ABSTRACT

Assessing the Impact of a School Garden on the Attitudes of Children Towards Agriculture in Rural Western Kenya

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A school garden was established at the Bethlehem Home Academy by the Straw to Bread non-profit organization in rural western Kenya in 2012. This school serves very poor and often malnourished children from the Luo tribe on the Nyakach Plateau, a region dependent almost entirely on subsistence farming. In this area, prone to drought and agricultural hardship, it is important for young people to learn good techniques and have positive attitudes about farming in order to provide quality sustenance for themselves and their community.

This study uses a sample of 63 students and teachers at the school to assess the Straw to Bread program's attempt to improve knowledge and attitudes about farming and nutrition in the target community of children of the Nyakach Plateau. Descriptive information about the garden and participants was gathered, and a knowledge assessment was administered to the older students to assess knowledge about agriculture. Results indicate that the school garden was effective at improving the attitudes of the children about farming, at introducing new foods to the children and surrounding community, and at teaching the children about farming technique. Future innovations will be based on these findings.

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ASSESSING THE IMPACT OF A SCHOOL GARDEN ON THE ATTITUDES OF CHILDREN TOWARDS AGRICULTURE IN RURAL WESTERN KENYA

A Thesis Submitted to the Faculty of

Baylor University

In Partial Fulfillment of the Requirements for the

Honors Program

By

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Waco, Texas

May 2015

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ACKNOWLEDGEMENTS

I would like to thank all of the participants including the students, teachers, and community members of the Nyakach Plateau who have made this project possible. I especially thank Pastor Habil Ogola and Charles Tei for their dedication to the Bethlehem Home school garden. I am grateful to Flora Park, Katherine Durbin, and Jonathan Tingle for their help with data collection and statistical analysis of results. I extend a special thanks to my mentor Dr. Lisa Baker who has guided me through this thesis and has changed the course of my life.

CHAPTER ONE

Introduction

Hunger in the Developing World

Globally, about 870 million people are estimated to be undernourished. This means that 1 in 8 people in the world remain hungry. More than 100 million children under age five are undernourished and underweight (United Nations, 2013). This hunger is due to poverty, poorly distributed resources, climate change, a growing world population, and a lack of education.

Africa has a population of 910.4 million people and a poverty rate of 48.5%. It is the world's poorest continent. Starvation is a threat to the growth and success of the continent. The youth, who should be the most productive portion of society, make up over half of the unemployed of the continent (United Nations). This is a contributing factor to the challenge of developing a self-sustaining, adequately nourished continent.

Kenya, with a population of 40 million people, has a poverty rate of 45.5% (United Nations). The urban areas are dotted with slums like Kibera in the capital of Nairobi. Rural areas struggle to grow sufficient food and have the added difficulty of transportation of goods along poor roads. Remote communities can become food deserts without the means to produce or import food. The provision of food for these desperately poor communities is an essential step.

Besides intervening for immediate relief of starvation, there is a need to improve the capacity of communities to provide their own food. There are multiple barriers to subsistence farming in rural Kenya. These include climate change, social stigma, a lack

of resources, and a lack of education. Solutions to these problems start with education. A focus on providing knowledge about new farming techniques and nutrition along with encouraging agriculture as a career choice for future generations will begin the walk towards eliminating hunger in Kenya, Africa, and eventually, the world.

CHAPTER TWO

Literature Review

The State of Malnutrition

During the United Nations Millennium Summit in 2000, 147 heads of state adopted eight development goals for developing countries (Muller, 2002). Target 1 of the Millenium Development Goals includes halving the proportion of people who suffer from hunger in the time period from 1990 to 2015. One in five children under age five in the developing world are underweight, and children in rural areas are nearly twice as likely to be underweight as urban children (United Nations, 2013). As a country, Kenya has noted a slight decrease in population hunger, but the country may not reach the fifty per cent reduction goal by 2015 (United Nations).

Lack of adequate nutrition, while always detrimental, has exaggerated effects on young children. In her article "Child Malnutrition and Climate in Sub-Saharan Africa: An Analysis of Recent Trends in Kenya," Kathryn Grace (2012) describes the state of malnutrition and its consequences. She reports,

> Negative health outcomes among children, particularly stunting, are a common result of food insecurity. When a child's natural growth trajectory is negatively impacted because his nutritional and caloric needs are consistently unmet, his growth slows and the likelihood of him completing secondary school and obtaining wage-earning employment decreases (p. 405).

This creates a downward spiral that prevents communities from attaining both food and economic security. Grace goes on to discuss how stunting in young girls can lead to

difficulty in childbirth and an increase in the delivery of underweight babies. Grace also points to climate change as a factor that could intensify the already difficult burdens of sustenance farmers in Kenya. There may be ways to moderate the impact of reduced rainfall and warmer climate by improving social factors, education, and social services (Grace, 2012).

A study by Haddad (2012) also mentions the effects of undernutrition and its causation of stunting, wasting, anemia, morbidity, malnourishment from mother to child, and death. Haddad describes the "invisibility" of the malnourished children of the world. He states that,

> Undernutrition is visible for the 9 per cent of infants that are severely and acutely malnourished – they are terribly thin, cannot eat and if untreated are close to death. Rather, it is the bulk of the undernourished children – the mild and moderately undernourished – who are invisible. Without external references, these children look normal. They show few clinical signs of any physiological damage. Yet, the damage is there: their brain development is impaired, as is their immune system. They will earn less in adulthood, be more likely to live in poverty and more prone to diet-related chronic disease in late adulthood (p. 14).

This "invisibility" makes malnutrition an easy problem to overlook. Haddad calls for a scale-up of political commitment and claims that nutrition for the people of a country cannot occur without the investment of its government. This further compounds the problems that the Nyakach Plateau faces. While the Kenyan government is moving forward in many areas, it is unlikely to meet its Millennium Goal 1 of reducing hunger by one half (United Nations). It will take time to develop the infrastructure needed to

support the entire Kenyan population, especially the underserved rural areas. Hopefully, some suffering can be circumvented through NGO programs.

Due to a food price crisis in 2008, the number of malnourished in the world increased in comparison to the past progress that had been made since the 1990s. Fanzo (2011) points out that that crisis disproportionately impacted sub-Saharan Africa, which has the world's highest proportion of undernourished at 29%. Fanzo also notes that small farms provide over 90% of Africa's agricultural production. On a note that could provide some optimism for the future, he mentions that many of Kenya's resources of green leafy vegetables (between 800 and 1000 species) are not being utilized, as only 10 out of 210 species actually make it into markets and into the mouths of the starving citizens.

Micro-and Macronutrients

Important factors to providing quality nutrition include both macro- and micronutrients to help support the growth of both the body and the mind. A lack of micronutrients is an underlying cause of morbidity and death (Black, 2003).

