SCHOOL GARDENS AND FOOD INSECURITY IN PIMA COUNTY:
The role school garden programs play in addressing food insecurity and the potential at Acacia Elementary School

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Pima County, Arizona has a high rate of overall and childhood food insecurity (15.8% and 26.1% respectively). At the same time attitudes and interests in School Garden Programs have led to an increase in programs throughout the county. This research considers the following question: What role do school gardens play in alleviating food insecurity in Pima County? How can a School Garden Program be designed to best attend to food access, and how can it be applied specifically at Acacia Elementary School? Three school garden programs at three different schools were examined based on academic standing of the school, food security status of students and families, and garden programs related to food access. Observations of school garden programs and discussions with school faculty and teachers showed that there were two potential effects of the programs: Direct or Indirect Effects. Direct effects include produce that is directly donated or sold (affordably) to students and families. Indirect effects of school gardens provide skills, resources, confidence to practice gardening, cooking, or raising chickens at home. Indirect effects proved to be more significant than direct effects. Themes of school garden programs that address food access in this way included (1) Community Partnerships, (2) Extra-Curricular Garden Programs, (3) Cooking Education and Cultural Celebration, and (4) School and District Commitment. The potential of school gardens to alleviate food insecurity was directly applied to the new implementation of a school garden at Acacia Elementary School, a Title 1 school located in a rural food desert. The “ripple effect” food access garden programs cause can create a powerful force in communities living in urban or rural food desert and living with extreme food insecurity.
Introduction

The significance of food stretches across cultures and between borders as it not only nourishes our bodies, but creates communities and celebrates tradition. Nevertheless, it is no secret that food in commercial and industrial production can be destructive to our environment and that standard distribution overlooks many people and marginalizes many communities. Accessibility and security simply fail to reach a significant population of people in the United States, and even more so in Pima County, Arizona. Backyard gardening, community gardens, backyard chickens, community supported agriculture, and urban farms are increasingly gaining popularity in Pima County. This trend is reflective of changing attitudes and interests certainly, but it is also a response to extreme food insecurity. As it stands now access to healthy, safe, and culturally appropriate food is limited for as many as 1 in 6 people in the region. This insecurity only increases in households with children where 26% or approximately 1 in 4 children struggles with hunger (“Food Insecurity”, 2013).

Food security here refers to access to sufficient food for a healthy lifestyle, where food is nutritionally adequate and available in socially acceptable ways that do not require scavenging, food emergency servicing, stealing, etc. (Cook, 2009). An argument made here and increasingly so within food studies is that issues of food security must be brought to the discussion concerning Food Deserts (Gallagher, 2008). These are geographic areas that are “characterized by reduced access to fresh, healthy foods” (Zimmerman, 2013). This sort of food insecurity coupled with more traditional ideas of limited access result in communities suffering from both under and over-nutrition, where the quality and quantity of food provided to children heavily influence childhood health (Cook, 2009). Childhood food insecurity affects many in Pima County and schools have taken on programs to alleviate some of these challenges. These appear
as school lunch and breakfast programs; summer food services; and child and adult food programs.

School Garden Programs may not have been specifically designed to alleviate food insecurity but over time have developed a role in food access through creative and effective development. These programs initially developed around concepts of improved education and social development (“Meeting the Challenges”, 2015). More contemporary trends see healthy food choices and nourishment as impetus for educators to develop these programs (Subramaniam, 2002). Addressing food security is not only limited to hunger relief, but also to child health and academic success implying with good reason that school garden programs have potential in being a multifaceted approach to student wellbeing (Cook, 2009).

The research here will address the gap in knowledge between school garden production and childhood food insecurity, answering the question: Within Pima County, what role do school garden programs play in food access and security? What is the best way to design a school garden program so that it may attend to food insecurity, and how would this look at Acacia Elementary School in Pima County?

**Acacia Elementary School** is a Title 1 school in Southern Arizona serving a population with individuals and families who report financial struggles and food access challenges. It resides in a relatively rural area, though one that is experiencing suburbanization rapidly. Since 2010, the population of Vail has increased by 5.7%-a rate which is comparatively 5% larger than the rest of Arizona and twice as large of an increase as the United States during this same time period (Vail, 2015). With this suburbanization, the town (Census Designated Place) has experienced an increase in fast food restaurants and little in fresh food grocery stores. Discussion with teachers and parents at Acacia Elementary School revealed that a large population struggles
financially and access to fresh food proves difficult due to a number of factors such as transportation, income, etc.

