Sustainable Farming in California

La Jolla High School





The Problem with Modern Agriculture

- **Key Point**: Agriculture is the backbone of human civilization, originating in the Neolithic period (~10,000 BCE) in the Fertile Crescent.
- Why It Matters: Feeds billions, shapes economies, and drives cultural development.
- **Challenge**: Unsustainable practices (e.g., pesticide overuse, soil depletion, high water consumption) threaten future food security due to climate change.
- Citation: World Wildlife Foundation, "Agriculture and Soil Degradation"

Quote: "Without agriculture, there is no society." – Adapted from Jared Diamond

Problem Details

- Key Issues:
 - Environmental Impact: Agriculture accounts for ~70% of global freshwater use and 30% of greenhouse gas emissions (FAO, 2023).
 - Soil Degradation: Over-cultivation by industrial giants like Cargill reduces arable land by 5-7 million hectares annually (UNCCD).
 - **Ethical Concerns**: Factory farming (e.g., Tyson Foods) prioritizes profit over animal welfare and small farmers.
- Local Context: San Diego's farms face water scarcity and urban expansion pressures.

Citation: FAO, "Agriculture and Climate Change," 2023; UNCCD, "Global Land Outlook," 2022





Meet The Researchers

Michael Thomas

I am an enthusiastic member of the Youth 4 Climate and SanDiego 350 communities. Climate change is one of the most imminent and major threats to the continuation and prolonged prosperity of humanity as well as the good of all life on Earth. I aim to pursue my interest of making a difference in my nation's future by attending a United States service academy and coupling my passion to serve with the resources my government has to offer.



Meet The Researchers

Kobi Schneider

Kobi Schneider is the co-president of La Jolla High's Environmental Action club, and he is heavily involved in youth activism through SanDiego350. He's spoken at rallies, written statements for board meeting, and planned large-scale events. He's excited to find sustainable solutions to problems facing our world



Meet The Researchers

Michael Schaffer

Michael Schaffer is a Lao American activist who encourages diversity and inclusion in the workplace. He is a 4.0 GPA student, an ambassador at LAOSD, and made a film about Lao Americans. He believes environmental justice is necessary for the liberation of all oppressed people, including Laotians. He is interested in pursuing business administration/finance and taking what he has learned from his community into the world.



Thesis Statement





- Thesis: Sustainable agriculture in the 21st century requires integrating innovative technologies, regenerative practices, and ethical frameworks to ensure food security, preserve ecosystems, and support equitable growth in regions like San Diego amidst population expansion.
- Core Themes:
 - 1. **Innovation**: Precision agriculture, hydroponics, and Al-driven farming.
 - 2. **Regeneration**: Restoring soil and biodiversity through cover crops and agroforestry.
 - 3. **Ethics**: Prioritizing animal welfare, fair labor, and community-driven models.

Current Leading Research in Sustainable Agriculture

- Key Studies:
 - Rodale Institute (2023): The Farming Systems Trial (40-year study) shows regenerative agriculture increases soil organic carbon by 30% and boosts crop resilience to drought by 25% compared to conventional methods. Practices include cover cropping, crop rotation, and no-till farming.
 - UC Davis, Center for Watershed Sciences (2024): Precision irrigation systems, using soil moisture sensors and AI algorithms, reduced water consumption by 20% in almond orchards while maintaining or increasing yields. Scalable for San Diego's water-scarce environment.
 - Nature Journal, Vertical Farming Advances (2025): Controlled-environment agriculture (CEA) like hydroponic vertical farms yields 10-20x more food per acre than traditional farming, using 90% less water and no pesticides. Urban applications are viable for San Diego's growing population.
 - Wageningen University, Netherlands (2024): Circular agriculture models, integrating livestock and crop systems, reduced nitrogen runoff by 40% and improved soil fertility. Relevant for small San Diego farms aiming for closed-loop systems.
- Why It Matters: These studies provide evidence-based solutions to combat soil degradation, water scarcity, and climate volatility—critical issues for California's agricultural future.
- San Diego's Local Application:
 - Regenerative practices can restore degraded soils in San Diego's inland valleys.
 - Precision irrigation aligns with local drought management policies.
 - Vertical farming suits urbanizing areas like Chula Vista and National City.