There is a large body of basic science about the effects of particular nutrients. Stein (2001) provides a summary of this information in an article titled "Global Impacts of Human Mineral Malnutrition." Calcium plays a major role in blood clotting, muscle contraction, nerve transmission, and tooth formation. Iron is a component of hemoglobin and numerous enzymes, so the consumption of iron helps to prevent anemia. Fiber is important for digestion and maintenance of blood sugar and is found in all vegetables, beans, and fruits. Magnesium is a cofactor for enzyme systems, and manganese is important in forming bones and some enzymes in the metabolism of amino acid,

cholesterol, and carbohydrates. Molybdenum is a cofactor for enzymes involved in catabolism of sulfur amino acids, purines and pyridines. Potassium is required for basic cellular function. Low levels of potassium can cause cardiac arrhythmias, muscle weakness, glucose intolerance, high blood pressure, salt sensitivity, increased risk of kidney stones, high bone turnover, and risk of cardiovascular diseases.

Many micronutrient deficiencies can lead to impaired cognitive functioning (Black, 2003), which can then affect the ability of children to learn and grow into productive members of society that can support their surrounding communities. The effective prevention of micronutrient deficiencies must begin early in development, preferably starting with pregnant mothers. After birth, many different fruits and vegetables must be provided for the child, especially through the first few years of life, in order to optimize the development of the brain (Black, 2003).

Providing Food at School

In a study about the impact of Chile's school feeding program on education outcomes, McEwan (2012) established that it is more important to feed children quality high-nutrition food instead of high-calorie foods. He suggests that the focus of national policy should shift to the nutritional composition of school meals rather than just increasing calories. Simply increasing the calories that the children received in Chilean schools did not show the expected increase in enrollment, attendance, and test scores.

In Greenwich, a borough of London, Belot and James (2011) reported evidence that moving away from low-budget processed meals towards healthier options improved educational outcomes in English and science classes. Healthier meals also decreased

authorized absences (usually caused by illness) by 14%. They concluded that a well-balanced diet is the best way to enable good cognitive and behavioral performance.

Many important nutrients can be more reliably provided for children at school by foods grown in a community or school garden, including calcium, iron, fiber, magnesium, manganese, molybdenum, and potassium. Vitamins A, B5, B7, C, and folic acid can also be provided. Spinach would be a good source of calcium and iron. Other sources of iron that could be grown in a garden include beans and lentils, and sources of manganese and molybdenum would be nuts, beans, and other legumes. Growing sweet potatoes, bananas, and soybeans would provide the essential potassium that is needed.

The Importance of Education

The approach to correcting malnutrition must ensure the provision of nutrient-rich food at home and at school, but it must also include strategies to teach children concepts and habits of good nutrition.

Rao (2006) found that a classroom-based intervention in India resulted in significant improvement in nutritional knowledge of schoolchildren. This knowledge was retained with no significant decrease after two months. He concluded that children are receptive to learning more about nutrition in a classroom setting. Educating children at a young age about nutritional importance helps them to make healthy choices for the rest of their lives. The training of teachers to provide nutritional knowledge is important and would need to occur before the students could be given the best opportunity to learn. Rao also emphasized the effectiveness of posters containing nutritional information displayed in the classroom. Oldewage-Theron (2011) provides a comprehensive list of

different teaching materials that have been proven effective in encouraging children in South Africa to adopt healthier, well-balanced diets. These teaching materials range from charts and flash cards to fun interactive games.

Teaching children how to grow food is as important as nutrition education. Just because a child has learned about the importance of nutrition and has grown up around people who grow their own food does not mean that child knows the optimal way to farm. If these future adults are to be subsistence farmers or even part-time gardeners providing some of their own food, they must be taught these techniques in school.

In the literature, the important role played by diversity of crops, especially local species, and consumption of wild species in achieving balanced nutrition is emphasized. However, this information is not routinely taught in schools, especially starting at a young age. Heywood (2011) found that the topics of ethnopharmacology, biodiversity, agriculture, food and nutrition are linked, but research and teaching in these areas tends to have a certain compartmentalization. The lack of integration prevents progress towards sustainability. Heywood found that, "in recent years… there is an increased appreciation of the need to adopt a wider approach to human nutrition than the conventional agricultural model allows; there is also a greater awareness of the important role played by diversity of crops, especially local species, and local consumption of wild species in achieving balanced nutrition (p. 1)." He calls for coordination between the use of agricultural products and traditional medicines in order to improve nutritional and health standards.

The "ideal farm" was conceptualized by a sample of farmers from western Kenya in the article, "Bio-Economic Evaluation of Farmers' Perceptions of Viable Farms in

Western Kenya." Waithaka (2006) interviewed households in four sub-locations in Vihiga District to discover what the farmers' perceptions of the "ideal farm" were and what the farm would look like. Overwhelmingly, the farmers indicated that they would like a family size averaging 10 people (half adult/half children). The farmers thought that a farm size around 0.7 hectares was most desirable. For their own food crops, the farmers only indicated growing maize, while their cash crops included tea, sugar cane, dairy, and tomato. All farmers included in the study stressed maize as the most important crop that they grow.

> There was a rigid perception that a successful farm must produce the staple food maize even when it was readily available in the local market. However, the idea of selling surplus produce to neighbours or the local market was seen to be desirable. The implication of this was that large tracts of land were devoted to maize alone, even when yields were only sufficient to feed a household for two to six months in a year (p. 261).

Waithaka also found that the farmers consistently over-estimated the amount of maize they would produce per hectare (up to 20 times more than they actually harvested). He attributed this overestimate to the farmer's lack of access to markets and the high cost of farm inputs like fertilizer. A promising correlation that Waithaka found was that "all farmers highlighted the need for technical advice along with the formation of self-help groups to facilitate training and encourage exchange of ideas and marketing of produce (p. 262)." A sample of farmers was surveyed from Gayundunyi, and this sample was found to exhibit different ideas from many of the other areas surveyed. Waithaka found that the farmers he studied in Gayundunyi were relatively younger and had received more

education beyond primary school. Interestingly, he noted that these younger/more-educated farmers worked full-time on their farms and were more experienced with key enterprises like tea production. These younger farmers had devoted their lives to agriculture and were proven to be more successful at the farming that they did. This promising finding could indicate that more education leads to more positive attitudes and improved knowledge about farming.

A Comprehensive Model for an Educational School Garden

A number of authors stress that all interventions (including food-based strategies such as home gardens) to reduce micronutrient deficiencies should combine the provision of food with nutrition-education campaigns. Muller (2005) believes that the introduction of a garden into a community will show a greater improvement in hunger relief when combined with education, i.e. a community garden reaches its full potential when used as a learning tool in addition to being a food resource.

Since death is the inevitable consequence of extreme malnutrition, and food insecurity is a product of poverty and instability, efforts made to reduce malnutrition must do so in the even wider context of encouraging political stability, health, and wealth in a society. Thus, Fanzo (2011) advocates agricultural and nutrition education combined with market system development.

In his paper, "Linking Agricultural Development to School Feeding in Sub-Saharan Africa: Theoretical Perspectives," James Sumberg (2011) describes and analyzes the effectiveness of the homegrown school feeding (HGSF) that has been presented

throughout the literature. The article reviews the HGSF literature and the main theories underpinning it.