Research will be primarily participatory through the analysis of case studies. Qualitative data will be collected through implementation of case study review of three local school garden programs in Pima County. Research will be primarily focused on programs that address food access as well as observations of teachers and faculty participating in these programs. The three case studies review City High School, Manzo Elementary School, and John B. Wright Elementary School. This specific population will emphasize localized experience in garden programming and aid in the ultimate implementation of a school garden program at Acacia Elementary School with potential to address food security. Recommendations and limitations discussed here will be applied throughout the development of the school garden.

Primary research questions for this project will look at the various ways in which school garden programs in Southern Arizona address food access and security. How have schools approached obstacles including funding and school culture; and how can the community at and around Acacia Elementary School benefit from a school garden program in terms of food security?

**Methods**

The purposes of qualitative research are “to explore, explain, or describe”, where the researcher inquires and studies the relationships among individuals, groups, and events (Marshall, 33). She plays a significant and personal role in the research, often looking to “illuminate lived experiences of interest by providing rich description and to foster taking action” (Marshall, 35). Methods of research involve a developing hypothesis and evolving questions of interest, where primary research is meant “to discover those very questions that are
most probing and insightful” (Marshall, 39). Within the qualitative method, the constructivist paradigm practices an interactive connection between the researcher and the research participants and a close and harmonious relationship within a community where there is communication of ideas and concerns (Introduction, 11). Working with key faculty, teachers, and students encourages interaction and certainly involves close community participation, of which will explicitly influence the overall resulting research.

**Literature Review**

The presence of gardens in schools today is not novel and in fact philosopher and pedagogue John Amos Comenius contended as early as the seventieth century that “a school garden should be connected with every school, where children can have the opportunity for leisurely gazing upon trees, flowers and herbs, and are taught to appreciate them” (Weed, 1909, cited in Subramaniam, 2002). The idea of natural and environmental contexts for learning have held true throughout the years, but the integration of them into classroom curriculum to deliver the abundant academic, personal, and societal benefits is more recent (Subramaniam, 2002). Today the primary roles of School Garden Programs include environmental attitudes, nutrition, academic achievement, and food access. While food access is the major focus of this research, the former concepts intersect with the latter as one of the qualities of school garden is to be wholesome and cross-curricular.

**Nutrition**

Perhaps the swiftest connection made between students and a School Garden Program is improved nutrition. The health of children today, which is directly connected to future health complications and associated medical costs, is affected both by the food served at their schools as well as the food they consume at home (Cook, 2009). Access to fresh food is important, but
without nutritional literacy or an understanding of how to prepare the food it is difficult to make a lasting impact. In the 2014 “Hearing Before the Committee on Agriculture, Nutrition and Forestry within United States Senate” it was reported that the rate of obesity in American children more than doubled within the last thirty years. Moreover, 20% of U.S. healthcare spending is allocated to obesity related illnesses (Meeting the Challenges, 2015).

The National School Lunch Program has developed and improved over the years to compensate for low-come families and apparent health difficulties, but student nutritional literacy has not been improving. Julia Bauscher, the Director of School and Community Nutrition Services at the Jefferson County Public School in Kentucky, explains that at her school students on average produce $680,000,000 worth in fruit/vegetable waste annually-financially and environmentally a significant loss (Meeting the Challenges, 2015). With these challenges, research on the link between school gardens and nutrition is abundant.

According to the Public Health Nutrition journal, school gardens can effectively improve primary school student’s willingness and ratings of vegetable taste (Morgan, 2010). There are numerous factors that affect a child’s eating habits-familial inheritance, culture, ideals, income, as well as physical, social, and commercial media environments. ‘Empty calories’ and unhealthy snacks are connected to advertising and marketing which is not exclusive from school culture. In 2009 food companies who spent $150 million on marketing in schools (Federal, 2012). Illuminated in Food Marketing to Children and Youth, “marketing to children in America represents, at best, a missed opportunity, and at worst, a direct threat to the health prospects of the next generation” (McGinnis, 2006).

School garden programs provide an opportunity to teach (or “market”) to children about the possibilities, great taste, and health benefits of a healthy diet. A recent study found that
elementary students experience improved nutritional literacy when their nutrition education is combined with garden education. Students were separated into three groups: a nutrition education and gardening group, a nutrition education only group, and a control group which received neither education. Students who participated in the nutrition and garden education group, where they prepared and consumed the food they grew, showed significant improvements in nutrition comprehension and taste assessments and were much more likely to consume vegetables during their lunchtime than the other groups (Parmer, 2009). Nevertheless, while consuming more fresh foods and nutritional literacy are significant in the improvement of child health, the accessibility to such is essential.

