution, underscore the urgent need for transitioning towards organic alternatives. Organic land care offers a holistic approach to environmental sustainability, promoting soil health, biodiversity, and human well-being. By embracing organic practices, we can cultivate resilient ecosystems, mitigate climate change impacts, and pave the way toward a more sustainable future for generations to come.



Economic Implications

A. Cost Analysis of Organic vs. Inorganic Methods

Research indicates that organic production/soil generally exhibits lower production costs compared to conventional (inorganic) methods, mainly due to reduced need for expensive chemical inputs. However, organic farms often face lower yields, particularly in the fruit, vegetable, and animal husbandry sectors, which can impact their overall economic performance. Integrated Pest Management (IPM) and biotechnology (GM crops) are modifiers that can optimize either system, with IPM reducing input costs without sacrificing yields and GM crops offering lower production costs and higher yields, especially beneficial for small and low-income producers. Despite these advantages, the adoption of such practices requires careful consideration of market demand, price premiums for organic products, and potential environmental benefits.

With more research evidence, artificial turf commands a higher upfront investment, with costs ranging from \$6 to \$20 per square foot, encompassing materials and labor, potentially culminating in a \$9,000 expense for a typical 1,000 square foot installation. This pricing, as highlighted by sources such as ArtificialGreens, is influenced by various factors, including the choice of synthetic grass, company overhead, and operation fees. In stark contrast, natural grass presents a more budget-friendly option, especially when seeded directly. Although adding features like sprinkler systems can escalate costs, they remain substantially lower than those for artificial installations, according to Austin Turf Company.

Regarding maintenance, the two options diverge further. Artificial turf boasts minimal upkeep, primarily needing occasional cleaning and brushing, which drastically cuts down annual maintenance costs to about \$340 for non-pet owners, as noted by InstallItDirect. Natural grass, on the other hand, requires consistent care, including regular watering, mowing, fertilizing, and pest control, which can accumulate to about \$720 annually just for mowing. Over time, while artificial turf avoids the frequent overhauls natural grass requires, it does necessitate replacement roughly every decade, potentially incurring additional environmental cleanup costs. These factors could elevate the long-term costs associated with artificial turf despite its low maintenance needs. Conversely, natural grass, although more demanding in regular upkeep, might prove economically favorable over the long haul when considering both maintenance and

environmental sustainability. Labor costs for installation are similar for both options, adding another layer to the cost analysis but not differentiating significantly between the two.

B. Long-term Financial Sustainability

In considering the long-term financial sustainability of landscaping choices, the choice between artificial turf and natural grass holds significant economic implications, especially when evaluated against the backdrop of environmental and maintenance considerations. Natural grass, despite its higher ongoing care costs, offers potential for financial aid through grants or funding aimed at supporting sustainable projects, which could alleviate some of the initial financial burdens. Over a 25-year period, the total maintenance cost for natural grass, including aeration, overseeding, fertilizing, and water usage, can become substantial. However, its ability to be managed and rejuvenated rather than replaced can provide economic benefits over time, especially when compared to the depreciation rate of artificial turf, which necessitates more frequent capital investments due to its finite lifespan of 10 to 15 years.

Switching to artificial turf involves high upfront costs but offers significant reductions in ongoing maintenance expenses, such as eliminating the need for watering. Nevertheless, the need for periodic replacement every 10 to 15 years, depending on usage and quality, introduces a recurring significant expense. When considering long-term project discount factors, the faster depreciation rate of artificial turf can be a critical factor in financial planning, highlighting the need for more frequent reinvestment compared to the more gradual investment in maintaining natural grass.

Parallel to the debate on landscaping is the financial sustainability of organic versus conventional farming, which also hinges on several critical factors. With careful management and strategic market positioning, organic farming can be as cost-effective or even more profitable than conventional methods. This advantage is often driven by higher market price premiums for organic products and the potential to lower input costs over time. Strategies such as crop rotation and fostering habitats for beneficial insects can reduce reliance on costly organic inputs. Despite generally lower yields compared to conventional methods, organic farming can offer superior environmental benefits, including enhanced biodiversity, soil erosion control, and improved soil fertility. These environmental advantages contribute to its long-term sustainability and may offset the higher costs associated with organic practices. Additionally, the scalability of organic farming, while challenging due to the dependency on organic fertilizers and the necessity to maintain production levels without synthetic nitrogen fertilizers, is supported by its energy



efficiency and reduced environmental pollution. By integrating these perspectives, it becomes clear that both choices in landscaping and agriculture require a careful consideration of upfront costs, long-term investments, and environmental impacts.

C. Potential Savings and Investment Returns

In analyzing the economic implications of landscaping and agricultural choices, it is essential to incorporate both environmental health metrics and potential savings alongside investment returns. Starting with landscaping, natural grass not only avoids the chemical risks associated with artificial turf, such as PFAS and PAHs, which are known for their adverse health impacts but also enhances community safety and health through regular soil and water testing. Moreover, artificial turf can exacerbate heat-related hazards due to its higher surface temperatures compared to natural grass, thereby increasing the risk of heat-related illnesses. In contrast, natural grass supports biodiversity and plays a vital role in carbon sequestration and cooling local climates, which not only contributes to environmental health but can also reduce the energy costs associated with cooling buildings.

Additionally, while artificial turf is often lauded for its water-saving advantages since it requires no irrigation, natural grass can be equally water-efficient if managed correctly. Employing strategies such as selecting drought-resistant grass varieties, using WaterSense-labeled irrigation systems, and practicing efficient watering techniques can lead to substantial water savings. Research from UMass suggests that with proper management, water usage for natural grass can be reduced by more than 50% compared to traditional irrigation methods. This conservation contributes further to natural grass's role in air purification and urban temperature reduction, enhancing its economic value when considering the broader impacts on public health and urban living environments.

Further, according to Expertise Justin's research on the use of organic products like leaf mold compost, there are considerable cost savings to be realized. For instance, the total avoided cost of using organic compost instead of conventional methods ranges between \$6,559.25 and \$7,084.25, based on the reduced expenses of \$157.14 to \$169.72 per ton for disposing of organic materials. These savings are significant when compared to the costs of purchasing compost, which can range from \$2,100 to \$2,625 for 75 cubic yards, according to pricing provided by Jim Carse. Moreover, composting organic leaves through more sustainable methods, like using a brush bin, could save an additional \$4,459.25 compared to traditional disposal methods. These financial metrics underscore the dual benefits of organic farming: reducing environmental impact



through enhanced carbon sequestration and lowering costs through efficient organic waste management.

D. Economic Benefits for Local Communities

The transition to organic land management and the broader adoption of organic farming practices hold profound implications for both environmental health and economic sustainability. Recent research, as outlined in Nature, underscores the substantial benefits of organic practices in enhancing soil health and sequestering carbon, which directly contributes to reducing atmospheric CO₂ levels. This carbon sequestration is not merely an environmental benefit but also presents a significant economic opportunity. The monetization of carbon savings, including reductions in soil organic carbon and annual decreases, offers a compelling financial incentive. These savings extend across various sectors, reducing costs associated with agriculture, energy production, health impacts from mortality, and even mitigating economic damages associated with sea-level rise due to climate change.

Adding a practical perspective to these findings, the implementation of organic land management on college campuses, as demonstrated by initiatives like the Herbicide-Free Campus, illustrates tangible economic benefits. For example, at institutions such as Harvard University, the adoption of organic practices has led to notable cost reductions by eliminating landscape waste removal expenses and lowering fertilizer costs. Furthermore, these practices have been shown to decrease water usage by up to 30%, amplifying both economic savings and environmental preservation. Such management strategies not only reduce direct operational costs but also contribute to the sustainability and health of local communities. By fostering a healthier environment, these practices enhance community well-being and support long-term ecological resilience.

Through these combined environmental and economic lenses, organic farming and land management emerge as strategic approaches to address climate change while also enhancing financial viability. The integration of carbon savings with direct cost reductions in agriculture and campus management exemplifies how sustainable practices can align economic performance with environmental stewardship, making a compelling case for their widespread adoption.

Social and Community Impact

The transition towards organic land management practices on college campuses has far-reaching implications that extend beyond environmental benefits. This transition has the potential to positively impact campus communities, foster educational opportunities, and strengthen partnerships between institutions and their surrounding neighborhoods.

A. Perceptions and Attitudes Towards Organic and Inorganic Methods

The adoption of organic land management practices can significantly influence the perceptions and attitudes of students, faculty, and staff toward sustainable practices. According to the survey we conducted, a significant portion, or 72% of respondents expressed concerns about the use of chemical pesticides on campus grounds, viewing them as harmful to both students and the environment. Furthermore, when asked about the hypothetical scenario of water fountains being contaminated with pesticide residues, most respondents expressed negative sentiments, indicating a strong aversion to such contamination.

As colleges and universities prioritize environmental action and promote the use of natural, non-synthetic methods for landscaping and pest control, it can send a powerful message about the institution's commitment to sustainability. This can lead to increased support and positive attitudes towards organic land management approaches, particularly among individuals who prioritize environmental and personal well-being.

What are your thoughts on the use of chemical pesticides on campus grounds, such as sports fields or landscaped areas?

40 responses

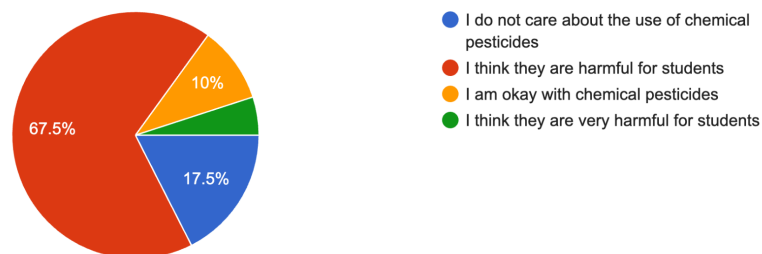


Chart 1: Survey Results on Opinions for Chemical Pesticides in Public Facilities

Hypothetically, If you were attending a university where water fountains were contaminated with pesticide residues, how would that make you feel?

40 responses

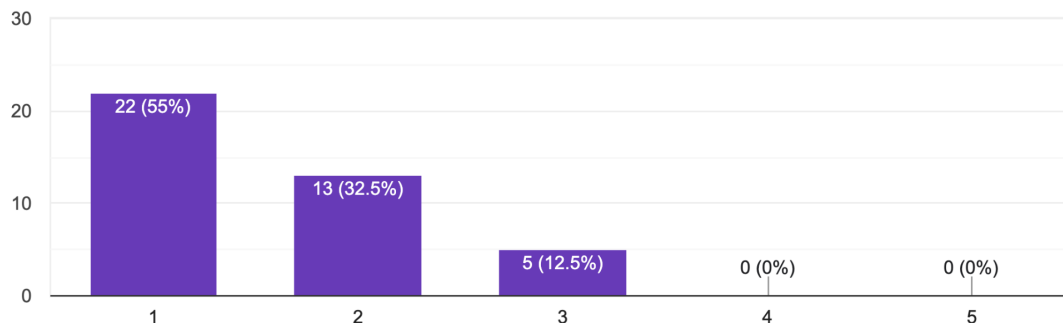


Chart 2: Bar Graph Showing Opinion Results on Water Contamination Hypothetical Scenario

B. Educational Opportunities and Experiential Learning for Students

The implementation of organic land management practices on college campuses presents unique educational opportunities and experiential learning experiences for students. Campuses can serve as living laboratories, where students can actively participate in hands-on learning activities related to sustainable landscaping, soil health management, composting, and the cultivation of native plant species.