Sumberg describes the benefits to the economy of the surrounding community by the implementation of a HGSF as helping to generate "demand-assisted growth". The organization of a market centered on both the garden at the school and the surrounding farmers could provide the basis for growth of a community market. By selling produce from the garden and supplementing the foods grown in the garden with produce bought at the local market, the community receives an internal stimulus that could help to spark a self-sustaining economy. The stability of a local market could help the community to more effectively sell their produce and to better achieve nutritional goals through greater access to different foods and the possibility of specialization. Sumberg emphasizes that a HGSF can only be effective at helping the economy of the local community if the school and sources of food are in close proximity. He struggles with the definition of "local" as presented in many articles, calling for greater clarity in if "local" refers to the immediate village, the area surrounding a school, or an entire country.

Sumberg (2011) also emphasizes that "there will be few if any agricultural development benefits from HGSF if there is no accompanying increase in farm productivity" (p. 348). In summary, the surrounding community and future farmers must have adequate access to information, training, and technology in order to provide the produce that is necessary to support a community.

Uduku (2010) investigated how to effectively build a school-feeding program into a "development hub" that can help the entire community. Uduku calls for,

> the evolution of a new school design model, in which the school site becomes a 'development hub', supporting children's education, associated support activities including school feeding, and importantly also, integrated community development outreach activities (p. 59).

Uduku (2010) sites three major benefits of a school feeding program; improved childhood health and nutrition, improved cognition and educational outcomes, and the promotion of healthy eating through linking up with community farm projects. Through interviews with head teachers, staff, students, and parents Uduku found that the community welcomed the school feeding programs, especially in the two South African primary schools. The case studies in South Africa linked the school feeding program to a school-farming program in which parents and other local community members were able to grow and sell produce to the school and community. In Vilikanzi Primary School of South Africa, Uduku provides the results of this interview:

> A grandmother, who has cared for her grandchild since her parents died from HIV/AIDS, simply stated, ''I am very happy with the school's help with my granddaughter'' (translation from Zulu, Vilikanzi School Field Visit, 14th August 2007). As well as the girl receiving school meals, the grandmother cultivates a plot on the school farm. Another pupil underscored the importance of the feeding programme in her/his school, '' . . . these are our needs and not just wants'' (pupil, Dalweide Primary School, Paarl, South Africa) (p. 64).

In this instance, the program successfully combined a school feeding program with agriculture to provide sustenance and outreach to the community. Uduku emphasizes that

including the community in the development of the school enhances a sense of ownership throughout the community which can lead to greater transparency and accountability.

Uduku concluded from interview results in this study that the integration of a school feeding with nutrition education, health, and agriculture has the greatest impact on the target population. The school becomes a source of knowledge and growth for the whole community. Uduku deduced that school-feeding programs had broader benefits to the community when they were coupled with a school-farming program. When a school is unable to produce enough food in the school garden, Uduku advocated going to the local market to buy produce grown by the local farmers in order to provide a boost to the community economy.

Keatinge (2013) also advocates using a garden at a school to convince children of the importance of gardening and teach them valuable lessons about nutrition and farming technique. He believes this is an important step in helping to achieve the Millennium Development Goal 1. Furthermore, he emphasizes the role that a garden can play in empowering women and communities to achieve greater unity and reduce hunger. He concluded that community and school gardens are a good stepping-stone to alleviate hunger. He notes that success will not occur without a greater influx of knowledge about farming technique and a more integrated effort from agricultural, nutritional, and health sectors

The Gap in the Literature

The literature supports the concept of a school garden being an effective source of nutrition, nutrition education, and farming technique education. It can be inferred from the improved outcomes of the younger, more educated farmers in Waithaka's study (2006) that their attitudes about farming as a career may have been improved precisely because of education. A school garden in addition to nutritional information given in the classroom is effective at convincing children of the importance of nutrition and biodiversity in their diets.

HGSFs have been praised for their ability to provide both education and nutrition to the children of the school and the surrounding community, but Sumberg (2011) emphasizes the need to quantify these results. He notes that future researchers should quantitatively investigate the benefits that HGSF has on the nutrition, health, and schooling of students. He admits that the almost complete lack of data on the operation of HGSF programs in Sub-Saharan Africa limit the empirical analysis of their effectiveness.

While studies have noted an improvement in knowledge in children exposed to a school garden, there is little research about how the children themselves feel about working in the garden, their knowledge about nutrition, or their attitudes towards farming as a career.

This study was designed to describe the effect after one year that a school garden had on the attitudes of children about agriculture. It also sought to confirm the finding cited in the literature that a school garden does increase children's knowledge about nutrition. Finally, the technical farming knowledge of the students was analyzed to see if

the children who worked in the garden could demonstrate some basic knowledge of farming.

Community-Based Research: Straw to Bread and the Nyakach Plateau

Straw to Bread is a U.S.-based non-profit organization that is carrying out a comprehensive development effort in partnership with the Luo community of the Nyakach Plateau in western Kenya, an area that is almost entirely dependent on subsistence agriculture. The projects of these combined efforts encompass the areas of sustainable agriculture, clean water, education, healthcare, and small business.

The community of the Nyakach Plateau is a rural population that has experienced in recent years the death of adults and children due to hunger. In this area, prone to severe drought alternating with disastrous flooding, it is important for young people to learn good techniques and positive attitudes about farming in order to help provide quality sustenance for themselves and their community in the years to come.

In 2012 Straw to Bread established a school garden in response to the urgent problem of starvation on the Plateau. This garden was an experiment in providing adequate nutrition to the children at the Bethlehem Home Academy, the school established by Straw to Bread and its Kenyan partners. The school serves very poor and often malnourished children who rarely receive any food other than the one meal they are offered at school each day.

The School Garden

Produce that has been grown in the garden includes the staples of the Kenyan diet, maize and beans, and seeks to introduce new produce to encourage nutritional diversity. The produce of the garden is listed in Table 1.

Garden Produce Grown
Avocado
Banana
Beans
Butternut
Capsicum
Carrot
Coriander
Cowpea
Ground Nut
Kale
Maize
Mango
Paw Paw
Sweet Potato
Yamaranth

Table 1

The garden is organized into four quadrants. Between quadrants and along the outskirts of the garden, trenches have been dug to channel excess rainwater through the garden. In each quadrant, a different plant is cultivated each growing season. A portion of one quadrant is reserved for composting and as a nursery for young plants. Fruit trees are planted along the perimeter of the garden to prevent soil erosion. On the downhill border of the garden a stone wall has been built to retain soil. The entire garden is fenced in with barbed wire.

Figure 1

A quadrant of the garden containing ground nuts (front) and maize (back)

Figure 2

Stone wall and fruit trees (back left) with newly plowed and planted quadrants (right)

Productivity of the Garden

The garden introduced new farming techniques to the area. One technique that the school garden has introduced is trenching around the plots of the garden in order to avoid soil erosion (Figure 3).

Figure 3

This has proven to be an effective technique. When the school garden plots are compared to a private garden situated directly across the path, it is clearly seen that the private garden has experienced substantial soil erosion due to rain (Figure 5) causing damage to the plants. On the other hand, the school garden has experienced very little soil erosion (Figure 4), and it can be seen that the plants are flourishing.