**Academic Outcomes**

Hunger and health permeate into the educational performance of school children. According to non-profit FeedingAmerica “hungry children do more poorly in school and have lower academic achievement because they are not well prepared for school” (Cook, 2009). School garden programs are often implemented in hopes of encouraging depth in learning and enhanced academic outcomes (Subramaniam, 2002). A student’s academic performance may be considered one of the most significant concerns for educators looking at beginning a school garden program: can such a program really enhance a student’s achievement, and not merely distract students from formal class subjects? Research has shown that garden-based education does not negatively impact academic performance, rather in many cases improves a child’s academic outcomes. Studies involving garden-based education in science and math classes concluded that those students who participate in school garden lessons experienced improved outcomes in subjects of math and science (Berezowitz, 2015, Blair 2009, Klemmer 2005).

These certainly are not the only subjects focused on within school garden programs. Language development in the garden gives students an authentic context for using language as
students practice language as they work together to complete a garden task. Where schools have an emphasis on English as a second language, students were reported as having experienced enhanced literacy learning (Martin, 2011). Traditional classroom teaching fails in aiding those students who experience optimal learning strategies through different means. In this case, garden-based education provides hands-on learning for students who better benefit from tactile learning (Martin, 2011). School garden programs additionally provide opportunity for “cross-curricular learning” where a science lesson may connect with writing and math lessons, broadening and enhancing students' academic achievement (Martin 2011).

**Food Access and Security**

Access to safe, healthy, and culturally appropriate food is a child’s right-and yet childhood food insecurities are ever present in the United States and Pima County. The latest Economic Research Service at the United States Department of Agriculture (USDA)’s report on food insecurity in late 2014 revealed that 48 million people in the United States are considered food insecure, and of that population 16 million are children (Child Food Insecurity, 2015). In Arizona, 1 in 6 people are considered food insecure (“Hunger”, 2016). The food insecurity rate in Pima County was 15.8% while the childhood food insecurity rate reached 26.1% in 2015 (Coyle, 2015). In other words, approximately 1 in every 4 children are food insecure in Pima County (see appendix A). Pima County performance in access to grocery stores is limited for children, elderly, and low-income populations at rates much lower than many other U.S. Counties (Coyle, 2015).

Areas that are additionally at risk for childhood food insecurity are known as food deserts. There is currently no fixed definition of food deserts but they are generally identified under two criteria: financial and geographic accessibility (Morton, 2007; Shute, 2014). Geographic accessibility refers to areas with no or very distant affordable grocery stores and
those that are often imbalanced with convenience, liquor, or fast food options (Gallagher, 2008; Shute, 2014). Food deserts are additionally identified within areas of low-income and impoverished populations (Gallagher, 2011). In these communities access to fresh food is attributed not only to lack of options but also to the higher costs of fresh foods, often found in convenience or specialty stores. The USDA uses Low-Income and Low-Access indicators to determine food accessibility and food desert locations (Shute, 2014). Primary concerns regarding food deserts center around “diet related poor health outcomes including diabetes, cancer, obesity, heart disease and premature death” (Gallagher, 2008). According to Feeding America and The ConAgra Foods Foundation, “families with children, especially those with young children, are the group most likely to be food insecure” (Cook, 2009). These occur in both rural and urban contexts, and negatively impact children who may be at “increased risk for obesity and have increased need for school-based interventions that target obesity, such as those aimed at increasing fruit and vegetable intake” (Zimmerman, 2013).
A significant population in Arizona and in Pima County lives in food deserts (“Food Access”, 2015). School garden programs provide the opportunity to alleviate the stress of inaccessibility. Numerous programs throughout the country utilize programs such as the Garden-to-Cafeteria program in Southern Arizona where food grown in the school garden beds are used for food in the cafeteria. This provides not only fresh food for the students, but decreases the amount of food purchased from contractors (Hellburg, 2009; Huddleson, 2015).