While our survey did not directly address educational opportunities, several respondents mentioned their engagement with nature on campus and their interest in sustainability initiatives, suggesting a desire for such experiences. Participating in organic land management projects can help students gain a better understanding of biodiversity conservation and the interconnectedness of natural systems. These experiences can inspire students to pursue careers in environmental sciences, sustainable agriculture, or related fields, contributing to the development of a skilled workforce committed to addressing environmental challenges.

How often do you engage with nature on UT campus? (Studying on the UT lawn, sitting by the Turtle Pond, etc.)
40 responses

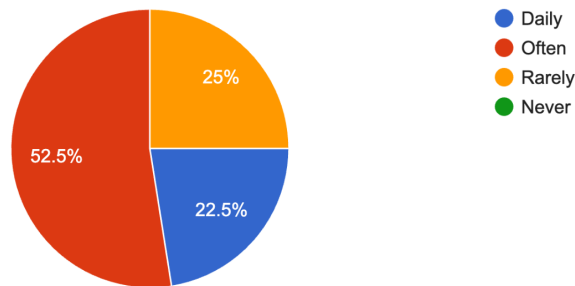


Chart 3: Pie Chart Expressing Engagement Results with Nature at UT Austin

C. Campus-Community Partnerships and Outreach Initiatives

Organic land management practices can also serve as a catalyst for fostering partnerships and outreach initiatives between college campuses and their surrounding communities. Institutions can collaborate with local organizations, community gardens, and urban agriculture initiatives to share knowledge, resources, and best practices related to organic landscaping and sustainable food production.

Faculty and professional respondents on the survey shared insights on the benefits and challenges of implementing organic land management practices, indicating their involvement and expertise in this area. These faculty members could potentially serve as valuable resources for fostering collaborations with local stakeholders, contributing to the development of community-based projects, educational workshops, and community gardens that promote environmental awareness, food security, and community resilience.

D. Influence on Campus Culture and Sustainability Initiatives

The adoption of organic land management practices can have a profound impact on campus culture and encourage broader sustainability initiatives. According to the survey, several respondents, both students and faculty/professionals, expressed a positive attitude towards organic land management practices, even if it resulted in slightly higher costs or tuition fees. This

suggests a willingness within the campus community to prioritize sustainable practices and aligns with the notion that the adoption of organic land management can positively influence campus culture and sustainability initiatives.

Furthermore, respondents to the survey highlighted various sustainability initiatives on campus that were important to them, such as waste reduction, composting, recycling, and access to sustainable food sources like the Farm Stand on the UT Austin campus. The implementation of organic land management practices could complement and reinforce these existing initiatives, contributing to a broader culture of sustainability on campus.

Organizations like Re:wild Your Campus play a crucial role in promoting organic land management practices on college campuses. Through programs such as the Organic Pilot Program and Rewilding Projects, they provide valuable expertise, guidance, and support to institutions seeking to transition towards more sustainable land management approaches. Initiatives like the Advocacy Bootcamp program and participation in major environmental events highlight the importance of community engagement, education, and advocacy efforts in driving meaningful change.

Furthermore, the testimonials and success stories shared by faculty respondents, such as those from Willamette University, Seattle University, and Cascadia College, provide real-world examples of the benefits and challenges associated with organic land management practices. For instance, the Cascadia College faculty respondent highlighted the mindset change within the campus community that led to the landscape becoming part of the teaching and learning infrastructure, contributing to a broader solution-oriented approach.

These insights and experiences reinforce the narrative of organic land management practices having a positive social impact and fostering community engagement on college campuses. Incorporating the survey findings and testimonials into the discussion strengthens the arguments and provides a more comprehensive understanding of the perspectives and experiences of various stakeholders within the campus community.

Ultimately, the transition towards organic land management practices on college campuses represents a multifaceted endeavor that extends beyond merely environmental considerations. By embracing these practices, institutions of higher education can position themselves as leaders in promoting environmental stewardship, fostering a deeper connection between campus communities and the natural environment, and contributing to a more sustainable future.



If given a choice, would you prefer to have campus grounds maintained using organic methods, even if it resulted in a slightly higher tuition fee?

40 responses

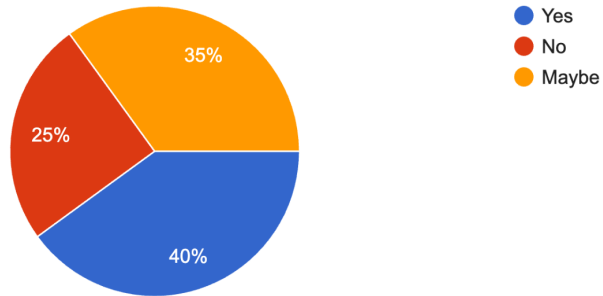


Chart 4: Pie Chart Showing Preferences on Organic Practices Despite Increased Costs

Financial Case Study

A. Case Study Meta-Analysis on Conventional Land Management

Before developing a Social Return on Investment (SROI) model for evaluating the economic and environmental impacts of transitioning from artificial to organic turf, it was essential to undertake a comprehensive meta-analysis. This analysis synthesized data from five distinct locations that had implemented both artificial and organic turf systems. Each case study provided critical variables such as maintenance costs, mowing, labor, production, seeding, and fertilization expenses, as well as overall program management details. These studies also offered specific insights into the per-acre coverage on campuses, initial installation fees, and other foundational data necessary for building an accurate SROI model.

The meta-analysis was pivotal not just for gathering quantitative data but also for understanding the broader economic and ecological implications of each turf system. For instance, examining the differences in maintenance requirements and initial costs between artificial and organic turf across diverse geographic and climatic conditions allowed for a more nuanced approach to the model's economic assumptions. Moreover, the analysis delved into the potential economic benefits of carbon savings, which are increasingly relevant in the context of global efforts to mitigate climate change. Information from the University of Texas regarding their school irrigation setup and the actual calculations from their leaf-saving reduction program provided additional data points that highlighted the environmental benefits and cost savings associated with organic turf management or setup.

Building on this foundational research, the SROI model was constructed to assess the net present value (NPV) of transitioning to organic turf. This involved applying a discount rate to both the projected costs and benefits, translating them into present values to allow for direct comparison. Costs included both direct expenses such as labor and installation as well as indirect costs like environmental damage from pesticide use in artificial turf scenarios. Benefits were quantified in terms of reduced environmental impact, lower ongoing maintenance costs, and the economic valuation of carbon sequestration and other ecosystem services. By summing up these present values and accounting for terminal values, the model provided a comprehensive view of the long-term financial and environmental returns on investment. This scientific approach was crucial for making informed decisions about sustainable landscaping practices, highlighting the

importance of rigorous meta-analytical techniques in underpinning effective environmental policy and management strategies.

1. Review of the “Denison University Case”

Denison University operates a variety of athletic fields and encompasses both varsity and practice facilities. The case study delves into the maintenance and management of two specific grass fields at the university: the Barclay-Thomsen Field, primarily used for varsity soccer games and summer camps, and an adjacent practice soccer field.

The university dedicates significant resources to the upkeep of its natural grass fields, which span a total of 21 acres. The annual maintenance cost for these fields is just under \$37,000, breaking down to approximately \$1,800 per acre. This figure excludes the expense of pesticides, encompassing labor, materials, aeration, and mowing. The grounds manager of Denison University points out that organic management practices not only contribute to reducing overall maintenance costs but are also becoming more economically feasible as the market for sustainable products grows in both demand and quality.

In contrast, the artificial turf fields at Denison present a different set of financial considerations. While the upfront costs may appear lower, the university resurfaces its artificial turf approximately every seven to eight years at a cost of around \$800,000. Additionally, the annual maintenance expenses for these synthetic fields amount to about \$115,000. Therefore, when comparing long-term costs, natural grass fields prove to be more cost-effective.

The specific expenditures for the grass fields include \$10,300 on products such as seeds, fertilizers, and top dressing. Additionally, equipment rental costs amount to \$2,500 annually, with labor costs accounting for \$24,000. Through this detailed financial breakdown and ongoing management, Denison University effectively demonstrates the advantages and sustainability of maintaining natural grass sports fields over synthetic alternatives.

2. Review of the “Southwest Pennsylvania Case”

In communities around Pittsburgh, the debate on the viability of natural grass for athletic fields centers on both its functionality and cost-effectiveness. To address these questions, the Toxics Use Reduction Institute (TURI) compiled a report from several school districts and communities that have transitioned to organic grass management practices. These groups have adopted



"cultural controls" like aerating and fertilizing, which boost soil and grass health while reducing reliance on pesticides, often linked to environmental and health risks for children.

The case study detailed four entities: Pittsburgh Public Schools, Fort Cherry School District, Heidelberg Park, and Bethlehem Center. Each illustrates varied experiences and budgetary scopes. For instance, Pittsburgh Public Schools have instituted a broad, ongoing, district-wide program for sustainable grass management. Fort Cherry School District, benefiting from favorable soil conditions, requires fewer interventions. In contrast, Heidelberg Park has seen substantial improvements with simple maintenance routines. Bethlehem-Center is in the preliminary stages of enhancing its fields amidst broader infrastructure and financial challenges.

Focusing on the data, the maintenance costs for these grass fields include soil testing at \$254, aeration totaling \$1352, and fertilizing costing \$1636. A notable outcome from Heidelberg Public Works' maintenance regime—which included consistent mowing, twice-yearly aeration, seeding, and fertilizing—was the transformation of previously bare patches into lush, thick grass by spring 2020. This success underscores the value of consistent mowing, which not only spurred vigorous grass growth but also curtailed weed proliferation.

In terms of soil quality, a consultant collected two samples from each of the three field locations and sent them to PJC Organic in Massachusetts for analysis. This analysis, costing about \$75, showed that the soil's pH ranged from 5.2 to 5.4, slightly more acidic than the optimal range of 6.5 to 6.9. However, the organic matter content was within the ideal 5% to 15%, indicating healthy soil conditions conducive to robust grass growth. These findings, detailed in Table 2, demonstrate the effectiveness of the adopted organic management practices.

Table 2: Soil testing results and recommendations from PJC Organic (example)		
Results	Ideal range	Comments/ recommendation from PJC Organic
pH: 5.4 Buffer pH: 6.7	6.5–6.8 6.9	Two applications (spring and fall) of high efficiency calcitic lime
Percent organic matter: 6.8	5–15%	- Fertilize - Top dress & overseed thin areas in spring and fall - Return grass clippings when weed seeds are not present
Cation exchange capacity (CEC): 7.5	10–15	- CEC is a measure of the soil's ability to hold nutrients - Apply a humic acid soil amendment
% Base saturation K: 4.2% Mg: 14.9% Ca: 53.4%	K: 2–5% Mg: 10–15% Ca: 65–75%	- Ca:Mg ratio is too low and will be addressed through liming with calcitic lime and/or Humic+ - It has been found that soils low in Ca and high in Mg tend to exhibit greater weed pressure and are more prone to compaction - Current ratio (Ca:Mg): 3.6:1. Ideal range: 7:1–15:1

Table 1: Key Metrics from “Southwest Pennsylvania Case”

3. Review of the “Martha’s Vineyard Case”

The case study highlights the organic management of natural grass athletic fields on Martha's Vineyard, a project managed by The Field Fund in collaboration with local school and town partners. The objective is to document the community's shift to organic practices and to inform other communities about the possibilities and outcomes of such an initiative. Martha's Vineyard, through The Field Fund, showcases how dedication to organic field maintenance can create sustainable and resilient athletic fields suitable for children, teens, and adults across generations.