Figure 4

Figure 5

Another technique that has been effectively used to prevent soil erosion in the school garden includes building a sort of terrace wall at the downhill portion of the garden. This wall prevents the soil from leaving the garden even when heavy rains fall.

The school garden also has fruit trees planted around the perimeter of the plots in order to further prevent soil erosion.

The school garden is fenced in with barbed wire. This is an effective technique to keep both domestic and wild animals from entering the garden, eroding the soil, and eating the plants or produce. The act of fencing in a garden is not commonly practiced on the Plateau, likely because fencing can be expensive.

These methods have been proven effective in the garden and will continue to be improved upon. These innovations have been taught to the children on their visits to the garden.

Anecdotal information gathered at the establishment of the garden showed that many of the children at the school did not consider farming to be a desirable job, did not receive support from their friends or families to become farmers, and were not interested in nutritional diversity. Many of the children in this area have previously left the Plateau to go work in the cities because they believe that these "desk jobs" are more desirable.

In the Luo community, there is a clear divide between what is considered a career and what is considered a job (personal communication, 2013). In general, a job is something that a person does on the side and does not receive the same acknowledgement in the community that a career would. A career requires many years of schooling, and most careers are believed to be located exclusively in large cities. This cultural stigma against farming as a legitimate career was one of the major reasons that the Bethlehem Home school garden was introduced. It was the hope of the school and prominent members of the community that the garden would help teach the children that farming is a good job and that every person should be able to grow their own food.

The community of the Plateau wants to become self-sustaining, but this cannot occur if the young men and women leave the Plateau for better prospects they perceive to be predominantly located in large cities. The community also hopes to dissuade their youth from moving to larger cities to find work, because often there is no work to be had in the city. Because they cannot find work, the youth can become trapped in a constant struggle for daily food. They can be drawn into slums and become surrounded by starvation and disease, with no prospects for their future. The community of the Nyakach Plateau wants to avoid this bleak future for their youth. They hope that the younger generations will be encouraged to stay on the Plateau to help build a sustainable community through good farming practices.

Prior to the establishment of this garden, there was no nutrition or agriculture education at the school, and certainly not a hands-on approach. The teachers had no training in farming themselves, nor did they have training in teaching children about nutrition or farming. While the primary goal was to provide food for the schoolchildren, the garden was established with secondary goals in mind. These goals included teaching the children to enjoy farming and teaching them to be effective farmers.

A year after the implementation of the garden the developers wanted to gather initial impressions from the students and the teachers about the secondary benefits the garden had provided in its earliest stages before formal training of the teachers had begun. This study is composed of structured interviews with the children and teachers about the first year of the garden's existence. This community-based research will help to inform future efforts in the Bethlehem Home Academy garden as well as to contribute new data to the professional literature about the effectiveness of such an approach. It was

anticipated that the initial adult response to the garden would be good, but it was unknown as to whether the children themselves would believe that they had benefitted. It was also important to establish a baseline of the children's knowledge about nutrition and farming against which to measure future interventional success.

In summary, the overarching goal of the study was to gather information to better serve the children of this school and its surrounding community through making the garden an interactive and accessible tool for education and nutrition.

It is hoped that the implementation of the school garden will improve the children's outlook on self-sustainability by growing their own food, give them valuable knowledge about nutrition and farming, and provide nutritious food for them as they attend school. If these goals are met, then the school garden may help to prevent this generation from leaving their land while providing greatly needed healthy food to this small, suffering part of the developing world.

Schematic Representation

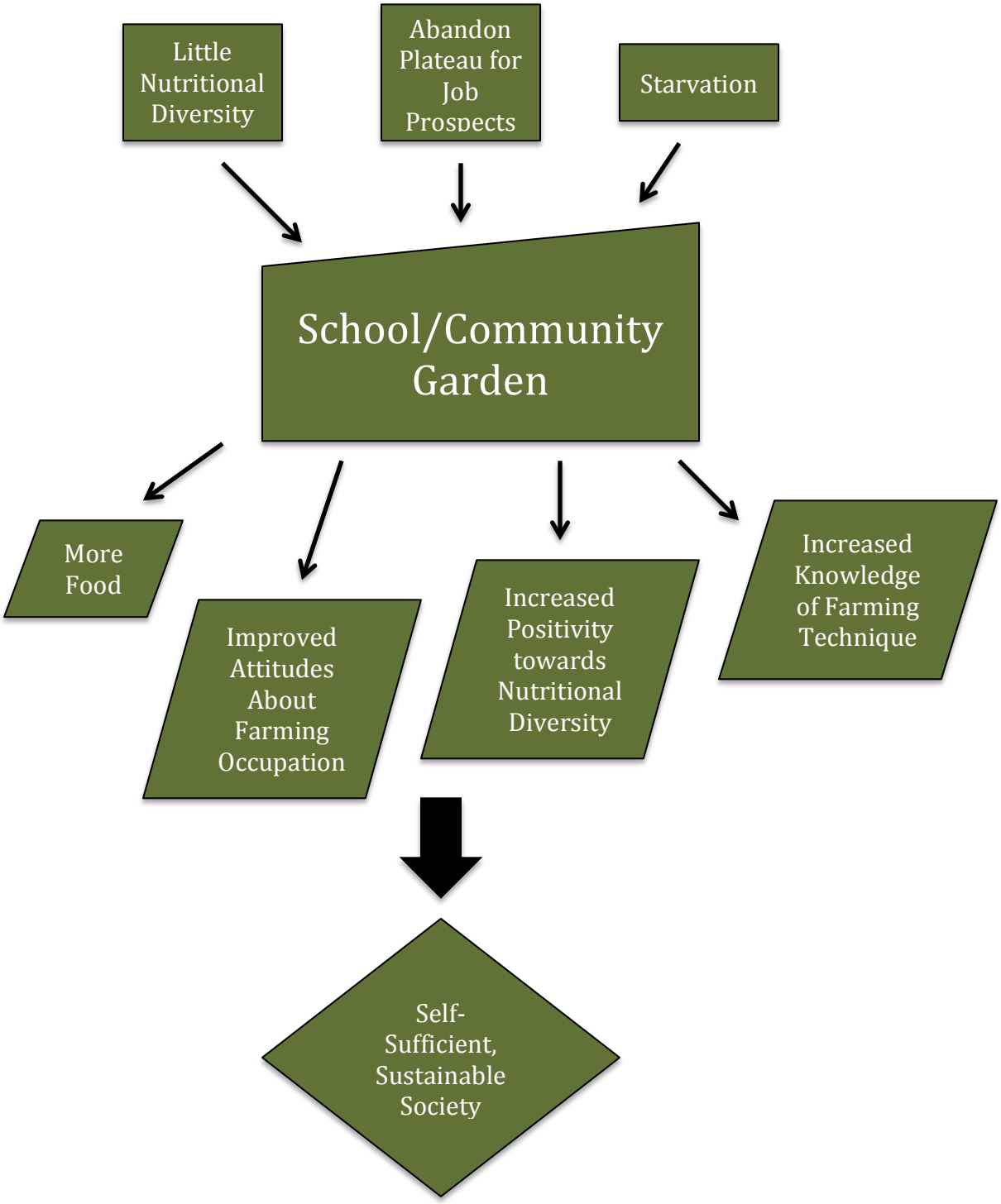

Figure 6

CHAPTER THREE

Hypothesis

Description of Study

Within the general objective of better understanding the effect of school gardens on poverty-stricken areas in rural sub-Saharan Africa, this study assesses the initial success of a school garden implemented in rural western Kenya and provides a baseline for future study. The specific objective is to gather information about the school garden project of the Straw to Bread non-profit organization and the attempt to improve knowledge and attitudes about farming and nutrition in the target community of the Nyakach Plateau. Information was collected through structured interviews of the students and teachers of the Bethlehem Academy regarding their experiences in the garden a year after the garden was established.