**Barriers to School Garden Programs**

Among the intersecting and multifaceted benefits of school gardens discussed in literature today, barriers to developing these programs are similarly abundant. Obstacles that face School Garden Program implementation at Acacia Elementary School in Vail, Arizona include rigid school system functions, lack of funding, negative school culture, and the dry, desert climate. Nevertheless, what are often overlooked are the difficulties in creating and sustaining these programs. Building a garden bed, planting a row of carrots, and getting kids excited about going outside is simpler than ensuring that garden time translates to academic achievement, improved nutrition, and food access. Many of these challenges are rooted in a school’s local policies and locational environment. Managing a school garden exists outside of what teachers are paid to do which poses an additional workload. Additionally, school gardens need attention that extends beyond the regular school calendar. Keeping gardens maintained during school breaks is a challenge schools and teachers face in implementing such a program.
Arizona specifically ranks 47th in United States education for per pupil funding as of 2015. The state lacks funding and severely seeks educational support from its local government (Ladner). Teachers often express the obligation to “teach to the test”, placing high priority on standardized test scores that promise funding and correlate to success. The implementation of the controversial “No Child Left Behind” law in 2001 has increased concerns about heavy reliance on standardized tests that focus most on math and science, leaving other important subjects (Klein, 2015). The pursuit for wholesome and “complete education” is dominated by these tests and other never-ending lists of teacher obligations. Understandably teachers often shy aware from potentially uncertain approaches such as place-based garden education.

**Education Funding in Arizona**

School garden programs have a positive impact on students and their community but the practical implementation of these programs faces many obstacles. It is important to understand the common barriers to this development in order to better pave the way to implementation and maintainability. Among general barriers to implementation, there are often site obstacles specific to a region. The region of discussion here is Southern Arizona, including Pima County and specific cities of Tucson and Vail, Arizona. Exploring not only the obstacles but also the means by which students, faculty, staff, and communities overcame obstacles is significant. Collaboration rather than competition are inherit to garden programs, therefore any way that the passionate members of these programs can help each other and their gardens thrive means a stronger and healthier community for everyone.

That status of current K-12 education funding in Arizona is lower than the national average, ranking “47th (among the 50 states and the District of Columbia) per $1,000 of personal income, 50th (next to last) on a per student basis, and 51st (lowest) per student per $1,000 of per capita personal income” (Hoffman, 2009). While education funding in Arizona was above
average in the 1960s-1970s, funding has since fallen far below the national average. Arizona faces educational challenges attributed to high poverty rates, low rates of education attainment or full-time employment of parents, and a growing English-language learner student population. Considering this, funding should in fact be higher than the national average (Hoffman, 2009).

School Culture

The School Effectiveness Division of the Arizona Department of Education define school culture as “a shared philosophy of commitment, ownership, vision, mission and goals that promote a culture of excellence” under which an entire school community is committed to student improvement, actively supports and respects cultural diversity, and embraces commitment to and responsibility for student success. School culture is complex. If positive, it has the potential to improve student academic outcomes through educator inspiration to learn, take risks, and work collaboratively. Unfortunately negative school culture, and the history of such, has the potential to set back progress and school improvement. Staff and faculty may resist changes in educational approaches and decrease risk taking attitudes due to negative past experiences or attitudes (Lui, 2004). In schools with a history of lacking funding and poor academic rating in states like Arizona this negative culture could have developed in some schools over time.

Data

Consistent criteria were collected and analyzed from three different school garden programs case studies in Southern Arizona. The criteria first included Academics: school “grade”, learning styles, and degree of “garden curriculum” which is to say the degree to which the school uses their garden spaces and resources in their standard state curriculum. A school’s “report card” is a grade assigned by the Arizona Department of Education which is based on
exam assessments (English Language Acquisition, Annual Measurable Objectives, Mathematics, and Science), traditional graduation rates, student growth, and ELL (English Language Learners) Reclassification ("State Accountability", 2015). Secondly, research was collected based on student and family population assessments through the lens of food access and security. This involved considering federal funding/Title 1 status which is determined by the number of children attending from low-income households. A common measure of food insecurity in schools and one collected in this study looks at the number of students eligible for free or reduced lunch. Geographical and accessibility factors are considered through the classification of food deserts in surrounding neighborhoods or if provided through reports by school affiliates (students, teachers, staff, parents, etc.) of food desert characteristics. Finally data was collected on the various school garden programs and operations that the school offers to students which may appear as garden clubs, food markets, farm programs, etc.

The three schools of focus in this study include City High School, John B. Wright (JB Wright) Elementary School, and Manzo Elementary School located in the City of Tucson within Pima County.

**Results**

**City High School, SLUG (Sustainable Laboratory Urban Garden)**

City High School is a public charter school located in the heart of downtown Tucson. A small school enrolling approximately 200 students in grades 9-12 annually, City High School is closely partnered with Paulo Frieire Freedom School. In 2014, a collaborative build/design studio between the University of Arizona Sustainable City Project and the College of Architecture, Planning, and Landscape Architecture implemented a green space in the alleyway alongside the school with the intention of being an urban agriculture laboratory (SLUG, 2014). Today the site
hosts an aquaponics system, a system where waste produced by fish provides nutrients for plants to grow hydroponically and in turn purifies the water, as well as several vegetable and herb beds (City High, 2016). Since its completion, the garden program has been run under only City High School faculty and staff without University of Arizona affiliation.