Martha's Vineyard has embraced a comprehensive maintenance protocol that not only covers standard practices like soil testing and aeration but also integrates high-tech methods such as drone photography and soil sensors. This blend of traditional and cutting-edge techniques allows for precise targeting of maintenance efforts, enhancing soil health and maximizing the utility and longevity of the fields. Despite the higher maintenance costs—about 30% more than on the mainland, primarily due to transportation and labor costs—the fields benefit from this meticulous care.

The Field Fund's use of advanced systems, like smart irrigation, which leverages non-potable water and adapts to real-time data, exemplifies a commitment to resource conservation and environmental responsibility. The maintenance regimen is adjusted according to the intensity of the fields' use, ensuring that fields for organized sports receive more frequent upkeep compared to those for general use or physical education.

The costs associated with maintaining these fields are broken down into two main categories: products, including items like seeds, fertilizer, and calcium silicate, and labor and rentals, which cover activities like mowing and equipment rental. Across six sites, the total expenditure reaches \$65,600, with the annual cost per acre being \$7,620. This investment underlines the value placed on providing a safe, healthy, and environmentally sustainable play area for the community. The data presented here, collected through 2019, offers a transparent look at the financial commitment required to sustain organic field management and serves as a resource for similar projects elsewhere.

4. Review of the “Marblehead Case”

Marblehead's case, where a commitment to children's health and environmental protection sparked a pivotal shift in 1998 when the Board of Health recommended phasing out pesticide use on public and private properties. Following this, the town's first municipal organic lawn demonstration site was launched with support from a TURI grant. Since 2002, Marblehead has organically managed all 20 acres of its publicly owned grass fields, a testament to its dedication to sustainable practices.

Delving into the operational specifics, Marblehead's case studies reveal that the annual cost for organic management of their athletic fields hovers between \$4,250 and \$4,500 per acre. This expenditure encompasses essential maintenance tasks such as mowing, aeration, and the judicious application of organic products like fertilizers and soil amendments. In a display of precision agriculture, the town employs soil testing to tailor the maintenance regime to the unique needs of each field, ensuring optimal health and performance.

The costs break down into specific allocations: product costs range from \$1,500 to \$1,750 per acre, totaling \$30,000 to \$35,000 across all fields. A Turf Specialist, dedicated to the fields' upkeep, earns \$75,000 annually, spending nearly half of their work year on tasks including aeration and fertilizer application, amounting to about \$34,400 in labor costs attributed to these activities. Additional staff, responsible for the 25 annual mowing sessions per field, contribute to a labor cost of approximately \$20,500.

This case study from Marblehead demonstrates the efficacy of organic field maintenance, serving as a model for other communities considering such a transition. By showcasing how they manage their multi-use fields and maintain quality standards, Marblehead provides a blueprint for sustainable field management that upholds both environmental integrity and fiscal responsibility.



5. Review of the “Springfield Massachusetts Case”

In 2014, the Springfield Department of Parks, Buildings, and Recreation Management embraced a greener approach to their land care by initiating organic management of their natural grass fields and parks. This shift, backed by a TURI grant, was not just for the aesthetic or recreational benefits but also with an eye towards environmental conservation, particularly the health of the Connecticut River. With six pilot sites to start, Springfield has since expanded this initiative, reaching a total of 12 organically managed sites as of mid-2019.

The Springfield case studies reveal a cost-effective management system, tallying under \$1,500 per acre annually. The data is striking; for a relatively modest annual investment of \$45,280, the city maintains its fields without pesticides, instead relying on organic fertilizer, soil conditioner, and lime. The allocation per acre is detailed: 440 pounds of fertilizer at \$410, 420 pounds of conditioner at \$200, and 230 pounds of lime at \$60, amounting to \$670 per acre.

Beyond products, Springfield's comprehensive care includes regular soil testing and aeration, with a total expenditure of \$98,080 in 2018 for all 12 fields. When broken down, this figure translates to about \$1,460 per acre. Maintenance also encompasses irrigation system repairs and winterization at costs of \$7,200 and labor expenses of \$45,600. This investment not only keeps the fields in prime condition for a multitude of activities—from sports to concerts and picnics—but also represents the city's commitment to safeguarding the local environment for future generations.

Table 8: Annual amount of soil products used and associated costs per acre in Springfield's organic management program, 2018

Product	Pounds Used per Acre	Cost per Acre
Fertilizer (two applications)	440	\$410
Conditioner	420	\$200
Lime	230	\$60
Totals	1,090	\$670

Table 2: Key Metrics from “Springfield Massachusetts Case”

B. Comparing Financial Metrics with Dell Medical Data - SROI Financial Model

Rewild Campus Organization SROI Texas 180 Degrees Consulting												
x	Assumptions		Water Rate and Assumption		Referenced Form Master Water Balance sheet						Meta Analysis	
	Current Year	4/27/2024	Supply total		30%						Springfield	\$1,463.88
	Discount Rate	10%	Impaction %		30%						Marblehead	\$4,250.00
	Ratio		FY 09 Supply total (Gallons)		\$20061.443						Denton	\$1,752.38
	Rate of Increase - Soil Organic Use	4.00%	% reduction from FY 09		35%						Martha Vineyards	\$7,527.91
	Rate of Increase - Dollar Cost on Agriculture	1.00%	Average Price Per 1000 Gallons		\$5.10						Average Annual Cost Per Acre	\$3,773.54
	Rate of Increase - Dollar Cost on Energy	1.00%	Price Increasing Rate (Including Inflation)		1%						Increasing rate (including inflation)	1%
	Rate of Increase - Dollar Cost on Mortality	1.00%	UT Austin acre	432							UT Actual Cost per year	\$1,886,771.07
	Rate of Increase - Dollar Cost on Sea-Level Rise	1.00%	Organic Soil or Fertilizer use per acre	2000	Historical Rate							
	Water Conservation Rate	37.00%	Total Tree on UT Campus	4900	Growth Rate	1%						
	Rate of Increase - Leaf Compositing	1.00%	Tree Par area	11.34295959								
			Tree Produce Ton rate	1.5x								
Benefit & Cost Calculation												
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E
x	Organic Soil - Carbon Capture											
	Dollar Benefit - Soil Organic Capture	844000	898560	934922.4	971882.486	1010757.796	1051168.108	1093235.632	1136965.057	1182443.66	1229741.406	1278931.062
	Carbon Tons Reduced By Soil Organic	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
	Carbon Tons Reduced By Annual Soil Organic	207840	278053.8	289695.744	301283.3738	313334.9167	325868.3154	338903.0459	352405.1678	366527.5345	381219.8358	396468.6293
	Dollar Cost of Carbon Ton on Agriculture	\$ 84.00	\$ 84.84	\$ 85.69	\$ 86.55	\$ 87.41	\$ 88.28	\$ 89.17	\$ 90.06	\$ 90.96	\$ 91.87	\$ 92.79
	Dollar Cost of Carbon Ton on Energy	\$ 9.00	\$ 9.09	\$ 9.18	\$ 9.27	\$ 9.37	\$ 9.46	\$ 9.55	\$ 9.65	\$ 9.75	\$ 9.84	\$ 9.94
	Dollar Cost of Carbon Ton on Mortality	\$ 90.00	\$ 91.81	\$ 92.73	\$ 93.65	\$ 94.59	\$ 95.54	\$ 96.49	\$ 97.46	\$ 98.43	\$ 99.42	\$ 100.41
	Dollar Cost of Carbon Ton on Sea-Level Rise	\$ 2.00	\$ 2.02	\$ 2.04	\$ 2.06	\$ 2.08	\$ 2.10	\$ 2.12	\$ 2.14	\$ 2.17	\$ 2.19	\$ 2.21
	Composite Cost of Removing a Ton of Carbon	\$ 185.00	\$ 188.95	\$ 193.72	\$ 198.61	\$ 203.51	\$ 208.44	\$ 213.38	\$ 218.35	\$ 223.33	\$ 228.38	\$ 233.40
	Total Dollar Benefit of Soil Organic Fertilizer	\$ 49,550,400.00	\$ 52,047,740.16	\$ 54,670,946.26	\$ 57,426,361.96	\$ 60,320,650.60	\$ 63,360,811.39	\$ 66,554,195.28	\$ 69,908,527.79	\$ 73,431,917.57	\$ 77,132,886.22	\$ 81,020,383.69
x	Water & Irrigation Benefit											
	Supply total	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938	598039.938
	Impaction sub-total	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814	179411.9814
	Water Saving Rate	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%	37.00%
	Actual Saving Per Ton (K Gallons)	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311	66382.43311
	Price per 1000 gallons	\$5.00	\$5.00	\$5.10	\$5.10	\$5.20	\$5.20	\$5.31	\$5.36	\$5.41	\$5.47	\$5.52
	Weighted Saving from Irrigation	\$331,912.17	\$335,231.29	\$338,581.60	\$341,960.44	\$345,368.13	\$348,843.02	\$352,331.45	\$355,854.77	\$359,431.93	\$363,067.45	\$366,837.52
	Discount Factor	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14	2.36	2.59
	Total Discounted Return Calculation	\$331,912.17	\$304,755.72	\$279,821.16	\$256,926.70	\$235,905.42	\$216,604.07	\$198,881.92	\$182,609.76	\$167,668.96	\$153,950.59	\$141,354.64
	Total 11Y Benefit from Irrigation Savings	\$ 467,212,172.13										
x	Leaf Cost Benefit											
	Total tree	4900	4949	4998.49	5048.4749	5098.956649	5149.940245	5201.448738	5253.463225	5305.997858	5359.057636	5412.648415
	Tons of leaves rate (Tons)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Total Tons of leaves produce annually	7350	7423.5	7497.735	7572.71335	7648.439474	7724.932869	7802.173107	7880.194638	7958.995166	8038.596754	8118.978232
	Save Program Per Tons	\$169.72	\$171.42	\$173.13	\$174.86	\$176.61	\$178.36	\$180.16	\$181.96	\$183.76	\$185.52	\$187.48
	Total save	\$1,247,442.00	\$1,272,315.58	\$1,298,093.15	\$1,324,164.82	\$1,350,806.93	\$1,377,952.03	\$1,405,448.87	\$1,433,302.41	\$1,461,523.85	\$1,490,124.60	\$1,519,116.30
	Discount Factor	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14	2.36	2.59
	Total Discounted Return Calculation	\$1,247,442.00	\$1,156,832.35	\$1,072,684.25	\$994,879.65	\$922,616.21	\$855,599.80	\$793,452.14	\$735,818.66	\$682,371.47	\$632,806.49	\$586,841.73
	Total 11Y Benefit from Leaf Cost Program	\$10,225,679.44										
x	UT Actual Cost per Year											
	Average Spending per Acre	\$3,773.54	\$3,811.28	\$3,849.39	\$3,887.88	\$3,926.76	\$3,966.03	\$4,005.69	\$4,045.75	\$4,086.21	\$4,127.07	\$4,168.34
	Acres	432	432	432	432	432	432	432	432	432	432	432
	Total Cost Per UT	\$1,630,170.20	\$1,646,471.80	\$1,662,936.62	\$1,679,565.59	\$1,696,361.65	\$1,713,325.26	\$1,730,458.52	\$1,747,763.10	\$1,765,240.73	\$1,782,893.14	\$1,800,722.07
	Discount Factor	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14	2.36	2.59
	Total Cost Discount Calculation	\$1,630,170.20	\$1,486,792.64	\$1,374,327.79	\$1,281,882.79	\$1,158,637.83	\$1,063,846.19	\$976,798.72	\$896,678.82	\$823,497.83	\$756,159.73	\$694,236.31
	Total 11Y Investment Cost	\$12,770,657.38										
x	Analysis											
	SROI											
	Carbon Capture	\$ 467,212,172.13										
	Water Irrigation	\$2,600,180.36										
	Leaf Cost Program	\$10,225,679.44										
	Cumulative Benefit	\$ 480,038,031.93										
	Cumulative Cost	\$12,770,657.38										
	SROI	37.59x										

Model 1: Actual Model Output with SROI Calculations

The financial model in question meticulously assesses the viability of transitioning to organic land management on a university campus, employing various metrics to forecast economic and environmental returns over time. It hinges on assumptions about water rates, carbon reduction rates, and other key factors, which inform the benefit and cost calculations presented. Central to the analysis is the concept of discounting, where future benefits are adjusted to their present value, acknowledging that money today is worth more than the same amount in the future due to its potential earning capacity.

