a. Title and Principal Investigator Information

Title: Case Study of Urban Agriculture in Detroit:
Optimizing Social and Bio-Physical Sustainability in Urban Environments

Student Researcher: Brett Zeuner
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Principal Investigator and Mentor: Dr. Lawrence Lemke
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b. Project Summary

Intellectual Merit

The current status and sustainability of urban agriculture in Detroit will be assessed from social and bio-physical perspectives. Participant observation and unstructured solo and group interviews will be used to collect information on three urban agriculture sites in Detroit. Soil sampling and analysis will be done on two of three sites with the presence of multiple contaminants being investigated. Through the assessment of the collected data the relationship between factors affecting the social and bio-physical sustainability of the three sites will be investigated.

Dr. Lawrence D. Lemke, the study mentor, is continuing research on the spatial variability of contaminants within soil plots during the summer of 2015. Soil sampling and analysis methods that Lemke and affiliated researchers have developed will be implemented at two of the three community gardens being assessed in this study (Bugdalski, Lemke et al. 2014). The presence and spatial variability of heavy metals, polycyclic aromatic hydrocarbons (PAHs), and anti-biotic resistant strains of bacteria within the two gardens will be determined. These results will be part of a larger project that is addressing the bio-physical conditions and related social concerns associated with contamination of urban gardens.

The qualitative interviews and analysis proposed here will contribute to developing the educational and community outreach components of the larger project previously mentioned. By exploring the relationships between perception of risks associated with soil contamination and the ideas, beliefs, and values held by those involved with urban agriculture will help in the development of educational outreach materials.

Broader Impacts

The soil sampling and analysis methods being further developed as part of the larger study could be implemented on a larger-scale to develop a standardized, empirical database of contamination of soils in community gardens across the City of Detroit. A database of that quality could allow for a more efficient and equitable allocation of remediation and educational resources.

Furthermore, expanding the knowledge base surrounding the relationship between the social and bio-physical sustainability of urban agriculture within the city of Detroit is increasingly relevant as social stressors, such as high poverty and crime rates, a high volume of vacant homes, and a declining population, continue to affect the quality of life within the city. Urban agriculture may serve as a practical method of ameliorating social concerns affecting the city as a result of the heavy industrialization and subsequent disinvestment that has occurred since post-World War II. The application of social science research methods, coupled with insights gained from allied research on bio-physical contaminants, will increase understanding of the relationship between the bio-physical and social sustainability of urban agriculture within the City of Detroit, both in the present and in the long-term.

c. Project Description

A. Introduction and Background

The sustainability of the social and bio-physical environment must be addressed to safely grow foods in urban areas through the 21st century and beyond. Within the City of Detroit, sustainability of the urban environment is critical to developing urban agriculture as a means of solving long-term social issues. Urban agriculture can offer many benefits to community members but it may also pose risks (Kim, Poulsen et al. 2014). The relationship between an individual's bio-physical and social environments is well documented.

The presence of lead in soil has been correlated to childhood exposures and seasonal variations in blood lead levels (BLL) (Zahran, Laidlaw et al. 2013). Lead contamination has a strong negative effect on educational performance among children in the Detroit Public School System (Zahran, Laidlaw et al. 2013, Zhang, Baker et al. 2013, Moody 2014). Furthermore, lower socio-economic status and racial residential segregation in Detroit neighborhoods have been correlated to higher BLLs in children (Moody 2014), suggesting environmental justice issues concerning the impacts of soil contamination within the city. The Detroit-Warren-Livonia metropolitan statistical area (MSA) is the most segregated MSA in the United States of America (Hyra, Squires et al. 2012) and has been shown to have some of the highest BLLs of children compared to other major United States cities (Zahran, Laidlaw et al. 2013, Zhang, Baker et al. 2013, Moody 2014).