**City High Academics**

In the latest Arizona Department of Education report, City High School was given a grade of B (Arizona…City, 2014). The school is accredited and encourages hands-on learning styles (City High, 2016). With this, the implementation of a school garden program follows suit. In talks with the garden program coordinator, the space has been utilized as a beneficial green space in an urban area but use with its garden and aquaponics system as a part of classroom curriculum has proved more difficult. Teachers are hesitant to commit to garden/aquaponics curriculum in addition to other programs and regular responsibilities.

**City High Food Access/Security**
City High School is a Title 1 school, with the surrounding area considered to be food deserts based on geographical and transportation factors as presented by the USDA Food Atlas (Arizona…City, 2014). Additionally, faculty reported that many students and faculty use the Summer Meal program at the school which provides free meals during summer breaks for students, families, and faculty which rely on free and reduced priced meals during the school year. Currently, 50% of the student population at City High School are eligible for free and reduced lunch.

City High Garden Programs

City High School currently offers several programs associated with their school garden which addresses themes of nutrition, cooking education, and agriculture. Collaboration with the Community Food Bank of Southern Arizona along with other Pima County organizations allows for City High School to expand their efforts with their school garden to the Las Milpitas de Cottonwood Community Farm. Here they have a Farm Crew which participates in growing and tending their own plots as well as helping with other community farm duties. All of the City High students visit Las Milpitas throughout the year and attempt to incorporate relevant food studies into their general curriculum (Las Milpitas, 2016). A portion of what is grown in the school garden and Las Milpitas is given to students to take home while another portion is used for their Culinary Program. The City High Culinary Program educates students on nutrition and
food preparation as well as prepares food for events such as their Family Nights. City High School requires seniors to complete internships before graduation. There are internship opportunities for students in SLUG operations which several students take advantage of each year usually through maintenance or working with the aquaponics system.

**Manzo Elementary School**

Manzo Elementary School is a public school located in the Barrio Hollywood neighborhood in Tucson. In 2012 it was awarded the Best Green School by the U.S. Green Building Council’s Center for Green Schools. The National Education Week 2013 named Manzo an “Environmental Educational Success Story” (About Escuela Manzo, 2016). Since beginning their Desert Biome Ecology Project in 1994, the Manzo garden and ecology program has grown to include a desert tortoise habitat, a sunken garden area along with many raised garden beds throughout the campus, an aquaponics system, a greenhouse, and a chicken flock and club. Manzo Elementary School works very closely with the University of Arizona Community and School Garden Program as well as programs such as the Biosphere 2’s LEO program, Tucson Audubon Society, Southwest Conservation Corps, Tucson Cactus and Succulent Society, and Arizona-Sonora Desert Museum (About Escuela Manzo, 2016).

**Manzo Academics**

In the most recent 2013-2014 academic report card, Manzo Elementary School was at a letter grade of a C (Arizona…Manzo, 2014). Just a few years ago in 2012 the school was earning a D, so since its implementation of its school garden program its grade has improved greatly. Educators and faculty report that they expecting to earn a letter grade of B in the near future which many attribute to the garden based education practiced at the school (Allen, 2013). The school prides itself on experiential and project based learning through their garden programs.
Students recognize that they are learning about math and ecology while they are working with the chickens and gardens (About Escuela Manzo, 2014).

**Manzo Food Access/Security**

The Barrio Hollywood and other neighborhoods surrounding Manzo Elementary School are considered food deserts according to geographical and accessibility terms under the USDA. The school receives federal finding assistance through the Title 1 program (Arizona…Manzo, 2014). Currently 93% of the Manzo Elementary School population are eligible for free and reduced lunch. According to faculty and parents, Manzo families often rely on nearby fast food establishments for many of their meals.

**Manzo Garden Programs**

Manzo Elementary School hosts many garden programs and has various garden resources available to students, families, and community members. Resources include an aquaponics system, various garden beds, compost services, chickens, a desert tortoise habitat, greenhouses, and more. Notable programs related to food access and security includes, firstly, their Manzo Market. Several times a month and following harvests students at Manzo sell fresh produce from their gardens, greenhouse, and aquaponics along with fish and eggs to families and community members at affordable prices. Students who participate in Manzo Market harvests take left-over produce home to their families. The market was for the first time expanded to include culinary demos using garden produce at the schools second annual Fiesta Manzo. Cooking demonstrations focused on preparing traditional and familiar foods (96% of the students
attending Manzo Elementary are Mexican-American) with garden produce such as kale and chard. Manzo’s Cluck Club involves around eight students in caring for chickens at school as well as incubating, taking home, and raising their own chicken. The school is Garden-to-Cafeteria certified by the University of Arizona’s College of Agriculture Cooperative Extension, which allows them to serve food produced in through their various garden programs to all students in the cafeteria.