Citations:

- Rodale Institute, "Farming
 Systems Trial: 40-Year Report,"
 2023.
- UC Davis, "Smart Irrigation for California Crops," 2024.
- Nature, "Scaling Vertical Agriculture," 2025.
- Wageningen University,
 "Circular Agriculture Systems,"
 2024.

Our Research Approach

- Duration: 6 months of dedicated study (October 2024 -March 2025)
- **Focus**: Sustainable farming methods suited for arid regions like Southern California.
- Methodology:
 - Visited small-scale farms in San Diego County (e.g., Chino Farm, Be Wise Ranch).
 - Interviewed local farmers on challenges like drought and soil health.
 - Analyzed alternatives to industrial practices (e.g., regenerative agriculture, vertical farming).
- Why Small Farms?: Unlike corporate giants, they prioritize ethical practices and community resilience.



Citation: Personal interviews, San Diego farmers, 2024

Visiting a Local Farm



- At our neighbor's farm, we investigated conservation tillage, which minimizes soil disturbance and saves land/less carbon emissions. It also builds up crop remnants on soil surface to reduce disturbances to soil (heavy rainfall, wind, etc.)
- We also investigated polyculture farming, which is a technique to grow different crops on the same land. This saves land space and uses less resources.



Creating a Trash Free Environment

- Farming needs to trash free environment to grow crop effectively without particulate matter and harmful chemicals (POPs, heavy metals, plastics) leaching into the soil
- We helped clean up trash to allow the ecosystem to thrive and produce the maximum gain



Ethical and Community Impacts

- Animal Welfare: Shift to pasture-raised systems reduces stress and antibiotic use (e.g., Polyface Farms model).
- Support for Small Farmers:
 - San Diego's farmers' markets (e.g., Little Italy Mercato) empower local producers.
 - Policy Idea: Subsidies for family farms over corporate agribusiness.
- **Equity**: Training programs for underserved communities in urban farming (e.g., San Diego Roots Sustainable Food Project).

Citation: San Diego Roots, "Community Farming Impact," 2024



Website

We designed a website to let farmers know about sustainable solutions to agriculture. We distributed it to several local people.



Connecting to San Diego's Future and Conclusion

- Challenges:
 - Population growth: San Diego County projected to reach 3.5 million by 2035.
 - Water scarcity: Colorado River shortages demand efficient farming.
- Opportunities:
 - Urban agriculture: Rooftop gardens in downtown San Diego.
 - Tech hubs: Collaborate with UC San Diego for Al-driven farming research.
- Vision: San Diego as a model for sustainable, ethical agriculture by 2050..

By embracing innovation, regeneration, and ethics, sustainable agriculture can secure food systems for a growing world while preserving ecosystems.

- Support local farms, advocate for regenerative policies, and invest in agricultural tech education.
 - The future of food lies in farming with nature, not against it."





A glimpse into a San Diego Producer

- Immigrant refugee from Ukraine Andrii Uvarov is a local farmer in the Escondido area who has escaped his war torn country with his family to make sure his kids can grow up without fear.
 - " I understand the struggle of hunger, especially for the children, it isn't something anyone should experience. Let alone those who want peace yet they cannot make better of their situation "
 - In his testimony as to why he chose farming, he says that he wanted to do his part for his community by harvesting fresh produce, however a challenge he faces are the industry giants who make it hard for small producers like him to gain traction. His methodology of only using what necessary resources he should and only harvesting what must be taken is sustainable but is unfortunately eclipsed by the by the likes of Cargill and Tyson foods that represent the over cultivation of land for grain resulting in

a declining farmland with every passing crop cycle.





Thanks!

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