A standout figure within the model is the Social Return on Investment (SROI) ratio of 37.41x, a high value indicating that each dollar invested returns over thirty-seven dollars in social, environmental, and economic value. This suggests that the switch to organic practices, while

perhaps costly upfront, promises significant long-term benefits. This is evidenced by the model's substantial projected savings from carbon capture, water management, and waste reduction from the leaf compost program, outweighing the cumulative costs over the study period. The model is a potent tool, advocating for sustainable practices not just from an environmental perspective but as a sound financial strategy, emphasizing that the benefits—reduced carbon footprint, improved water efficiency, and overall environmental health—far eclipse the initial investments.



Conclusion

Our research rigorously evaluated the environmental, economic, and social implications of organic versus conventional land management, particularly on college campuses. Moreover, the financial research provided by our case study delivered another dimension of quantitative data that reinforced our stance that organic practices are beneficial long-term over conventional practices while maintaining an unbiased analytical approach. By integrating qualitative research, a meta-analysis, and survey results with this financial case study, the overall study provided a comprehensive perspective on the impacts of each land management practice.

To start, the environmental implications analysis revealed that organic practices significantly mitigate the reliance on harmful synthetic chemicals. This contributes to a reduction in biodiversity loss, soil degradation, and water contamination. Organic management practices also enhance carbon sequestration capabilities and improve soil health by encouraging biodiversity in microbial communities. This not only contributes to the sustainability of campus environments but also serves as a crucial step towards combating border environmental challenges like climate change.

In terms of economic implications, the initial findings suggest that organic practices incur higher upfront costs, primarily due to more labor-intensive methods such as manual weeding and the use of more expensive organic materials. However, the financial case study centered on the UT Dell Medical Center provided a pivotal insight: over time, these higher initial costs are offset by lower long-term expenses. These include reduced costs on chemical inputs and maintenance, as well as intangible costs such as environmental remediation (often necessitated by conventional practices). The sources referenced in this section effectively demonstrated that with strategic management and planning, organic land care management can be economically viable and sustainable. Organic practices potentially offer a better return on investment over conventional practices when considering long-term benefits and aggregated costs.

The social and community impacts revealed through surveys and interviews underscored a strong preference and desire among both students and faculty for organic practices. After asking scenario-based questions and requesting open-ended responses, we allowed each respondent to emotionally think about their newfound perspective on synthetic pesticides and fertilizers that go unknown every day. There is a clear trend of growing awareness for environmental and health impacts of land management practices. The study showed that campuses employing organic

methods could strengthen their educational missions while improving campus life quality. This reflects on institutions to devise commitments to sustainability and organic management since it resonates well with student, faculty, and community expectations.

Lastly, our financial case study focused on comparing the long-term cost-effectiveness of organic versus conventional land management practices. By analyzing the UT Dell Medical Center (land managed organically) against aggregated data from five conventionally managed lands in previous case studies, we uncovered significant economic long-term advantages in favor of organic practices. Specifically, the organic management at Dell Medical showed a notable reduction in ongoing maintenance costs and decreased reliance on expensive synthetic inputs. These findings highlight the potential for substantial financial savings over time with organic management, reinforcing the argument for its broader adoption and implementation in similar settings. Moreover, these results tie in well with our three qualitative lenses as they give further data to reinforce sentiments that literature review sources and meta-analysis supported as well. Ultimately, this case study serves as a compelling example of how organic land management supports environmental sustainability and offers fiscally viable alternatives that could be more impactful than current conventional practices.

The evidence amassed in the study articulates a compelling case for the adoption of organic land management practices in college campuses and other large areas of land. It delineates not only environmental and health advantages but also the economic rationality of choosing organic methods over conventional ones in the long run. By transitioning to sustainable practices, universities align with global sustainability goals and enrich educational systems on land care. The adoption of such practices sets a potent example and encourages other institutions to embark on similar transformations, leading to a societal shift towards caring about organic practices and accepting environmental responsibility more often. Hopefully, through our robust research, we invite other campuses to reevaluate their land management strategies and experiment with Re:wild Your Campus pilot programs.



Recommendations

Through analyzing Re:wild Your Campus's current social programs, UT campus's land management practices, various pieces of research and literature, and student responses to survey questions, we have been able to construct a comprehensive image of Re:wild's strengths and areas that could be improved. Our team of consultants has developed three main recommendations spanning three categories: student connection, transparency and accessibility, and expansion.

First, improved connection with students on college campuses is recommended because the student surveys indicated a high willingness of students to engage with organic practices, but they seem unaware of ways to help their university transition to more sustainable land management. For example, 40% of students surveyed said that they would pay higher tuition to have their campus maintained organically, while 35% said "Maybe." This encouraging statistic demonstrates college students' concern for environmental practices on campus while at the same time showing their hesitancy to commit economically to organic land care. Re:wild Your Campus should harness social media to step in and fill this gap between the desire for change and the knowledge of how to enact change.

To improve Re:wild Your Campus' social media presence, we recommend a stronger and more obvious association with Re:wild, the larger nonprofit that Re:wild is a branch of. Re:wild enjoys a much higher following on Instagram, and Re:wild Your Campus runs the risk of missing out on the social capital and influence that Re:wild has established through its more extensive network and resources. To link college students with Re:wild Your Campus, Re:wild can use social media to encourage students to become social media and on-campus ambassadors for Re:wild Your Campus. Our research can be made publicly available as optional training materials for the students to better understand the negative impacts caused by inorganic fertilizers, such as the high level of exposure to potentially carcinogenic pesticides. They can also use our compiled research to grasp the economic benefits of an organically managed campus, further closing the gap between students' environmental concerns and setting logical, actionable goals.

As for transparency and accessibility, the literature review and qualitative research revealed that there is a shocking lack of universal standards for what land practices can and can not be used in



land management across the country. The Northeast Organic Farming Association provides the nearest possible blueprint for what Re:wild Your Campus can accomplish through the already-established Green Grounds Certification program. NOFA uses a system of holistic operations – spanning from political advocacy to certification programs for farmers – to promote organic farming and land practices. Re:wild Your Campus will face resistance from college campuses as long as colleges have the option of choosing the “easier” route of conventional land management. Re:wild can partner with organizations like NOFA to increase their visibility on a political advocacy level while using social media to mobilize students to comply with standards that Re:wild can develop in conjunction with universities and research labs. By developing core standards that all college campuses must comply with regardless of region or circumstance (such as no Roundup used on grounds, mandatory Integrated Pest Management compliance), Re:wild can become more transparent and accessible for college students.

In addition to developing core standards and making them highly visible and accessible to college students and universities, Re:wild can encourage students on campuses to test the validity of the standards in a research setting to further reinforce student involvement with Re:wild and the scientific and economic viability of organic land care rather than conventional methods. Testing and researching Re:wild’s standards and publishing the results will give Re:wild Your Campus more credibility and visibility on a national political level, hopefully leading to a widespread shift away from harmful land management on college campuses. The University of Texas at Austin has demonstrated what this middle-ground transition could look like. Although the University of Texas is not part of Re:wild Your Campus’ programs, communication with Re:wild has helped UT gain recognition for its notable transition to important organic practices, such as the large composting program and the severe limitations on what chemical pesticides are used on campus to protect students’ health. By involving students in the research process of setting limitations and guidelines for campus land management, Re:wild Your Campus can encourage important changes to take place, even if universities are unable to completely comply with rigorous Green Grounds Certification standards.

Lastly, we found room for Re:wild Your Campus to expand into the realm of university athletics. At many universities, including the University of Texas, the management of athletics land is left up to departments that are entirely separate from a general land services department. Athletics are the main publicity points for universities: the health of athletes and the quality of their facilities is of utmost importance to universities and their faculty, as well as their student body. By appealing directly to athletics departments, Re:wild Your Campus can increase on-campus visibility and promote student involvement by capitalizing on pre-existing student participation



in athletics. To effectively appeal to athletics departments, Re:wild should prioritize economic and human health arguments. For instance, highlighting the risk of cancer, birth defects, and hormonal disruption caused by consistent contact with common synthetic pesticides would provide a convincing argument for universities that generate large amounts of revenue due solely to the health and performance of their student-athletes. Additionally, research conducted by organizations such as Beyond Pesticides has proven that high economic benefits are associated with organic land management as it relates to athletic facilities. In a graph published by Beyond Pesticides, a naturally-managed football field costs less than a chemical-intensive field after approximately two and a half years. While economic gain can rarely, if ever, be guaranteed, case studies and published literature provide ample evidence that organic land management overall costs less in terms of water, energy, yield, carbon sequestration, and human health-associated expenses.

In summary, research has overwhelmingly pointed to the dangers of conventional land management, especially in a college campus environment where students are constantly in contact with greenspaces and public outdoor areas. Whether students are laying out on a lawn, reading by a fountain, or taking a walk around campus to destress, contact is inevitable. Re:wild can help students further understand the necessity of organic land management through a strategic social media presence, increasing the visibility and accessibility of their standards, and targeting athletics departments. These three recommendations, if employed in concert with one another, should yield higher levels of student participation in landcare across their respective universities and in the country as a whole. College students are an untapped resource for environmental and political change – Re:wild Your Campus only has to find a way to tap into it.



Risks & Mitigations

In conducting our research on organic versus conventional land management practices, we navigated potential risks that could affect the integrity and applicability of our results. One such risk was the incomplete financial data collection. Given the complexity of capturing all indirect and direct costs associated with land management, we noticed that the data collected through UT Dell Medical was not fully available. Moreover, our meta-analysis during the financial case study revealed that certain land budgets did not have the metrics or budget amounts we were looking for. Hence, there is a possibility that not all financial data was captured, which could lead to a skewed understanding of the fiscal comparison between organic and conventional.