**John B. Wright Elementary School**

John B. Wright Elementary School is a public school located in the Garden District neighborhood in Tucson. This school is one of the most diverse schools in Tucson with a very high refugee population. It is a STEM emphasis school whose garden program began in 2012 after a generous donation was provided to the school. The school works closely with the University of Arizona Community and School Garden Program. Their program currently includes garden beds, a mini-orchard, worm composting, garden club, and a desert tortoise habitat.

**JB Wright Academics**

According to the most recent school report card, JB Wright Elementary School is earning a B grade (Arizona…John B, 2014). The school emphasizes STEM (Science, Technology, Engineering, and Math) curriculum and extra-curricular activities. The garden program is used to encourage hands-on learning styles in all different subjects, especially STEM emphasis areas.

**JB Wright Food Access/Security**

The elementary school receives federal funding assistance through though Title 1 programing (Arizona…John B, 2014). The Garden District neighborhood along with other surrounding
neighborhoods are considered food deserts according to the USDA, as well as to faculty and family responses. Faculty report that most of the children and families in the neighborhood that attend this school struggle with extreme poverty. Many live in section aid housing and foster homes. In talks with teachers, almost 99% of the students and families were eligible for free and reduced lunch (“National School Lunch”). Many of the students receive “snack packs” every Friday to combat lack of food over the weekend.

**JB Wright Garden Programs**

Beyond the worm composting and desert tortoise habitat, JB Wright currently uses their garden bed and spaces for classes and clubs to grow produce. There is a strong emphasis on academic achievement as well as nutritional comprehension. They have a garden club that meets three times a week to plant, maintain, water, and harvest the produce. The produce grown in the garden has been used for 2 garden-to-cafeteria events and community food bank donations, much of which goes to the school for families in need. Some of the produce is given away through their “snack pack” program. Additionally, the school is a recipient of Fresh Fruit and Veggie grant from Tucson Unified School District Food Services which provides students with a fresh snack twice a week as well as cultural and agricultural information about featured fruits or vegetables. In talks with teachers, the food provided through this grant are oftentimes familiar to students as the school has large refugee populations and hosts some of the most diverse populations of all Tucson schools.
Discussion

There have been many studies conducted on the impacts of school gardens on students, but much of the focus is on the academic, environmental, nutritional benefits. Other studies find successful links between school gardens and improvements in nutritional competency, but few on the availability or access to these fresh foods. Similarly, much research discussed in the literature review has been completed on the ways in which communities combat food insecurity but few have looked at how schools may be the site for creating food access. Ultimately, this research looks at linking the research on school garden programs and food insecurity in order to understand their potential.

Through qualitative case study research involving participatory and observational research based examination of three school garden programs in Tucson findings show that these programs most significantly attend to food insecurity for low-income and low-access families predominantly through indirect effects. The programs less significantly provide direct donation or access to significant amounts of fresh produce directly to families.

The direct ways that the school garden programs at the above mentioned schools involve the following: donations of harvests of fresh garden produce for students and their families, inexpensive produce sales, and school lunch Garden-to-Cafeteria programs. Even with these direct donations, the amount of food produced and donated is not significant enough to alleviate extreme food insecurity seen in these communities. School garden programs indirectly contribute to increased food access by providing families and students with knowledge and tools to combat food insecurity through home gardening, raising backyard chickens, and cooking education.
School garden programs address food security by providing fresh produce or tools for students to grow food themselves followed these themes: Community Partnerships, Extra-Curricular Garden Programs, Cooking Education and Cultural Celebration, and School and District Commitment.

Collaborations and Partnerships:

Manzo Elementary and JB Wright Elementary schools partner with the University of Arizona’s School and Community Garden program which provides each school and their teachers with interns who dedicate time to working with teachers and students at their school garden site. They help develop curriculum, work with students, and complete general garden maintenance. These partnerships can be successful in providing teachers with assistance since much of the teachers’ time is tied to the classroom. University students also bring their creativity to the school garden sites which can increase its prosperity.