Disparities among perception and knowledge of risks and accessible solutions are key issues in addressing the social and bio-physical sustainability of urban agriculture (Kim, Poulsen et al. 2014) Kim, Poulsen et al. (2014) surveyed community gardeners in the Baltimore, Maryland area to assess these disparities and identify possible conflicts therein. They found that two thirds of the respondents were aware of possible lead contamination. 74% of the respondents reported using raised beds with half of the respondents using raised beds exclusively. In-depth interviews

revealed that a common reason for using raised beds was to avoid exposure to perceived lead contamination in the gardener's soil. When asked about remediation efforts, more than half of the respondents did not know of any remediation solutions that they could implement besides using raised beds. The authors pointed out that using raised beds would not address all aspects of soil contamination. This study showed that there is a lack of general consensus in the Baltimore area about on the presence, risks, and solutions associated with soil contamination among urban gardeners.

The social sustainability of urban agriculture, as it relates to this study, draws heavily from the concepts of equity of access to key services and the mechanisms for collective self-determination in solving community issues (McKenzie 2004). Chief among those are the identification and remediation of soil contamination and the distribution of healthy, locally-grown food. Previous research has shown that the access to fresh fruit and vegetables is inadequate in many neighborhoods across the City of Detroit, particularly for majority African-American neighborhoods (Zenk, Schulz et al. 2005, Zenk, Schulz et al. 2006, Johnson 2012).

By maintaining a focus on valuing the self-determination of communities and avoiding cultural hegemonic practices, agricultural projects that are both low-risk and community-driven could be implemented within the City of Detroit in a socially sustainable manner. These projects could seek to address and solve various social issues, such as inaccessibility to nutritious, culturally-representative foods and lack of education surrounding food production and consumption.

Another critical component of ensuring social sustainability is proactively assessing the potential for conflicts among stakeholders. Stakeholder groups in the agricultural redevelopment process in Detroit include residents of Detroit and the surrounding greater metropolitan area, government officials, local businesses, and national corporations. Conflicts stemming from opposing cultural ideas and values may arise within, between or among any of these groups. The long history and current status of de facto segregation within the metropolitan area requires an emphasis on valuing the social and cultural goals of local community members throughout the redevelopment process.

The possibility of conflict is also present between local community members and the city government. According to information from the City of Detroit's website, last updated on May 5, 2015, the Detroit Land Bank Authority (DLBA) is in charge of all vacant properties that were previously under other department's supervision. According to the city's website, this puts over 80,000 homes under the control of the DLBA. The DLBA is comprised of an 88-person team. Further research may be warranted to assess the equity in outcomes of interactions between various stakeholder groups and the DLBA to ensure that people of various stakeholder groups are not facing comparatively greater barriers throughout the land acquisition process. An awareness of the potential for conflict throughout the research process will help maximize its benefits for the greater good of society.

B. Specific Aims

The overall objective of this study is to integrate the characterization of physical and biological characteristics of urban gardens with an investigation of how participants perceive the benefits and risks of gardening in their communities. The specific aims involve both bio-physical and social elements influencing the development of sustainable urban agriculture in Detroit:

Specific Aim 1. to assist and collaborate with other students in the collection of soil samples and the measurement of heavy metals in two Detroit urban gardens using specific methods described below.

The two hypotheses involved here are:

1) Heavy metals are present in urban soils
2) The distribution of heavy metals is not uniform across the area sampled

Specific Aim 2. to conduct interviews with community members holding agency in three Detroit urban gardens for the purpose of identifying their ideas and beliefs about:

- bio-physical sustainability of urban agriculture, in terms of the presence and remediation of soil contamination within urban soils.
- accessibility to education and resources concerning soil contamination and remediation.
- social outcomes associated with urban agriculture.

Specific Aim 3. to identify relationships between the actors perceptions of the three aforementioned topics using the methods described below to determine the functions that urban agriculture serves for the actors.