To alleviate this risk in future replications of the study, a structured approach to data collection would be essential. Regularly scheduled budget reviews with departments engaged in land management could ensure that all financial expenditures and savings are meticulously documented. Diversifying data sources to include different institutions and geographic locations, and validating these with the help of financial experts, would further strengthen the reliability of the data. This rigorous approach to financial data collection and validation is imperative to underpin the economic analysis with a high degree of accuracy.

Another potential risk involved the diversity of survey responses, which is critical to ensuring the social data reflects a broad range of opinions and experiences. In our initial study, there may have been a skew towards a particular demographic that is not representative of the broader university population since we targeted University of Texas at Austin students. This could potentially lead to biases in the understanding of the social implications of land management practices. Although we attempted to create an unbiased survey poll, certain respondents responded with feeling biased towards a certain perspective due to the nature of the scenario-based questions.

Looking ahead, expanding the reach of the survey distribution through collaboration with a variety of national student organizations and broader databases would be key to capturing a more diverse set of responses. Moreover, future studies could incorporate stratified sampling to ensure that all sub-groups within the university community are adequately represented. By clearly communicating the scope and context of the study, researchers can ensure that the findings are relevant and specific to the institutions in question, avoiding overgeneralization from a

potentially skewed sample. On the other hand, we can utilize psychologist or expert-driven advice to aggregate survey questions that will provide more nuanced, unbiased questions to ask students and faculty. That way, future respondents can feel empowered to respond with their own voice rather than be swayed by the vernacular of the survey.

The overarching goal of addressing these risks is to enhance the replicability and validity of the study. By setting a precedent for meticulous data collection and broad-based survey distribution, future research can build upon our findings to further illuminate the nuanced impacts of organic versus conventional land management practices. Hopefully, this setup will contribute to new bodies of knowledge that support informed decision-making in university settings and beyond.



REFERENCES

- “\$340 Billion in Annual Disease-Related Costs Associated with Endocrine Disrupting Chemicals.” *Beyond Pesticides Daily News Blog*, 1 Mar. 2019, beyondpesticides.org/dailynewsblog/2019/03/340-billion-in-annual-disease-related-costs-associated-with-endocrine-disrupting-chemicals/.
- AL-Ani1, Mehjin A M, et al. “Effect of Pesticides on Soil Microorganisms.” *Journal of Physics: Conference Series*, IOP Publishing, 1 Sept. 2019, iopscience.iop.org/article/10.1088/1742-6596/1294/7/072007/meta.
- “The Basics of Nature-Based LandCare.” *Perfect Earth Project*, newfs-society.s3.amazonaws.com/documents/Topos_PEP_LeafLet_EN_V4.pdf. Accessed 17 Apr. 2024.
- Cacek, Terry, and Linda L. Langner. “The Economic Implications of Organic Farming: American Journal of Alternative Agriculture.” *Cambridge Core*, Cambridge University Press, 30 Oct. 2009, www.cambridge.org/core/journals/american-journal-of-alternative-agriculture/article/abs/economic-implications-of-organic-farming/E1AF385F401DE4C115187A898CEA223D.
- Calabro, Grazia, and Simone Vieri. “Limits and Potential of Organic Farming towards a More Sustainable European Agri-Food System.” *British Food Journal*, 8 May 2023, www.emerald.com/insight/content/doi/10.1108/BFJ-12-2022-1067/full/html.
- Chowdhury, Ashim, et al. “123 Impact of Pesticides on Soil Microbiological Parameters ...” *NCBI*, 22 Feb. 2008, agri.idaho.gov/main/wp-content/uploads/2020/10/NCBI-Impact-of-Pesticides-on-Soil-Microbiological-parameters.pdf.
- “City of Portland Landcare Ordinance.” *Civicplus*, 19 Sept. 2022, content.civicplus.com/api/assets/c0be3031-73ff-438f-b641-323507f1c9c8.
- Cornelisse, Tara, et al. “New Study: Agricultural Pesticides Cause Widespread Harm to Soil Health, Threaten Biodiversity.” *Center for Biological Diversity*, 4 May 2021,



biologicaldiversity.org/w/news/press-releases/new-study-agricultural-pesticides-cause-wide-spread-harm-to-soil-health-threaten-biodiversity-2021-05-04/.

“Cost Comparison: Organic vs. Chemical Land Management.” *Beyond Pesticides*, 2020, www.beyondpesticides.org/assets/media/documents/documents/Cost%20Comparison.pdf.

Donley, Nathan, and Tari Gunstone. “Pesticides Are Killing the Organisms That Keep Our Soils Healthy.” *Scientific American*, 1 June 2021, www.scientificamerican.com/article/pesticides-are-killing-the-worlds-soils/.

Durham, Timothy C., and Tamás Mizik. “Comparative Economics of Conventional, Organic, and Alternative Agricultural Production Systems.” *MDPI*, Multidisciplinary Digital Publishing Institute, 25 Apr. 2021, www.mdpi.com/2227-7099/9/2/64.

“The Expense of Pesticides Significantly Outweigh Economic Benefits.” *Beyond Pesticides Daily News Blog*, 9 Dec. 2021, beyondpesticides.org/dailynewsblog/2021/12/pesticides-expenses-significantly-outweigh-economic-benefits/.

Gaal, Wester van. “Pesticides ‘Cost Double the Amount They Yield’, Study Finds.” *EUobserver*, EUobserver, 30 Nov. 2021, euobserver.com/green-economy/153671.

Gardner, Dr. David. “Natural Organic Lawn Care.” *Ohioline*, 16 June 2017, ohioline.osu.edu/factsheet/hyg-4031.

Giri, Shiv Kumar, et al. “Impact of Agrochemicals on Soil Microbiota.” *SpringerLink*, Springer Nature Singapore, 1 Jan. 1970, link.springer.com/chapter/10.1007/978-981-16-9310-6_3.

“Global Growth of Organic Farmland Further Advances UN Sustainable Development Goals.” *Beyond Pesticides Daily News Blog*, 11 Mar. 2020, beyondpesticides.org/dailynewsblog/2020/03/global-growth-of-organic-farmland-further-advances-un-sustainable-development-goals/.

“Green Lawns and Gardens Resources.” *Department of Environmental Conservation*, dec.ny.gov/get-involved/living-green/sustainable-landscaping/green-lawns-garden-resources. Accessed 17 Apr. 2024.



- “Groundbreaking Report Demonstrates Benefits of Sustainable Land Care Practices on College Campuses.” *Earth Island*, Earth Island Institute, earthisland.org/index.php/news/entry/groundbreaking-report-demonstrates-benefits-of-sustainable-land-care-practices-on-college-campuses. Accessed 25 Apr. 2024.
- Hays, Laresa. “How Pesticides Affect Soil Microbes.” *TeraGanix*, 14 Sept. 2023, www.teraganix.com/blogs/organic-gardening-tips/how-pesticides-affect-soil-microbes?_pos=1&_psq=how%2Bpesticides&_ss=e&_v=1.0.
- Hoover, Shawnee. “Organic Land Care and the Development of National Standards.” *Beyond Pesticides*, 2005, www.beyondpesticides.org/assets/media/documents/infoservices/pesticidesandyou/Summer%202005/organic%20land%20care.pdf.
- Karpouzas, Dimitrios G., et al. “Pesticide Soil Microbial Toxicity: Setting the Scene for a New Pesticide Risk Assessment for Soil Microorganisms (IUPAC Technical Report).” *DeGruyter*, De Gruyter, 1 Oct. 2022, www.degruyter.com/document/doi/10.1515/pac-2022-0201/html.
- KDigital Hosting. “The Importance of Natural Methods and Organic Land Care, the Harrington’s Way.” *Harrington’s Organic*, 5 July 2022, www.harringtonsorganic.com/the-importance-of-natural-methods/.
- Klonsky, Karen. “Comparison of Production Costs and Resource Use for Organic and Conventional Production Systems.” *California Agricultural Issues Lab*, 15 June 2022, cail.ucdavis.edu/category/publications/.
- Martin, Tovah. “Do Pollinators Prefer Native Plants to Their Cultivated Siblings? - The Washington Post.” *The Washington Post*, 27 Feb. 2024, www.washingtonpost.com/home/2024/02/27/do-nativer-plant-varieties-attract-pollinators/.
- “Maryland State House Organic Land Care Project.” *Maryland Pesticide Network & Maryland Pesticide Education Network*, 11 May 2022, mdpestnet.org/projects/pesticides-and-the-chesapeake-bay-watershed/healthier-alternatives-2/maryland-state-house-organic-land-care/.

Medo, Juraj, et al. "Changes in Soil Microbial Community and Activity Caused by Application of Dimethachlor and Linuron." *Nature News*, Nature Publishing Group, 17 June 2021, www.nature.com/articles/s41598-021-91755-6.

Meena, Ram Swaroop, et al. "Impact of Agrochemicals on Soil Microbiota and Management: A Review." *MDPI*, Multidisciplinary Digital Publishing Institute, 23 Jan. 2020, www.mdpi.com/2073-445X/9/2/34.

"National Organic Program." *National Organic Program | Agricultural Marketing Service*, www.ams.usda.gov/about-ams/programs-offices/national-organic-program. Accessed 17 Apr. 2024.

"The Nature of Natural: Organics Market Report." *Lawnandlandscape.Com*, Aug. 1997, www.lawnandlandscape.com/article/the-nature-of-natural--organics-market-report/.

"Non Toxic Landscapes." *Non Toxic Communities*, www.nontoxiccommunities.com/organic-land-care.html. Accessed 17 Apr. 2024.

"Nova Scotia." *Byron Shire Chemical Free Landcare*, byronshirechemicalfreelandcare.org/case-studies/chemical-free-public-spaces/canada/canada-provinces/nova-scotia/. Accessed 17 Apr. 2024.

Onwona-Kwakye, Michael, et al. "Pesticides Decrease Bacterial Diversity and Abundance of Irrigated Rice Fields." *Microorganisms*, U.S. National Library of Medicine, 25 Feb. 2020, www.ncbi.nlm.nih.gov/pmc/articles/PMC7142973/.

Oregon Tilth Organic Land Care Policies & Standards, sustainablect.org/fileadmin/media/Content/For_resources/LNR/1._Organic_Land_Care.pdf. Accessed 17 Apr. 2024.

"Organic Land Care for Your Community." *Wildapricot*, The Canadian Society for Urban Organic Land Care, 2018, fastrope.wildapricot.org/resources/document/uTljNHN_T9II2VPclRSi4ZWwhcgTKbmLiErZbLIuU9N_rY4wRkZJHo0Qj0ZKGpGO7ueDMgXTm5b8k9ln1IX6Qg2?token=e5a98a572a59a7463fac176816a8146e.



“Organic Land Care.” *Conserve CT*, NOFA,
conservect.org/southwest/wp-content/uploads/2018/01/organiclandcare.pdf. Accessed 17
Apr. 2024.

“Pesticides and Soil Health.” *Pesticides and Soil Health*,
www.biologicaldiversity.org/campaigns/pesticides-and-soil-health/#:~:text=As%20little%20as%200.1%25%20of,continuing%20to%20harm%20soil%20health. Accessed 16 Apr.
2024.

“Pesticides: A Model That’s Costing US Dearly.” *Le Basic*, 30 Nov. 2021,
lebasic.com/en/pesticides-a-model-thats-costing-us-dearly/.