JB Wright donates some of its harvests to its local community food bank which serves many of the families attending the elementary school.

City High School’s collaboration with Las Milpitas de Cottonwood increases the yield of fresh produce harvested by increasing the available space from their campus garden to that of the community farm (Las Milpitas). This space also provides increased community interaction, increasing the amount of knowledge shared among students and other gardeners in Tucson.

Extra-curricular: Garden Clubs, Cluck Clubs, Farm Crews

All three of the school garden case studies have extra-curricular options for students through their school garden program. This differs from garden-based curriculum which
emphasizes integrated garden education into state standard curriculum. These extra-curricular garden programs focus on gardening, chicken raising, cooking, or farming education. Such programs give students the tools and knowledge needed to grow food at their own homes or in local community gardens. The garden club at JB Wright is held three times a week with first, third, fourth, and fifth graders who are interested in gardening. The Cluck Club at Manzo Elementary teaches eight children about how to care for chicken and provides each with a baby chick to raise at their homes. These chickens are intended to provide eggs for the families with which they reside. The City High farm crew works at their on-site garden as well as at Las Milpitas where they learn about agriculture and gardening in Tucson. Additionally, students are required to complete senior internships. Some of these students complete their internships with the garden program which can help provide knowledge and skills in garden maintenance and management.

**Cultural Awareness and Celebration**

Manzo Elementary School has a large Mexican-American student population and J.B. Wright Elementary School has a large population of refugee students. Students bring many distinct traditions and culture to these communities. In talks with teachers and faculty, there is a gap between what these families are familiar with cooking/eating and what grows best in school garden environments. Using an example from Manzo Elementary, the school very successfully grows large yields of kale and chard but these are not familiar vegetables for these families. They try to sell this in their Manzo Market, but have seen this gap in culturally familiar foods and
school garden produce. In April 2016 at their annual Fiesta Manzo, students sold their produce at the Manzo Market but alongside it provided hands-on demonstrations and prepared meals that used the garden-fresh Kale and Chard in more familiar dishes. Demonstrations included recipes, samples, and sales of dishes such as Spinach Tamales.

**School and District Commitment**

Discussions with teachers and faculty revealed a common theme found in the sustainability and impact of these programs and their potential to attend to food security: commitment to the garden program by the school or district. City High School and Manzo Elementary School both have paid positions within their school garden programs in the form of school garden coordinators. Additionally, support was acknowledged through certification by the University of Arizona’s College of Agriculture Cooperative Extension, which allows schools to serve garden produce to students through their cafeteria.

**The Ripple Effect:**

A common theme found in all three case studies and in discussions with teachers and faculty was the concept of a “ripple effect”. Direct reduction in food insecurity through produce donations (JB Wright) and affordable garden production sales (Manzo Market) is less common, harder to achieve, and ultimately does not provide significant amounts of produce for communities. Teachers and faculty expressed confidence in the idea that students were given the resources (chickens), encouragement (community, empowerment), and skills (gardening techniques) to grow their own food at home or at local community gardens. It can still be
difficult to produce significant amounts of fresh food in backyard or community gardens, but any outlet for fresh food production is warmly welcomed. No matter how you look at it, empowering children and families to take control of some aspect of their food system makes a powerful difference in our communities.

**Restrictions:** Constraints school gardens face in addressing food access follow these themes:

*Limited Space*

The space available in urban areas can greatly influence the amount of food produced, therefore decreasing the amount available for distribution as observed at all three schools. “Big” school gardens at schools like Manzo are still small compared to production farms and are not nearly big enough to feed large numbers of families and students.

*Limited Time*

Contrasting the successful theme of School and District Commitment there are schools such as J.B. Wright where there is no officially paid garden programmer or school garden program staff and therefore much of the responsibility is placed on the teachers. Teachers, even if they would like, struggle with making enough time to dedicate to the garden space and potential of it impacting food security for their students.

**Potential at Acacia Elementary School**

Acacia Elementary began its School Garden Program at the end of 2015 with its first official garden club approval and planting day in April 2016. As a rural food desert, Acacia Elementary could benefit from the themes that follow a School Garden Program which most successfully attends to food insecurity through indirect and ripple effects.
Possible partnerships that Acacia Elementary could make include their IMPACT Community Food Bank and local churches. There are many surrounding local schools which could potentially partner with the school garden program through the form of academic achievement, community service, academic requirements, or school club activities. In-school clubs and programs such as environmental or science clubs at Acacia would additionally provide strong involvement and therefore help in increasing the scale of the program. The school has already begun its garden club. A chicken club is feasible with given space but requires more school support and involvement. Food demonstrations, cooking classes, and nutrition classes are possible with teachers already expressing interest in cooking and nutrition education.