The actors in this study will be defined by their agency, or ability to independently make decisions. More specifically, in terms of the 'projectivity' of their agency in regards to decisions affecting their urban agriculture site. The definition of projectivity of agency will be borrowed from Emirbayer and Mische (1998) who define projectivity as "the imaginative generation by actors of possible future trajectories of action, in which received structures of thought and action may be creatively reconfigured in relation to actors' hopes, fears, and desires for the future." Thus, the identity as an actor will be defined by one's ability to change their urban agriculture site in response to their hopes, fears, and desires. This definition complements the study because the information being sought are the perceptions of the actors which will be uncovered through observation and interviews.

C. Methods

The methods used to fulfill the first specific aim involve applying a previously developed sampling grid (Bugdalski, Lemke et al. 2014) laid out onto a 20x20 meter area on an urban agriculture site. There are 65 points that will be sampled with corresponding analysis of the presence of heavy metals at each point. These samples will then be analyzed in the laboratory using a Thermo Scientific™ Niton™ XL3t 950 GOLDD+ X-ray fluorescence (XRF) analyzer. The presence of arsenic, chromium, copper, manganese, nickel, lead, zinc, uranium, titanium, and cadmium will be determined. After this data has been collected the spatial variability will be determined by Dr.

Lemke and a graduate assistant using geo-statistical methods in ArcGIS, a geographical information system software program.

To fulfill the other two specific aims of this study an inductive methodological approach is required. The question being investigated is how are soil contamination and the risks associated therein related to the ideas, beliefs, and values held by actors involved in urban agriculture. Using a specific theoretical framework to develop a specific hypothesis on such a concept risks applying a limited scope of understanding to a complex social issue (Glaser and Strauss 1999). To avoid creating presuppositions as to the nature of the relationship in question, the methodology of grounded theory will be used. Grounded Theory Method is based in the idea that by avoiding presuppositions in observation of social phenomena a researcher can discover the patterns and relationships among their observations to determine the influencing variables (Patton and Patton 2002). In such an approach, the researcher moves from observations to empirical generalizations (Babbie 2007). This is in direct contrast to the deductive approach more commonly used in the natural sciences where a highly specific, well founded theory is used to formulate a testable hypothesis. The grounded theory method has a developed, empirical foundation behind using such methods which was first formulated by Anselm Strauss and Barney Glaser in 1979 (Strauss and Corbin 1990, Patton and Patton 2002, Babbie 2007, Glaser and Strauss 1999). The theory will develop throughout the research process through constant comparison and analysis of data as it becomes available (Strauss and Corbin 1990).

This will require the careful recording of observational data and information gathered through participant observation and qualitative unstructured solo and group interviews. The data collection process will begin with participant observation in the field, the urban agriculture sites in question. As rapport is developed and trust is built between the actors and the researcher, solo and group interviews can be then organized and conducted after the initial observations are coded and analyzed (Babbie 2007). The process of qualitative interviewing requires a general plan of inquiry which includes topics to cover, however, qualitative interviews do not consist of rigidly pre-designed questions that are uniformly asked to all subjects being interviewed (Strauss and Corbin 1990, Glaser and Strauss 1999, Babbie 2007). To develop specific questions prior to the interview would involve the use of some theory that shapes the motives of the questions which is in conflict with the epistemology of grounded theory.

The concepts that will form the focus on the interviews and research will be:

- Benefits of urban agriculture
- Perception of risks involved with urban agriculture
    - Awareness of heavy metals contamination in urban soils
- Awareness of solutions to perceived risks
- Perceived accessibility to solutions

By maintaing a focus on these concepts while avoiding specific questions that may influence responses, the interviews can be guided in a way that minimizes biases held by the researcher.