Pimentel, David. “Environmental and Economic Costs of the Application Of ...” *Beyond Pesticides*, 6 Mar. 2006,
[www.beyondpesticides.org/assets/media/documents/documents/pimentel.pesticides.2005up
date.pdf](https://www.beyondpesticides.org/assets/media/documents/documents/pimentel.pesticides.2005update.pdf).

“Policy Report - CCOF.” *CCOF*, 2020,
www.ccof.org/sites/default/files/CCOF-Roadmap-Policy-Report%20-%20Final-web.pdf.

“Pollinators Vital to Our Food Supply under Threat.” *Newsroom*, 16 Feb. 2016,
www.fao.org/newsroom/detail/Pollinators-vital-to-our-food-supply-under-threat/en.

“Pollinators Vital to Our Food Supply under Threat.” *Newsroom*, 26 Feb. 2016,
www.fao.org/newsroom/detail/Pollinators-vital-to-our-food-supply-under-threat/en.

Sangiorgio, Daniela, et al. “The Unseen Effect of Pesticides: The Impact on Phytobiota Structure and Functions.” *Frontiers*, Frontiers, 15 July 2022,
www.frontiersin.org/articles/10.3389/fagro.2022.936032/full.

Segedie, Leah. “Organic Land Care--Movement to Ban Herbicide Use in Schools & Parks.” *MAMAVATION*, 1 Dec. 2023,
www.mamavation.com/activism/organic-land-care-ban-herbicides.html.

Seis, Colin. *Landcare: More than Planting Trees*, Local Land Services NSW, 21 Nov. 2022,
<https://www.youtube.com/watch?v=ADgQMPEIQjs>.



Sellmer, Jim, et al. "Soil Management in Home Gardens and Landscapes." *Penn State Extension*, 12 Sept. 2017, extension.psu.edu/soil-management-in-home-gardens-and-landscapes.

"'Sicker, Fatter, Poorer': The Cost of Hormone-Disrupting Chemicals." *CBS News*, CBS Interactive, 3 Jan. 2019, www.cbsnews.com/news/sicker-fatter-poorer-the-cost-of-hormone-disrupting-chemicals/.

Sharma, Akanksha, et al. "Global Trends in Pesticides: A Looming Threat and Viable Alternatives." *Ecotoxicology and Environmental Safety*, Academic Press, 5 June 2020, www.sciencedirect.com/science/article/abs/pii/S0147651320306515#:~:text=The%20most%20commonly%20used%20natural%20pesticides%20are%20neem%2C,pyrethrum%2C%20rotenone%20and%20nicotine%20%28Duke%20et%20al.%2C%202010%29.

Silva, Vera, et al. "Environmental and Human Health at Risk – Scenarios to Achieve the Farm to Fork 50% Pesticide Reduction Goals." *Research@WUR*, Elsevier, 3 June 2022, research.wur.nl/en/publications/environmental-and-human-health-at-risk-scenarios-to-achieve-the-f.

"Sun Valley Idaho USA Project - Organic Land Care." *Harrington's Organic Land Care Consultation*, 22 Feb. 2023, organiclandcare.com/project/sun-valley-idaho-project/.

Sánchez-Bayo, Francisco, and Kris A.G. Wyckhuys. "Worldwide Decline of the Entomofauna: A Review of Its Drivers." *Biological Conservation*, Elsevier, 31 Jan. 2019, www.sciencedirect.com/science/article/abs/pii/S0006320718313636.

Sweitzer, Elizabeth. "Campus Conservation: The Changing Landscapes of American Colleges and Universities ." *The Emerald Review*, 18 Mar. 2023, emeraldreview.com/2023/03/campus-conservation-the-changing-landscapes-of-american-colleges-and-universities/.

Tudi, Muyesaier, et al. "Agriculture Development, Pesticide Application and Its Impact on the Environment." *International Journal of Environmental Research and Public Health*, U.S. National Library of Medicine, 27 Jan. 2021, www.ncbi.nlm.nih.gov/pmc/articles/PMC7908628/.

"Understanding Organic Pricing and Costs of Production." *ATTRA*, NCAT 2019, Nov. 2019, attra.ncat.org/publication/understanding-organic-pricing-and-costs-of-production/.



Vischetti, Costantino, et al. "Sub-Lethal Effects of Pesticides on the DNA of Soil Organisms as Early Ecotoxicological Biomarkers." *Frontiers*, Frontiers, 20 July 2020, www.frontiersin.org/journals/microbiology/articles/10.3389/fmicb.2020.01892/full.

Walder, Florian, et al. "Soil Microbiome Signatures Are Associated with Pesticide Residues in Arable Landscapes." *Soil Biology and Biochemistry*, Pergamon, 12 Sept. 2022, www.sciencedirect.com/science/article/pii/S0038071722002875.

"Why Organic?" *NOFA Organic Land Care Program*, nofa.organiclandcare.net/why-organic/. Accessed 17 Apr. 2024.

APPENDIX

A. Interview Questions

Personal Information

- Name
- Email
- Number
- Student or faculty/professor/project owner

Student

1. How familiar are you with the terms “organic fertilizers” and “inorganic fertilizers”?
2. Do you think organic land management is more or less expensive than using inorganic pesticides and practices?
 - a. (To gauge understanding of college student economic perspectives)
3. What are your thoughts on the use of chemical pesticides on campus grounds, such as sports fields or landscaped areas?
4. Hypothetically, If you were attending a university where water fountains were contaminated with pesticide residues, how would that make you feel?
5. Do you believe that the use of chemical fertilizers and pesticides on campus could have any impact on your health or the health of the local ecosystem?
6. Would you be more likely to support initiatives or policies that promote the use of organic fertilizers and environmentally-friendly pest management practices on campus?
7. Do you think the university should provide more education and awareness campaigns about the potential risks associated with synthetic chemicals used in landscaping and grounds maintenance?
8. If given a choice, would you prefer to have campus grounds maintained using organic methods, even if it resulted in a slightly higher tuition fee?
9. How often do you engage with nature on UT campus? (Studying on the UT lawn, sitting by the Turtle Pond, etc.) (every day, often, rarely, never)
10. What sustainability initiative on UT campus is most important to you as a student?

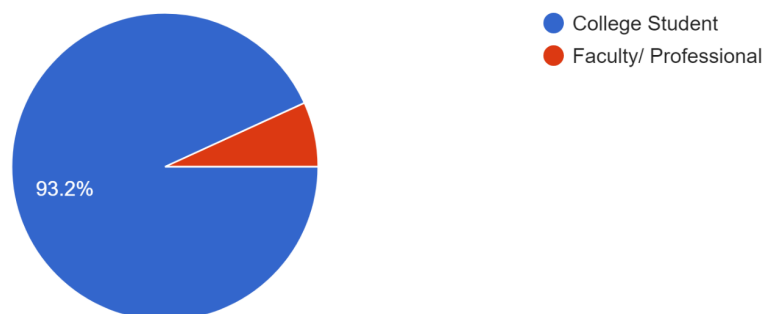
Faculty

1. Do you think organic land management is more or less expensive than using inorganic pesticides and practices? (To gauge understanding of college student economic perspectives? IDK you can delete literally anything I write on here, just brainstorming)
2. How important is sustainability research to the university, in your opinion? (0-5 option)
3. In your experience, what were some of the most significant benefits or positive outcomes observed after switching to organic products?
4. Were there any unexpected challenges or drawbacks that arose from using organic products that you had to address?
5. How confident are you in your understanding of organic vs inorganic land management practices?
6. What sustainability initiative on UT campus is most important to you as a faculty member?

B. Survey Results

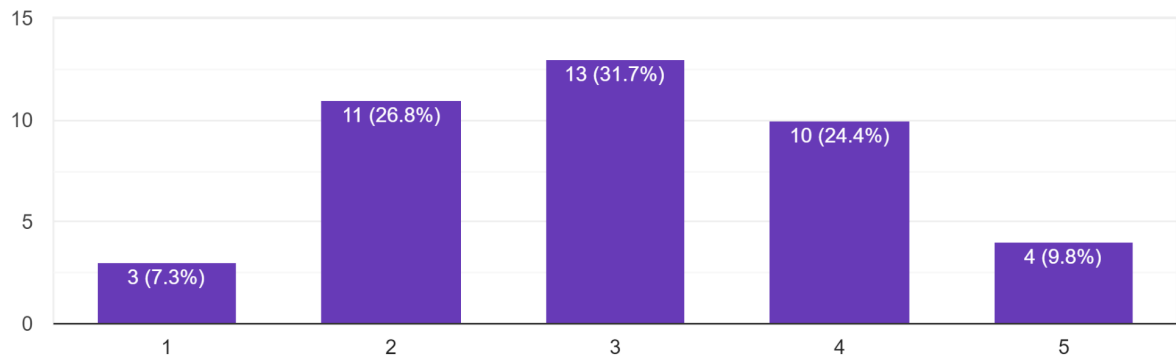
Which of the following are you?

44 responses



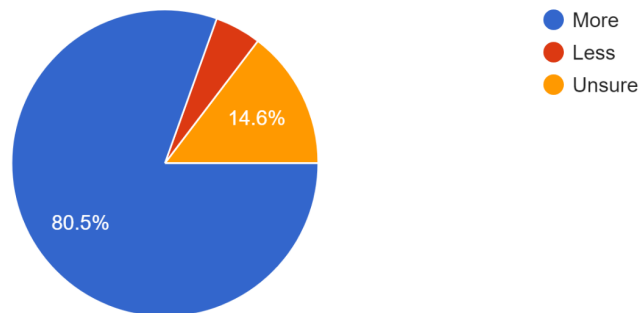
How familiar are you with the terms “organic fertilizers” and “inorganic fertilizers”?

41 responses



Do you think organic land management is more or less expensive than using inorganic pesticides and practices?

41 responses



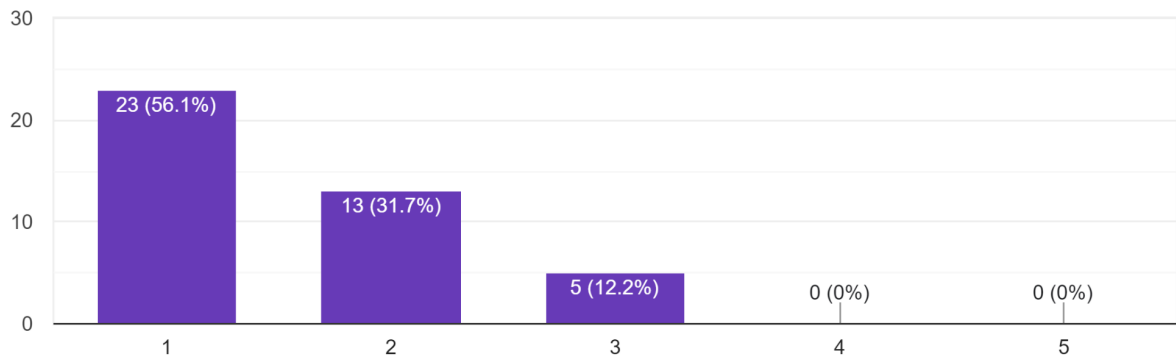
What are your thoughts on the use of chemical pesticides on campus grounds, such as sports fields or landscaped areas?