Research Questions and Hypotheses

Primary Research Question:

Does the implementation of a school garden affect the attitudes of children about farming as an occupation?

Hypothesis: The implementation of a school garden will improve the students' perception of farming as an occupation.

Null Hypothesis: The implementation of a school garden will have no effect on students' perception of farming as an occupation.

Secondary research question:

Does the implementation of a school garden have an effect on the students' knowledge about farming technique?

Hypothesis: The implementation of a school garden will increase students' knowledge about farming technique.

Null Hypothesis: The implementation of a school garden will have no effect on students' knowledge about farming technique.

Tertiary research question:

Does the implementation of a school garden have an effect on students' knowledge about the importance of nutrition diversity?

Hypothesis: The implementation of a school garden will increase students' knowledge about the importance of nutrition diversity.

Null: The implementation of a school garden had no effect on students' knowledge about the importance of nutrition diversity.

CHAPTER FOUR

Methods

Setting

This research was conducted at the Bethlehem Home Kuoko Academy on the Nyakach Plateau where a school garden was implemented by the U.S.-based Straw to Bread non-profit organization in 2012 to help alleviate hunger at the school. Straw to Bread sponsors a team that works for two weeks each year on the Nyakach Plateau in rural western Kenya among the Luo tribe. This annual activity is part of ongoing development projects and research in this area that encompass health care, food and sustainable agriculture, safe water sources, education, and small business development. The interviews were done by one person who conducted all of the interviews through a translator.

In this study, whether a student was a part of this group of Bethlehem Home orphans was recorded. Bethlehem Home is a charitable effort founded and led by Pastor Habil Ogola. Pastor Ogola cares for 60 orphans and elders, ensuring that they have food and suitable living conditions. Through his work and his partnership with Straw to Bread, he built Bethlehem Home Academy, which opened in the fall of 2010. Many of the orphans that Pastor Ogola cares for are able to attend the Bethlehem Home Kuoko Academy.

Sample

Every child who was present at school and whose parent gave informed consent was interviewed using a structured interview (see Appendix B and C) with the help of a translator. A small number of parents could not be located on the days of the study, so their children were not included in the study. Bethlehem Home Kuoko Academy teaches children ranging from age 3 to age 14. Children too young to enter into Grade 1 are placed in the "Baby Classes," which are equivalent to pre-kindergarten and kindergarten in the United States. For children in the Baby Class through Grade 3, the interview was performed using a simplified interview guide that they were more capable of answering. Grades 4 through 7 were given an expanded interview and knowledge assessment (see Appendix B). Teachers and administrators were also interviewed using a structured interview guide and a translator (See Appendix A). Students and teachers that were included were those that were involved in the school and especially those that helped with the school garden. Children were excluded from the study if they had not visited the school garden due to being too young. In the Baby Class, 13 students reported that they had not visited the garden.

Research Design

This was a cross-sectional study of the students and teachers at the school done between May 22 and May 27, 2013.

Measurements

The study was performed by means of structured interviews and a knowledge assessment of agriculture technique. These interviews and the knowledge assessment were developed by the investigator base on the questions raised in the literature and covered the topics of the children's attitudes toward agriculture, their knowledge of agriculture techniques, and their knowledge of nutrition. The teachers were also interviewed to determine what happened in the garden and how they used the garden as a part of the children's curriculum. Variables adjusted for include age, gender, Bethlehem Home status, and grade level.

Data Analysis

The qualitative data were analyzed to identify common themes. Answers were compiled and grouped according to content and summarized. The knowledge assessments were evaluated and correct answers tallied into a score from 0 to 11 possible points.

A positivity score was created using questions from the interview (see Table 2). For each positive response a child was given one point. Points were added into a positivity score ranging from 0 to 4 possible points.

Questions Contributing to Positivity Score
Do you receive support from friends and family about farming as a job?
Do you want to learn more about farming?
Do you think friends encourage you to farm more now than they did before the school garden?
Do you think the school garden makes life better for you?

Table 2

The quantitative data were entered into Microsoft Excel and then imported into SAS 9.3, the statistical program that was used for data analysis.

Descriptive Statistics

Frequencies, percent, and cumulative percent, are reported for each variable. For continuous variables, the mean, standard deviation, and range are reported.

Analytic Statistics

For continuous variables a t-test or ANOVA was used to test the difference between means in two or more groups. Multivariate analysis was used to assess interaction effects and the relative contribution of each predictor variable to the outcome variable. Multiple regression, logistic regression, and analysis of variance were used. In some cases, data were stratified and contingency table analyses using Chi-square were done to assess the modification of the relationship between the predictor and the outcome variables.

IRB Approval

The Baylor University Institutional Review Board approved this study before data collection began. All data from human subjects is anonymous. Informed consent was obtained before any subject provided data for the study.

CHAPTER FIVE

Results

Descriptive Information

Sample Characteristics

All students and teachers were from the Bethlehem Home Kouko Academy which was in its second year of operation. There were 55 students and 8 teachers in the sample. The distribution of students per grade level is listed in Figure 7. The average age of students was 9.58 years (SD=2.33) with a range of 5.4 years to 14.3 years (Figure 8). The distribution of grade levels is shown in Figure 3. Baby Class through Grade 7 were all represented in the sample, with Grade 3 having almost twice as many subjects as any other grade. The gender distribution of students was 51% male and 49% female. Bethlehem Home, as referred to in the methods section, indicates a student who is under the care of Pastor Ogola.

All eight teachers at the school were interviewed, including one teacher for each grade. Half of the teachers were male, and half of the teachers were female.