D. Project Activities and Expectations

The solo interviews will occur before conducting group interviews. After the solo interviews are conducted the resulting data will have to be coded and compared to notes taken during the participant observationThe process of coding involves laying out the collected data in text format and identifying concepts or ideas within the gathered observations. In the initial phase, statements and observations will be specifically coded with the codes becoming more connected and generalized as more comparison and data collection is made (Patton and Patton 2002, Babbie 2007). In the specific context of this study, some codes used in organizing the data collected through solo interviews will include: Benefits-Personal, Benefits-Community, Benefits-Health, Benefits-Spiritual, Benefits-Psychological, Risks-Metals, Risks-Lead, Risks-Arsenic, AccessBarrier-Economic, AccessBarrier-Social, etc. These codes will help to identify preliminary patterns that will help shape further solo interviews, if necessary, and eventually group interviews. After all interviews have been conducted there will be enough data to form overarching categories that group patterns of codes into meaningful concepts. Organization of data and coding will be maintained through CAQDAS, computer assisted qualitative data analysis software. The program used in this study will be Atlas-ti. In Atlas-ti, a system of codes can be maintained and kept organized allowing for constant comparison throughout the research process. Transana, a transcription software, will also be utilized to transcribe the solo and group interviews for processing in Atlas-ti. Transana will turn recorded interviews in the form of audio files into text format that can then be analyzed through coding which will be done in Atlas-ti.

E. Broader Impacts

As urban agriculture offers potential solutions to issues affecting Detroit, the sustainability of such a movement must be addressed and maintained. A more comprehensive understanding of the sustainability of urban agriculture in Detroit can be reached through exploring and identifying the subtle relationships between perception of social and bio-physical factors affecting urban agriculture. By using the social science research methods described in this proposal, the study will showcase the value of utilizing such methods to explore complex issues in urban environments. Although the proposed research will include three case studies, the methods employed could be applied to more urban agriculture sites to allow for greater generalizability and relevancy.

The relationships revealed through the proposed research will advance our understanding of patterns of ideas and beliefs held by actors with agency in urban agriculture sites. Knowledge of the socially-influenced perceptions held by those affected by soil contamination will optimize the shape the flow of resources in a more representative and accessible way by enabling those tasked with creating educational outreach materials to remain cognizant of the perceptions held by actors involved in urban agriculture. As a result, the research being overseen by Dr. Lemke on the spatial variability of contaminants in the soil of urban agricultural sites has an education and community outreach component that will also benefit from this proposed study.

F. Plans for Project Output and Data Management Plan

Making the results transparent and sharing the final report via the RISEUP program will help increase the societal benefits of this study. Furthermore, the results of this study will help to inform the educational outreach materials being developed as part of Dr. Lemke's larger study. Those materials will encourage discussion among stakeholder groups which is an important part of overcoming social tensions that have affected the metro Detroit region over the last century. As part of the RISEUP program's expectations, a poster summarizing the results of this study will be produced and made publicly available. In addition the educational outreach materials being developed by Dr. Lemke, the poster will be provided to the actors involved in the study.

To minimize the risk of exposing sensitive information, the data collected throughout the study will be securely stored with access limited to myself, the researcher, and my mentor Dr. Lemke. This will include the taped and transcribed interviews with the participants of the study. During the study that data will be accessed and managed through Atlas-ti, a qualitative data analysis program. Physical notes taken during the study will remain in the researcher's possession during the study with the physical copies being destroyed following completion of the study. Digital copies of the transcribed data will be kept for future records.

G. Bibliography

Babbie, E. R. (2007). The practice of social research. Belmont, CA., Thomson Wadsworth.

Bugdalski, L., L. D. Lemke and S. P. McElmurry (2014). "Spatial Variation of Soil Lead in an Urban Community Garden: Implications for Risk-Based Sampling." Risk Analysis 34(1): 17-27.

Glaser, B. G. and A. L. Strauss (1999). The discovery of grounded theory: strategies for qualitative research. New York, Aldine de Gruyter.

Hyra, D. S., G. D. Squires, R. N. Renner and D. S. Kirk (2012). "Metropolitan Segregation and the Subprime Lending Crisis." Housing Policy Debate 23(1): 177-198.

Kim, B. F., M. N. Poulsen, J. D. Margulies, K. L. Dix, A. M. Palmer and K. E. Nachman (2014). "Urban Community Gardeners' Knowledge and Perceptions of Soil Contaminant Risks." PLoS ONE 9(2): e87913.