School and District Commitment at this point is an obstacle for the school. Current school culture indicates that many teachers are hesitant to using teaching time in the garden. It is recommended to scale the garden program to the number of teachers involved. School support may more easily increase as class and teacher involvement in the garden increases. Ideally the school would eventually employ a Garden Coordinator or accommodate for school garden faculty.

In addressing limitations of time and space, Acacia really only faces time constraints. The school has a rather large campus with plenty of open and rural spaces for garden beds, chicken coops, composting, greenhouses, etc. Limited time is dependent upon school/district commitment and school culture.

**Conclusion**

The potential for school garden programs to provide significant amounts of fresh produce to families and communities is minor given restricted space, limited time, and extreme food insecurity in Pima County. The role of school garden programs in addressing food insecurity in
Pima County lies strongly in **indirect or ripple effects**. Garden programs such as garden club, cluck (chicken) club, garden internships, and culinary programs provide students and their families with the skills, resources, and confidence to grow their own food or raise their own livestock at their homes or in nearby community gardens. Teachers and faculty refer to this idea as the “ripple effect”.

Themes common throughout all three case studies that are found to strengthen the “ripple effect” are the addition of partnerships with universities, organizations, and communities; garden related extra-curricular programs; cooking education that considers and celebrates culture; and school and district commitment to the school garden program.

Implementation at Acacia Elementary School in the form of partnerships and extra-curricular garden programs are feasible given potential community connections and open space at the rural school. Cooking education is something many teachers at the school have already expressed interest in, increasing the feasibility of implementation. School and district commitment is a difficult obstacle given the current school culture and restricted time for teachers to spend outside of the classroom.

Overall and childhood food insecurity in Pima County stems from a larger issue within the food system in the Southwest. Many populations such as the ones discusses here are left marginalized and without access to fresh and healthy food and therefore is daunting to address in small contexts. Nevertheless, gardening and raising chickens at home or in a school allow for individuals and communities to control some aspect of their own food system and should not be taken lightly.
Limitations

Perspectives from other professionals in the field of food security as well as parents and students involved in the school garden programs would provide a more wholesome assessment of school garden impact on food insecurity. Quantitative data could have been collected on the number of school garden programs in Pima County and the amount of food produced at these schools.

Recommendations

Remaining questions:

Are there schools throughout the country that are producing and providing enough food to significantly alleviate food insecurity?

What do the “ripple effects” of school garden programs look like in communities and at home?

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Appendix
Appendix A
Table 12: Access to Healthy Food and Recreation

<table>
<thead>
<tr>
<th></th>
<th>Pima</th>
<th>Maricopa</th>
<th>Benchmark</th>
<th>Comparison Against Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>People 65+ with Low Access to a Grocery Store</td>
<td>4.5%</td>
<td>2.9%</td>
<td>2.8% U.S. Counties</td>
<td>X</td>
</tr>
<tr>
<td>Children with Low Access to a Grocery Store</td>
<td>5.1%</td>
<td>3.1%</td>
<td>4.4% U.S. Counties</td>
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<tr>
<td>Low-Income and Low Access to a Grocery Store</td>
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<td>3.7%</td>
<td>6.2% U.S. Counties</td>
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<tr>
<td>Food Insecurity Rate</td>
<td>15.8%</td>
<td>15.9%</td>
<td>14.7% U.S. Counties</td>
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<tr>
<td>Child Food Insecurity Rate</td>
<td>26.1%</td>
<td>25.4%</td>
<td>23.7% U.S. Counties</td>
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<tr>
<td>Adult Fruit and Vegetable Consumption</td>
<td>26.3%</td>
<td>23.3%</td>
<td>24.1% Arizona</td>
<td>✓</td>
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<tr>
<td>Access to physical activity locations</td>
<td>86.0%</td>
<td>88.0%</td>
<td>92% U.S. Counties</td>
<td>X</td>
</tr>
</tbody>
</table>

*How Pima County performs in the indicator compared to the identified benchmark. Red indicates worse performance; green indicates better performance. A ✓ means the indicator is similar or the same as the benchmark.  
**Years of data vary due to different sources of data, but range from 2000-2013 depending on the indicator.  

Over a quarter of respondents indicated they did not eat fruit (28.0%) or vegetables (94.8%) more than once a week in the past month.  
For more information, see F.S. of the Pima County Health Needs Assessment Web-based Survey Report (Appendix 1).