41 responses



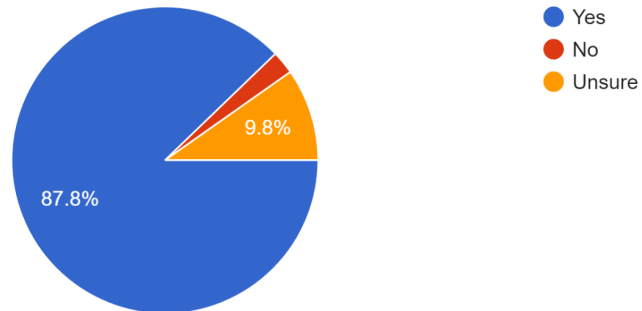
Hypothetically, If you were attending a university where water fountains were contaminated with pesticide residues, how would that make you feel?

41 responses



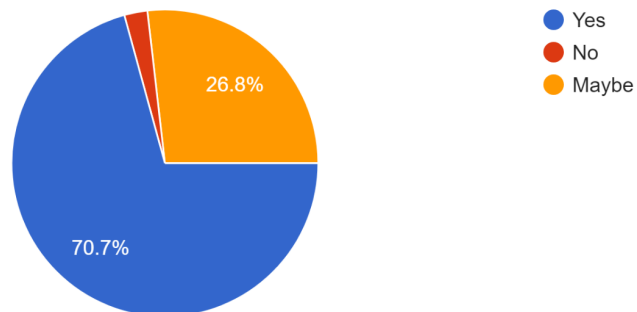
Do you believe that the use of chemical fertilizers and pesticides on campus could have any impact on your health or the health of the local ecosystem?

41 responses



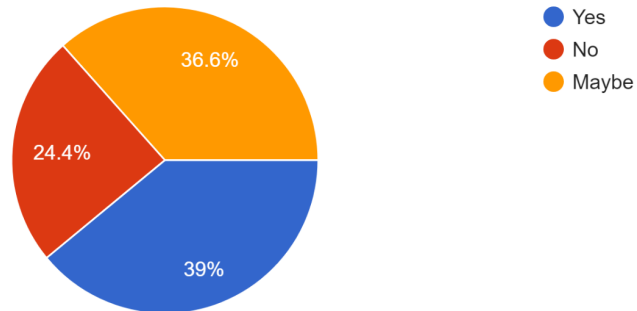
Do you think the university should provide more education and awareness campaigns about the potential risks associated with synthetic chemicals used in landscaping and grounds maintenance?

41 responses



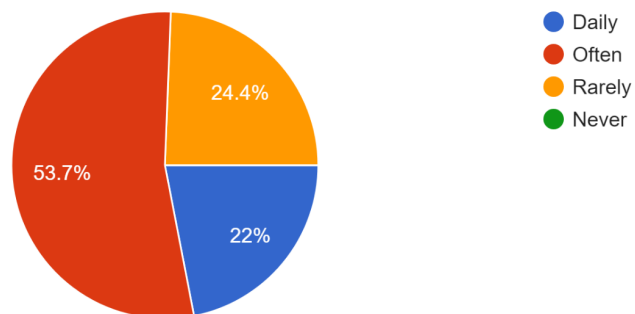
If given a choice, would you prefer to have campus grounds maintained using organic methods, even if it resulted in a slightly higher tuition fee?

41 responses



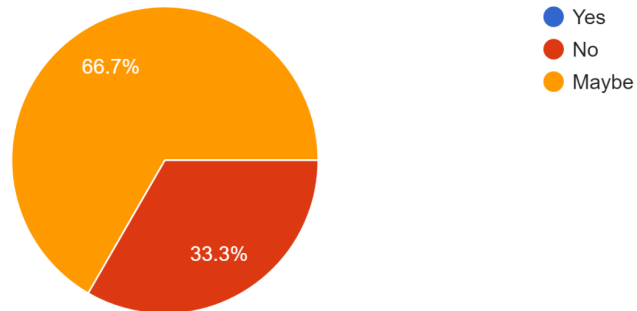
How often do you engage with nature on UT campus? (Studying on the UT lawn, sitting by the Turtle Pond, etc.)

41 responses



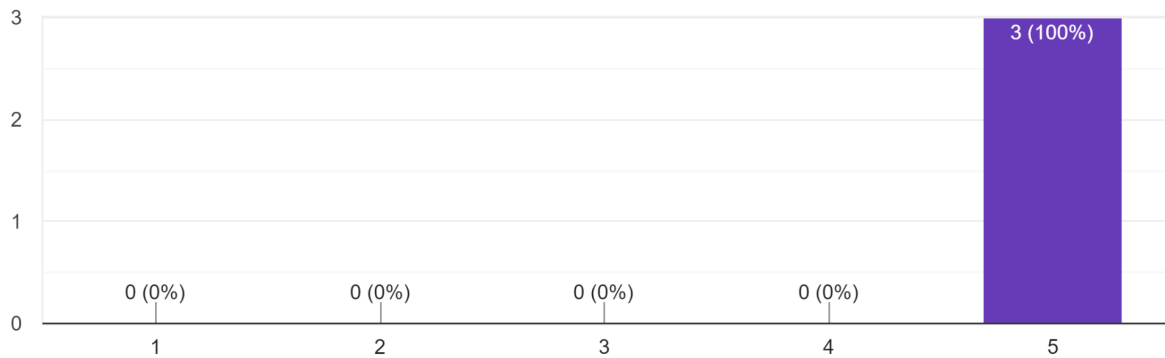
Do you think organic land management is more or less expensive than using inorganic pesticides and practices?

3 responses



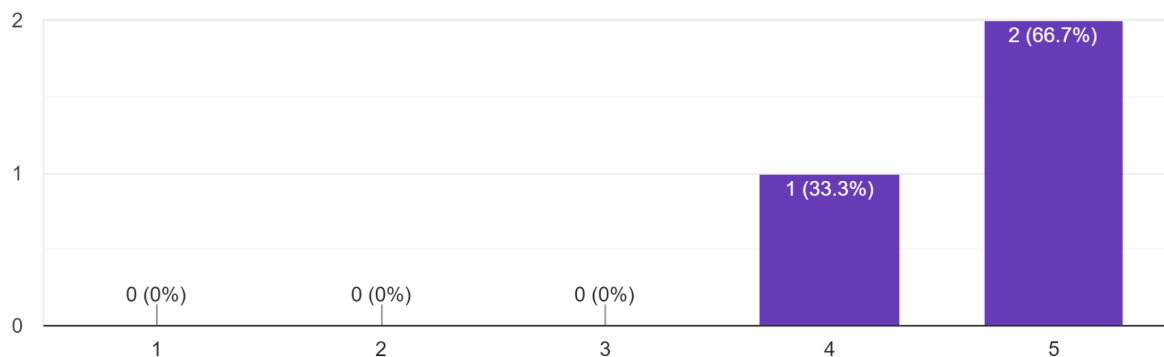
How important is sustainability research to the university, in your opinion?

3 responses



How confident are you in your understanding of organic vs inorganic land management practices?

3 responses



In your experience, what were some of the most significant benefits or positive outcomes observed after switching to organic products?

3 responses

Reducing costs of pesticides. People feeling better of how the university is cared for. Knowing that my crew had less exposure to pesticides. A more unique look to the campus.

HABITAT, AMBIANCE, INCREASED INTEREST,

The mindset change in the Grounds team which led to a mindset change within the campus community which led to the campus landscape becoming part of the teaching/learning infrastructure with led to the campus landscape being a part of the solution instead of part of the problem.



180Degrees
CONSULTING
TEXAS

Were there any unexpected challenges or drawbacks that arose from using organic products that you had to address?

3 responses

Peoples perspective. Crews expectations.

ADMINISTRATION PERSPECTIVE ON NEAT AND TIDY LANDSCAPES

Switching from inorganic to organic products proved to not be the path forward for us. We have found that managing a landscape organically is much more about observation, systems, and processes and not so much about products. It's the idea that you can't garden without products that got us into this mess in the first place.

C. Research Findings

The environmental impact also leans in favor of natural grass. Artificial turf contributes to soil compaction, reduced water infiltration, and increased runoff, degrading local water quality. It also sheds microplastics, contributing to broader ecological pollution problems. Natural grass, however, supports biodiversity, improves soil health, and controls runoff more effectively.

- Research at the University of Minnesota quantifies the carbon sequestration potential of turfgrass, demonstrating that lawns can sequester between **25.4 to 204.3 grams** of carbon per square meter per year. This data highlights the substantial role that properly managed grasslands can play in mitigating greenhouse gas emissions. (<https://turf.umn.edu/>)
- Further studies reinforce the idea that grasslands, especially in regions prone to drought and wildfire, such as California, are reliable carbon sinks. They are more resilient and less likely to become carbon sources compared to forests under similar stress conditions, making them a crucial component in sustainable land management strategies ([UC Davis](#))

Qualitative data that supports the environmental findings:

- Artificial turf installations typically involve removing topsoil and heavily ***compacting the substrate to create a stable base***. This compaction significantly reduces the soil's ability to absorb water, leading to increased runoff. A study noted that synthetic turf systems could drastically reduce soil infiltration rates, thereby increasing runoff when compared to natural turfgrass, which naturally enhances water filtration and absorption due to its complex root system. ([UFTurf](#))

- ***Increase runoff and water quality degradation:*** Due to the compacted base required for artificial turf, water infiltration is markedly reduced, leading to higher runoff volumes. This not only increases the risk of flooding but also the potential for runoff to carry pollutants into waterways. Runoff from artificial turf has been found to contain harmful metals such as zinc, which pose risks to aquatic life. Furthermore, artificial turf contributes to higher pollutant loads in runoff due to the lack of natural filtration provided by soil and plant roots found in natural grass areas.
- ***Microplastics Pollution:*** Studies estimate that hundreds to thousands of kilograms of microplastics may be released from a single artificial turf field into the environment annually. These microplastics can travel significant distances, polluting soil and waterways and posing a threat to aquatic ecosystems ([UtahStateExtension](#))

Building On Organic Maintenance Program ([Link](#))

To develop an effective action plan for maintaining a healthy grass playing field using organic methods, it's crucial to first assess and diagnose existing field conditions. Common issues such as soil compaction, visible wear, and puddling must be identified to understand their underlying causes. Soil testing is a valuable tool in this process, providing data on soil texture, moisture, pH, organic content, and essential nutrients like phosphorus, potassium, nitrate, and calcium. These tests also measure beneficial soil microorganisms, pinpointing imbalances that could hinder grass growth. With this detailed soil information, managers or specialized consultants can tailor maintenance practices, such as adjusting fertilizer blends and soil amendments, to optimize soil health and grass resilience while minimizing environmental impact and cost. This approach ensures the field is maintained sustainably and effectively, fostering optimal conditions for athletic use.

- Reversely speaking, the soil testing fee and material fee should be included in the direct cost of goods sold. The actual balance or imbalance PH data can be further considered as the indirect cost
- Use the PH table to calculate additional cost to make soil land to ideal PH
- texture , moisture, pH, organic content, soil organic matter

Thought process on the additional maintenance cost includes **soil amendments, aeration, Mowing and irrigation.**

1. **Soil Amendments:** The cost of soil amendments varies widely based on the specific needs identified by soil testing. For instance, adding lime to adjust soil pH or incorporating compost to enhance soil structure and microbial diversity are common practices. Costs can range from a few **hundred to several thousand dollars per acre**, depending on the type and quantity of amendments required.