McKenzie, S. (2004). Social sustainability [electronic resource] : towards some definitions / Stephen McKenzie. Magill, S. Aust, Hawke Research Institute, University of South Australia.

Moody, H. (2014). The relationship of neighborhood socioeconomic differences and racial residential segregation to childhood blood lead levels in Metropolitan Detroit. 3619171 Ph.D., Michigan State University.

Patton, M. Q. and M. Q. Patton (2002). Qualitative research and evaluation methods. Thousand Oaks, Calif., Sage Publications.

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Zenk, S. N., A. J. Schulz, T. Hollis-Neely, R. T. Campbell, N. Holmes, G. Watkins, R. Nwankwo and A. Odoms-Young (2005). "Fruit and vegetable intake in African Americans income and store characteristics." Am J Prev Med 29(1): 1-9.

H. Facilities, Equipment, Other Resources

Dr. Lemke has a 110 sq ft office (room 0224) in the Old Main building of WSU. This space is equipped with telephone, personal computer, and a high resolution black and white printer. Dr. Lemke maintains a 200 sq ft wet lab (room 1147) in the Biological Sciences Building, providing room for undergraduate students to complete the soil analyses required for the proposed research. Dr. Lemke's lab equipment includes a Thermo Scientific Niton XL3t 950 x-ray fluorescence (XRF) detector and stand, as well as a GOW-MAC 550P gas chromatograph and Shimadzu 660CR integrator for analysis of environmental gasses. Dr. Lemke also maintains a separate 300 sq ft computing laboratory located in room 0318 of the Old Main building, just down the hall from his office. This facility provides the resources needed to collect and analyze soil contaminant concentration information and to complete geospatial data analyses required to support the proposed research activities. Equipment includes five networked PC's, each with 3.2 or more GHz CPU and 4.0 GB RAM, flat panel displays, and a dedicated printer. Relevant resident software licenses include: ESRI ArcGIS10.2 (including the Spatial Analyst, 3D Analyst, and Geostatistical Analyst extensions); Stanford Geostatistical Modeling System (SGeMS), Geostatistical Software Library (GSLIB), SpaceStat (Biomedware, Inc.), Surfer 12.0; Intel Visual Fortran; SPSS, Minitab, and the Microsoft Office suite. Also included is a drafting table, a light table, filing space and desks for graduate and undergraduate student research assistants.

RISEUP Application 2015

Research Internships for a Sustainable Environment with Undergraduate Participation

DEADLINE: February 1, 2015	**SUBMISSION OPTIONS:** **(1) Email:** riseup@wayne.edu or **(2) Mail:** RISEUP Program; Physiology Department; 5374 Scott Hall; Wayne State University School of Medicine; 540 E. Canfield; Detroit, MI 48201-1928

SECTION I: PERSONAL INFORMATION

NAME: Zeuner Brett

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N/A

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PROFESSIONAL REFERENCES (list 3): (2 must be natural or social science teachers or research advisers)

Name	**Address** (or Institution and Department)	**Phone and email**
Denise Reiling	EMU Sociology Department Advisor & Professor	(734) 487-0012 dreiling@emich.edu
Thomas Wagner	EMU Sustainability Professor	(734) 487-0218 twagner4@emich.edu
Mika Weinstein	Chapter Coordinator - Food Recovery Network National	(415)300-6511 mweinstein@foodrecoverynetwork.org

COLLEGES ATTENDED: (use this form only; do not send transcripts)

Dates	**College**	**Major**	**GPA**
(Jan.) 2014 - Present	Eastern Michigan University	Sociology with statistics & sustainability minors	3.92
2011- 2013 (Dec.)	Schoolcraft College	General Education	3.70

STATUS (at end of this school year): (circle one): freshman sophomore junior **senior** other_____

Expected month and year of graduation: April 2016

SCIENCE/SUSTAINABILITY COURSES:

Date	No.	Title	Grade
2013	135	Into to Cultural Anthropology	A
2014	150	Thinking Sustainabily	A
2014	250	Quantitative Applications in Sociology	A
2014	308	Social Psychology	A
2014	336	Social & Cultural Change	A
2014	121	Calculus I	B+
2013	170	Elementary Statistics	A

Date	No.	Title	Grade
2014	110	Dynamic Earth System (Geology)	A
2015	224	Ethics and Food	Taking Now
2014	304	Social Research Methods	A
2014	307	Sociology of Labor	A
2014	307	Democracy & Power	A
2015	122	Calculus II	Taking Now

LABORATORY/RESEARCH EXPERIENCE:

Dates	Employer (Name & Address)	Tel. No.

RELEVANT HONORS:

Dean's List, President of EMU Chapter of Food Recovery Network, Applicant for EMU's 2015 Sustainability Prize (Awaiting Decision), Supplemental Instruction Leader (classroom assistant & tutor) for introductory statistics, SPSS tutor for undergrad/grad research, Emerald Scholarship Recipient at EMU.

SECTION II: INTERESTS

RANK SUBJECTS (most Interested = 1, least Interested = 13):

2 - 1. Heavy metals in urban gardens

3 - 6. Green Infrastructure

12 - 10. Sustainable Environments for Animals (a Detroit Zoo project)

9 -	2. Environmental education & Community Outreach	**13 -**	7. Sustainable small harbor management strategies Improving Water	**4 -**	11. Ecological History of "Natural" Places
1 -	3. Social Sustainability of Urban Landscapes	**7 -**	8. Water Conservation for Sustainable Management of the Great Lakes Basin	**8 -**	12. Toxic Algal Blooms
11 -	4. Environmental Issues and Action Plans in Belle Isle State Park	**10 -**	9. Communication for Environmental Management & Development	**6 -**	13. Public Policy for Improving Great Lakes Watersheds
5 -	5. Urban Neighborhood Environments				

For project descriptions, visit: www.riseup.med.wayne.edu/projectdescriptions2015.php

SECTION III: PERSONAL STATEMENT

As graduation becomes a clearer reality with each passing semester, I think that much more about where I want to see myself one year, five years following graduation. Having decided to study sociology with minors in sustainability and statistics, I find myself focused on the prospects of research on environmental and social issues for the bettering of society. My altruistic goals for sustainable food production in urban settings and an emancipation from the “big-ag" control over our food systems has led me to the tie together skills developed in sociological analysis and activism with the technical and practical applications of environmental science and sustainability.

I spend much of my time researching food systems and considering sustainable solutions that maximize opportunities for all. I have also started and run a chapter of Food Recovery Network at Eastern Michigan University. This initiative has allowed me to form a student group that facilitates the collection and donation of food from campus dining halls that would otherwise enter municipal landfills. As a student group, we seek to address the social stratification of food, where one group has a surplus while others in the surrounding area lack basic access. We are also currently working on creating a compost system for the school’s all-you-can-eat dining hall so that food scraps that cannot be donated do not enter the landfill to contribute to food waste and methane production. The community agency in Ypsilanti that we donate the food to is currently designing an urban garden to be built in March. Our goal is to integrate our idea for a campus composting system into the design of the urban garden to provide a natural boost to the health of the soil in the urban garden while also reducing the amount food wasted on Eastern’s campus.

I think the issue of food access and sovereignty, specifically in urban settings, is a critical issue that must be faced in the 21st century as humanity rapidly urbanizes and realizes its interdependence with one another and with the global ecosystem, as a whole. This is why I am so interested in the RISEUP opportunity. EMU does not have very many research opportunities, let alone in sociology and sustainability. I would be honored to be placed on any of these teams, however, the social sustainability of urban landscapes and heavy metal mapping of urban gardens are the most relevant to areas I have been personally focused on since pursuing these fields of study. It is my hope that with this research opportunity I will be able to get real-life experience and mentoring to help me develop as a student and an academic pursuing research and solutions on sustainable food systems in urban environments.