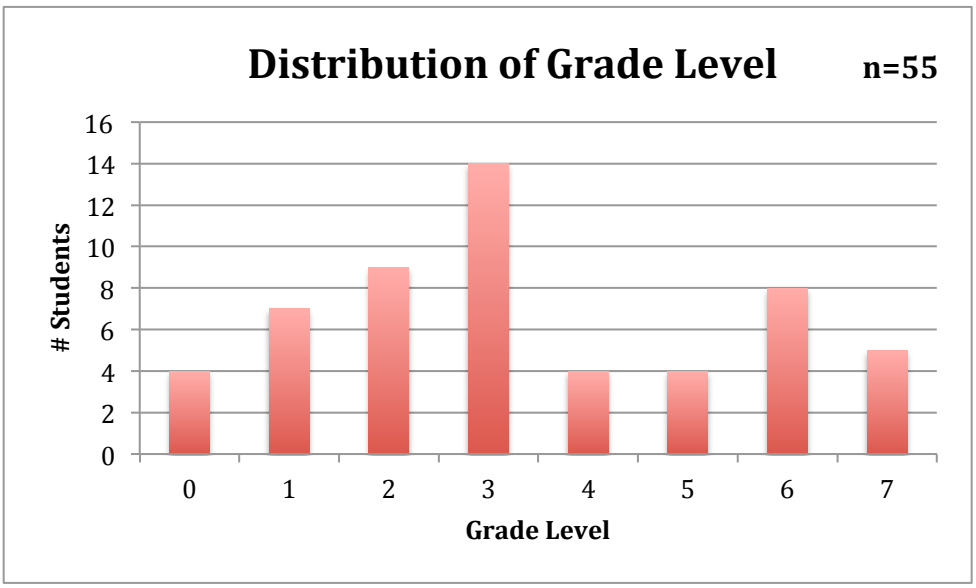

Figure 7

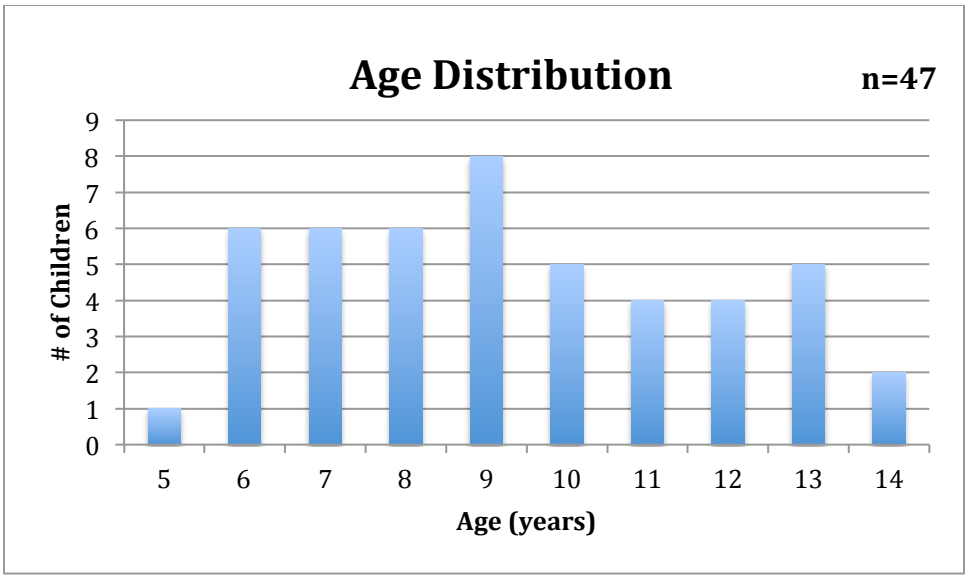

Figure 8

Teacher Interview Results

Questions and responses from the eight teachers are listed below in Table 4-6. On average, the teachers reported that the children visited the school garden for 30 minutes about two times a week (Table 3). The teachers reported using the garden to teach the children about farming methods, plants, nutrition, and other subjects such as science and social studies.

Garden Visits by Time		**n=8**
Time spent in garden	$\bar{x}$	**SD**
Children visit garden (per week)	1.74 days	±1.83
Time spent in garden per visit	30 minutes	±8.45

Table 3

Seven out of eight (87.5%) teachers gave positive answers about the children's interest in the garden, in becoming farmers, and in eating a diverse diet. One hundred percent of teachers reported an improvement in the children's knowledge of farming technique since the garden was started. When asked what the most important thing was that had come from the school garden, seven out of eight teachers reported that the food itself was the most important thing to come from the school garden. It is important to note that almost all of the negative responses recorded were from the teacher of the Baby Class.

Teacher Interview Questions		n=8
	Yes	**No**
Was the garden used to teach the kids about nutrition?	100.0%	0.0%
Was the garden used to teach the kids about things other than nutrition and farming, such as numbers, colors, science, etc.?	25.0%	75.0%
Did you see any of the students become more interested in farming throughout the year in the garden?	87.5%	12.5%
Did you see any of the students become more inclined to become farmers in the last year?	75.0%	25.0%
Did you see any students that did not like going to the garden to work?	62.5%	37.5%
Was there an improvement in the knowledge of the students about farming technique?	100.0%	0.0%
Did the children become more interested in eating many different kinds of foods?	87.5%	12.5%

Table 4

What was the most important thing that you saw come from the garden? n=8	
Food	50.0%
Food and Knowledge	37.5%
Knowledge	12.5%

Table 5

What curriculum did you teach the students in the garden?	n=8
Farming	50.0%
Science and social studies	25.0%
Nutrition	12.5%
Science	12.5%

Table 6

Students Grade Baby Class-3 Interview Results

As described in the Methods chapter, children in the Baby Class through Grade 3 were given a simplified interview. These results are summarized below in Table 7 and 8.

What do you like about going to the garden?	n=21
Working in the garden (tilling, planting, watering, etc.)	66.6%
Food	14.3%
Food and working	14.3%
Nothing	4.8%

Table 7

What do you not like about going to the garden? n=21	
Nothing- I like everything	57.0%
Watering	9.5%
Food	9.5%
Tilling	4.8%
Weeding	4.8%
Planting	4.8%
Harvesting	4.8%
Tilling and weeding	4.8%

Table 8

Students Grade 4-7 Interview Results

As described in the Methods chapter, children in Grades 4 through 7 were given an expanded interview. When asked what foods are important to eat (Table 9), 25% of older students said beans, grains, or nuts only. The other combinations of responses are represented below in Table 9 and Figure 9.