2. Aeration: Aeration is critical for relieving soil compaction and allowing air, water, and nutrients to penetrate the root zone. Costs for aeration depend on the size of the field and the frequency of treatment. Generally, aeration costs can range from **\$150 to \$300 per acre** per treatment, with several treatments needed throughout the year.
3. The cost of mowing varies based on the frequency of cuts and the size of the field. For athletic fields, regular mowing is essential to maintain grass at an optimal height for play. Typical costs for mowing can range from **\$30 to \$60 per acre per mowing session**, with the frequency depending on growth rates and usage patterns.
4. Effective irrigation is crucial for maintaining grass health, especially in drier climates. Costs for irrigation include both the installation and maintenance of irrigation systems as well as the water usage costs. The annual cost for irrigating an athletic field can range from **\$1,000 to \$5,000 per acre**, depending on local water rates and the efficiency of the irrigation system.

Safer Options for Health and Environment

There's multiple concerns that's both harmful to humans and the environment. Taking toxic chemicals or even pollution as an example, children are especially sensitive to toxic chemicals due to their rapidly developing organs and immature detoxification systems. Additionally, they breathe more air relative to their body weight and are more prone to ingest contaminants through hand-to-mouth actions compared to adults. Therefore, it's crucial to meticulously manage their exposure to environmental hazards. Though there's no specific quantitative. In the case studies, EPDM and TPE are mentioned as the types of synthetic rubbers commonly used in products like artificial turf infill, which can have direct implications for children's health due to their unique vulnerabilities. Children's rapid organ development and less mature detoxification systems make them particularly susceptible to the effects of toxic chemicals often found in these materials. EPDM rubber, for instance, can contain significant amounts of oil and additives like carbon black and may emit volatile organic compounds (VOCs) and other potentially harmful substances like phthalates, which are known endocrine disruptors. Although EPDM generally has lower levels of polycyclic aromatic hydrocarbons (PAHs) and heavy metals like chromium compared to recycled tire materials, the presence of these substances is still concerning. Similarly, TPE, which is used as an alternative to EPDM in applications such as play surfaces, may contain fewer VOCs and is typically free from vulcanization agents due to its manufacturing process that does not require curing. However, TPE can still release harmful chemicals depending on its composition, which can include styrene block copolymer, polyethylene, paraffin oil, and carbon black. These components have been associated with various health risks.

The exposure of children to these chemicals is particularly problematic as they breathe more air per unit body weight than adults and often engage in hand-to-mouth behaviors, increasing their potential intake of these contaminants. The ingestion and inhalation of particles from synthetic rubbers can lead to health issues, emphasizing the need for careful consideration and regulation of the materials used in children's play environments to mitigate risks and safeguard their health.

On the other hand, where many people are concerned about the environmental cost. The environmental concerns associated with artificial turf fields are multifaceted, primarily involving the pollution and ecological impact of materials used in these fields. Studies, including those by the Connecticut Department of Environmental Protection, highlight the significant issue of chemical runoff from artificial turf, particularly metals like zinc, copper, cadmium, barium, manganese, and lead. Such runoff is known to be toxic to aquatic life, with zinc and the cumulative effects of all contaminants combined (posing serious risks. Moreover, the problem of microplastic pollution is exacerbated by the migration of synthetic particles, such as infill and broken glass fibers, beyond the boundaries of the fields. These particles, often spread through activities on the fields and environmental conditions, can enter nearby ecosystems and waterways, potentially integrating into the food chain and affecting sedimentary organisms. Disposal of artificial turf materials poses yet another environmental challenge. While some components of the turf might be reused, degradation over time generally limits reuse opportunities, leading to disposal in landfills or through incineration. This contributes to waste and potential pollution, particularly if toxic substances are released during disposal processes.

More In-depth analysis on the number

The lifecycle costs of artificial turf vs. natural grass fields vary significantly, encompassing installation, maintenance, and disposal stages. According to the Sports Turf Managers Association (STMA), installing an artificial turf field can cost between \$4.50 to \$10.25 per square foot, with specific examples such as Natick, Massachusetts, where the total project cost for a new artificial turf field was approximately \$1.2 million. In contrast, natural grass fields may cost between \$1.25 to \$5.00 per square foot for installation, substantially less than artificial turf.

Maintenance costs also differ; artificial turf requires specific maintenance such as infill redistribution and periodic disinfection, typically costing between \$5,000 to \$8,000 annually. Natural grass, on the other hand, may cost between \$4,000 to \$14,000 annually, depending on the management approach. Notably, organic turf management can become more cost-effective over time, potentially costing 25% less than conventional natural grass maintenance.

When it comes to disposal and replacement, artificial turf fields are more expensive, with costs ranging from \$6.50 to \$7.80 per square foot. Long-term studies, such as those by Missouri University Extension and Australian government agencies, suggest that over a 25 to 50-year period, the lifecycle costs for artificial turf are approximately 2.5 times higher than for natural grass.

TURI - Cost Analysis

In assessing the lifecycle costs of artificial versus natural grass systems, a comprehensive analysis reveals significant economic implications for municipalities and sports organizations considering their installation and maintenance options. Installation costs for an artificial turf field measuring 85,000 square feet range from approximately \$400,000 to \$1 million, considerably higher than the \$50,000 to \$600,000 for a comparable natural grass field. This initial cost disparity is critical in financial planning, as the higher upfront investment for synthetic fields may impact budget allocations and funding strategies. From the given example, additional cost for synthetic turf installation includes land clearing, drainage, earthwork, fencing, landscaping, masonry, field surfacing, paving, and site functioning.

Additionally, maintenance for synthetic fields generally requires specialized equipment and periodic infill replacement, leading to ongoing costs such as \$5,300 to \$6,800 annually for basic upkeep by an external contractor. For natural grass, maintenance costs are predominantly labor-intensive, involving regular mowing, irrigation, and sod replacement, with estimated annual costs ranging from \$12,400 to \$13,000 per 2-acre field. Such figures necessitate a detailed understanding of both immediate and long-term financial commitments, influencing decisions based on available resources and long-term sustainability.

Regarding the integration of these costs into a Social Return on Investment (SROI) model, it is imperative to meticulously quantify each cost category to accurately assess the economic and social benefits relative to the invested capital. Installation, maintenance, and disposal/replacement costs must be annualized to provide a clear picture of yearly financial impact. For instance, the high initial cost of synthetic fields could be justified if the annual maintenance and longer life cycle offset the initial outlay, presenting a lower cost per year of useful life compared to natural grass. Similarly, the cost of disposal and environmental considerations must be factored into the SROI model to evaluate the true social and economic return. The model should also incorporate the frequency of use and capacity for events, as these directly influence the utility value derived from the field.



Actual Financial Variable Research

Pesticide Use Indicators

- “Average one time rate of application” of active ingredient on an acre of given crop
- “Average number of applications” made with specific active ingredient on a crop in a production cycle
- “Rate per Crop Year,” which is the average rate of application per production cycle
 - It’s important to include in analysis because pesticide industry has focused on identifying new modes of action that are highly specific to target pests and effective at low-dose rates

The frequency rate and the extent of use:

1. Percent Acres treated
2. Actual number of acres treated - can be denoted as (% acres treated * total crop coverage)
3. “Pounds Applied: total pounds of active ingredient applied per production cycle on a given crop

Environmental cost Analysis (Referenced through Cornell Research Paper)

Transition cost from conventional chemicals vs Organics

- Feed the soil approach
- Need efficiency rate, cost of transition, cost of setup, transition rate

On the ground level analysis

- Need to consider location, acres covered (most identifiable unit), water cost, lawns reduction rate, soil health rating, water retention and infiltration rate, reduction in chemical input, R&D cost

High level financial metric

- Social return on Investment (SROI), NPV cost benefit analysis, discount rate on multi-year cost benefit analysis. Coverage ratio

<https://edepot.wur.nl/247934>

<https://finmodelslab.com/blogs/kpi-metrics/regenerative-agriculture-advisory-kpi-metrics> (KPI)

<https://www.tandfonline.com/doi/pdf/10.4161/gmcr.2.3.17591> (Example of Input)

<https://croplife.org/wp-content/uploads/2016/04/Cost-of-CP-report-FINAL.pdf> (report on R&D)

<https://www.epa.gov/sites/default/files/2015-10/documents/chap4b.pdf> (pesticide PH Ratio)

- Think it as investment grade debt and each pesticide PH can be a metric formulation



Financial Metrics & KPI

$$\text{Soil Organic Matter (SOM)} = (SOM_{\text{Current}} - SOM_{\text{Initial}}) / SOM_{\text{Initial}}$$

- Organic materials present in the soil, measure the progress of soil implementation

$$\text{Water Retention rate} = (\text{Water Held in Soil} / \text{Total Water Holding Capacity}) \times 100$$

$$\text{Water use efficiency} = \text{Crop yield (\%)} / \text{Water Used (L)}$$

Estimate Costs and Benefits of control scenarios

1. Costs of organic transition are the additional costs that occur due to the introduction of the measures.
2. Benefits of transitional options are usually the avoided costs (i.e. the estimated losses or impacts) induced by the pest of concern, and detrimental environmental damage.
Therefore the data for benefit estimation can be derived from the impact assessment part of the PRA.

$$\text{Equation to measure Net benefits (NB)} = \sum \text{benefits} - \sum \text{costs}$$

$$\text{After discounting: Present Value of Benefits} - \text{Present Value Costs} = \text{NPV (Net Present Value)}$$

We need to estimate the direct effects of each control scenario as costs and benefits

- The direct effects of a control scenario are those positive and negative effects (expressed in monetary terms as benefits and costs), that occur expectedly or are wanted outcomes of the introduction of Dell medical project or actual organic transition
- The costs may include fixed and variable costs. This can be further segmented into labor cost, transition cost, differentiation of product choice with embedded price, existing contracts cost.
- Some types of expenditure are worth breaking down into their unitary cost (unit/year) and specific financial metrics (example shown above) to predict future total cost

Estimate the indirect effects of each scenario as costs and benefit

- Positive and negative externalities should be included
- For example, the use of pesticides may lead to the potential loss of beneficial arthropods or have negative effects on non-target vertebrate species and human health. In first part of the research we included as environmental opportunities cost
- Effects on income or capital from access fees or recreational areas should also be considered

Consider the time aspects of costs and benefits

- Differences in timing of costs and benefits affect their current value. To allow direct comparisons of the different options, convert annual costs and benefits to present values. Discount (annual cost and benefit) values to present values in the base year.

$$\text{PV of Cost} = C = \sum_{t=1}^N C(t) * v(t)$$

Variable explanation:

- $v(t)$ = the discount rate, N = number of year, $c(t)$ = potential cost of single year
- T = years, and C = value of total cost or benefits during numbers of years

Calculating decision criteria

- Net present value (NPV) provides a measure of the absolute difference(s) between costs and benefits ($\text{PV (B)} - \text{PV (C)}$) of each scenario and is usually the primary criterion as it indicates which option generates the largest net benefit.
- The benefit-cost ratio (B/C ratio, total PV benefits divided by total PV costs provides a measure of the relative difference(s) between costs and benefits.