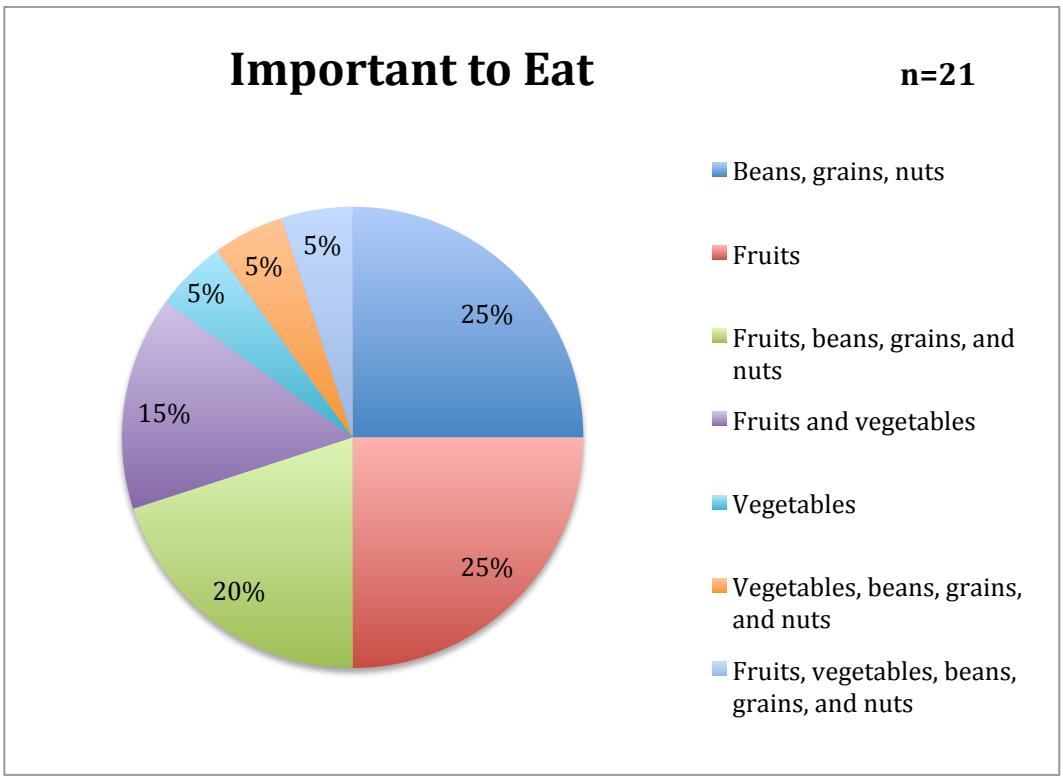

Figure 9

Foods the Children Reported as "Important to Eat" n=21	
Important to Eat	**% of Sample**
Beans, grains, nuts	25%
Fruits	25%
Fruits, beans, grains, and nuts	20%
Fruits and vegetables	15%
Vegetables	5%
Vegetables, beans, grains, and nuts	5%
Fruits, vegetables, beans, grains, and nuts	5%

Table 9

Attitudes Toward Farming

The results for questions 23-31 for the older children are listed in Table 10. It is important to note that all of the children think that farming is a good job. Also, 14.3% of the children did not feel that they received support about farming as a job. Most of the children reported that they received more encouragement from friends and family about farming because of the school garden. It is also important to note that 100% of the children report receiving more support about farming from the people that they live with after the implementation of the school garden.

Children Interview Results		**n=21**
Child Interview Questions	**Yes**	**No**
Do you think that farming is a good job?	100%	0%
Do you receive support about farming as a job?	85.7%	14.3%
Do you want to learn more about farming?	90.5%	9.5%
Do you think you could learn more about farming?	95.2%	4.8%
Do you like working in the garden?	100%	0%
Do your friends encourage you to farm more now than they did before the school garden?	95.2%	4.8%
Do the people that you live with encourage you to farm more now than they did before the school garden?	100%	0%
Do you think the school garden makes life better for you?	90.5%	9.5%

Table 10

Other Findings

At the end of the interview, the children were asked what they wanted to be when they grew up. Their answers are listed in Table 11. It is notable that all but about 10% of the children said that they wanted to be a farmer.

What do you want to be when you grow up? n=21	
Pilot and farmer	38.1%
Farmer	14.3%
Teacher and farmer	14.3%
Lawyer and farmer	9.5%
Engineer and farmer	4.8%
Doctor and farmer	4.8%
Nurse and farmer	4.8%
Nun	4.8%
Teacher	4.8%

Table 11

When children were asked what they had learned from working in the garden, most of them focused on the tasks of farming, such as planting. A third of the students, however, said that they had learned that farming is good and that the garden produces food for them.

What have you learned from the school garden? n=21	
The garden gives us food	23.8%
Planting and harvesting	14.3%
Planting	14.3%
Tilling, planting, and harvesting	9.5%
Farming is good	9.5%
Planting and fertilizing	9.5%
Tilling and planting	9.5%
Weeding	4.8%
Science	4.8%

Table 12

Knowledge Assessment Results

The results of the knowledge questions are shown in Table VII. The number of correct responses ranged from 27% to 100% correct answers out of 11 possible points. The average number of correct responses (listed in Table 13) was 76% (SD= 18) of the total. This average indicates that the children have a reasonable understanding of some aspects of agriculture. The children displayed a lack of knowledge about pests and

pesticides, scoring lowest on these questions. They scored the worst on question H and F. These results will be discussed further in the following chapter.

Knowledge Assessment Results by Question		n=21
Farming Technique Questions	**Correct**	**Incorrect**
A. What is soil erosion?	71.4%	28.6%
B. How do you prevent soil erosion?	76.2%	23.8%
C. Can soil get tired, and begin to make less food?	66.7%	33.3%
D. What do fertilizers do?	95.2%	4.8%
E. Is it important to plant many different fruits and vegetables?	90.5%	9.5%
F. What types of pests can hurt your garden?	57.1%	42.9%
G. How do you avoid/get rid of pests?	76.2%	23.8%
H. Are there bad things about pesticides?	42.9%	57.1%
I. Is it important to plant different things in different places from season to season?	90.5%	9.5%
J. When should you harvest your garden?	81.0%	19%
K. If storing produce, how should it be kept?	95.2%	4.8%

Table 13

Measures of Positivity

As described in the Methods chapter, a positivity score from the interview questions was created for the 21 older students to measure the children's general attitude towards the garden. Out of a possible 4 points, the average positivity score was 3.62 with

a range of 2 to 4 (SD= 0.669). This indicates an overall positive outlook on the garden and about farming.

n=21	$\bar{x}$	**SD**
Knowledge Score (0-11 possible)	8.36	2.03
Positivity Score (0-4 possible)	3.62	0.67

Table 14

Analytic Statistics

Positivity Analysis

Multivariate analyses were performed to evaluate whether the positivity score and the knowledge score were associated with each other or with socio-demographic variables: age, gender, grade level, and Bethlehem Home sponsorship. Because only the older children in Grades 4-7 were asked the questions that comprised the positivity and knowledge scores, the sample size for these analyses was 21 students.

Both bivariate and multivariate statistical analysis showed no significant relationship between the positivity score and any of the other variables, including the knowledge score.

Knowledge Analysis

Using bivariate analysis, none of the socio-demographic variables (age, gender, Bethlehem Home, grade) were significantly associated with the knowledge score except for the grade level of the child (n=20, t=2.94, p =. 0084). The children who have

attended more years of school scored significantly higher on the knowledge assessment than those who had attended less years of school. The biggest difference being between Grade 4 and the other grades (Figure 10).

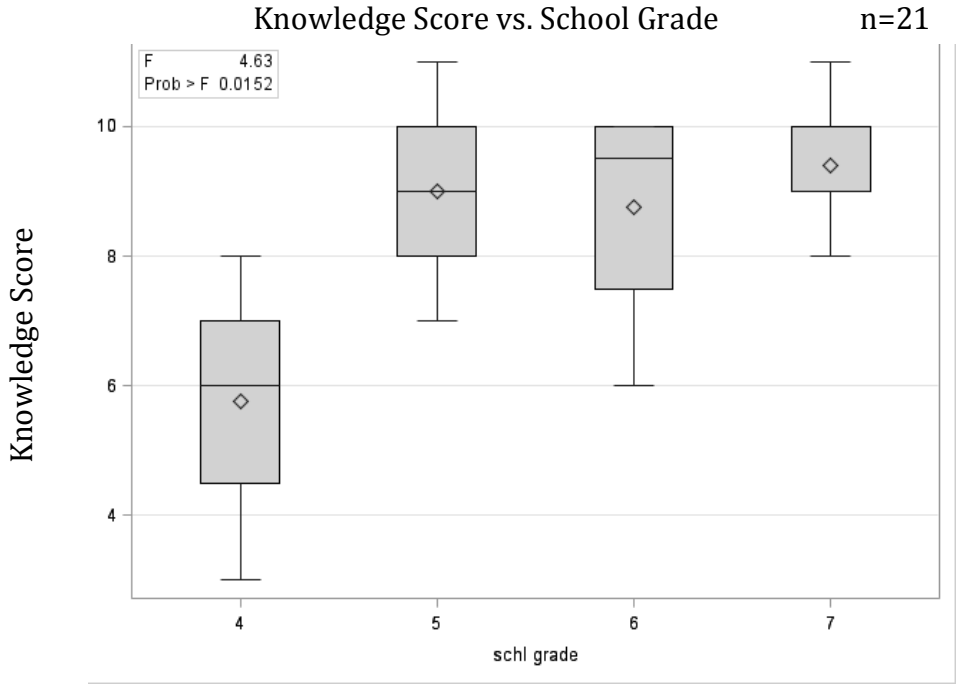

Figure 10

Using multivariate analysis, the knowledge score was regressed on the positivity score along with all of the socio-demographic variables. With this approach, the variable indicating whether a child was sponsored by Bethlehem Home was shown to be almost significant (p=0.0607) in addition to grade level (see Table 15). With a larger sample size, this relationship would most likely be significant. This would indicate that grade level was masking the effect of BH status on knowledge in this sample when, in fact, both variables are associated with the knowledge score. If the effect is truly significant,

then when the effect of grade level is adjusted for, the significance of BH status becomes apparent. The trend was analyzed, and it was found that the Bethlehem Home children had performed worse on the knowledge assessment than non-Bethlehem Home children.

Knowledge Regressed on Socio-demographic Variables n=20				
Overall Model F=5.12, p=0.0075, R-square=0.56				
Variable Name	**Mean**	**SD**	**F**	**p**
Bethlehem Home			4.07	0.0607
Yes	7.57	1.51		
No	8.79	2.12		
School Grade			5.47	0.0088
4	5.57	2.06		
5	9.00	1.63		
6	8.75	1.58		
7	9.40	1.14		

Table 15

Hypotheses

The three original hypotheses were as follows.

Primary Research Question:

Does the implementation of a school garden affect the attitudes of children about farming as an occupation?

Hypothesis: The implementation of a school garden will improve the students' perception of farming as an occupation.

Null Hypothesis: The implementation of a school garden will have no effect on students' perception of farming as an occupation.

Two questions in the interview directly addressed the issue of the impact of the garden on attitudes. Children were asked if the people with whom they live encourage them to farm more now than they did before the school garden was established. Out of the 21 older students, 100% of the children said yes.

The optimal way to establish the effectiveness of the garden in improving students' attitudes and knowledge would be to administer a pre-test and a post-test. The current information serves as a baseline from which changes may be observed once the garden becomes an established and expanded facet of the school curriculum. Another strategy would be to ask the students themselves if they believe that the garden has made a difference in their attitudes or knowledge. Of the older children, 100% interviewed thought that farming was a good job. The average positivity score was 3.62 out of 4.00,

also indicating the positive attitudes of the children towards farming. The responses of 87.5% of the teachers also indicated that the children had become more interested in farming. These teachers also reported the children's improved view of farming as a career. Within the limits of a cross-sectional study, the interview results indicate that the garden improved the attitudes of the children towards farming.

Secondary research question:

Does the implementation of a school garden have an effect on the students' knowledge about farming technique?

Hypothesis: The implementation of a school garden will increase students' knowledge about farming technique.

Null Hypothesis: The implementation of a school garden will have no effect on students' knowledge about farming technique.

The knowledge of the children about farming technique was shown to be fairly good by the mean knowledge score of 8.36 out of 11. During interview, 100% of teachers indicated that there was an increase in the children's knowledge of farming technique after the implementation of the school garden. Due to the lack of preliminary data on the knowledge of the children before the implementation of the school garden, it is not possible to conclude the extent of the increase in the children's knowledge. It was also observed within the community that some people were attempting to implement the techniques used in the school garden in their home plots.

Tertiary research question:

Does the implementation of a school garden have an effect on students' knowledge about the importance of nutrition diversity?

Hypothesis: The implementation of a school garden will increase students' knowledge about the importance of nutrition diversity.

Null Hypothesis: The implementation of a school garden will have no effect on students' knowledge about the importance of nutrition diversity.

Of the teachers at the school, 87.5% reported an increase in the children's interest in eating many different types of foods. When reporting the types of foods that they thought were important to eat 25% of children reported maize, beans, and nuts only. This would indicate a need for nutritional education. As above, it is not possible to conclude the extent of the increase in the children's knowledge about the importance of nutritional diversity. From interview results, it is apparent that the teachers and students were interested and excited about the fruits and vegetables that were introduced in the school garden.

CHAPTER SIX

Discussion

Support for Farming as a Career

One of the purposes of the school garden is to show the children that going to the city to find work is not their only option. In the interviews, at least 15% of the 21 older children interviewed indicated that they did not have support about farming as a job. It is the message of Straw to Bread and of the Bethlehem Home School that every person should be able to grow his or her own food. Though not every child feels support for farming as a job, it was encouraging and unexpected that such a high percentage of the children indicated positivity towards farming. From anecdotal information gathered before research began, it was assumed that support for farming would be much lower.

It can be concluded that the school garden has inspired support and positivity towards farming as a career.

Knowledge from the Garden

We have observed from the data gathered from the 21 older children Grades 4-7 that their knowledge of farming technique increases as they attend more years of school. This increase in knowledge is especially notable between Grade 4 and the higher grades as seen in Figure III. This jump in knowledge scores could be due to poor teaching methods used in Grade 4. This increase could also be due to the maturation of the children that occurs between Grades 4 and 5. As they experience more years of

schooling, the children may become more interested in learning from the garden. It is also possible that the students accumulate knowledge as they are exposed to the same material about farming over the course of several years of schooling. This finding, of course, may also reflect sampling bias.

The other interesting finding was that, after controlling for grade level, Bethlehem Home status is very close to being a statistically significant contributor to knowledge. If this is true then this is an indication that these children are indeed the most needy of all. This can be explained by the fact that the Bethlehem Home children are in worse situations than any of the other children. The children that are selected to be in Bethlehem Home are those who have no other place to go. They would starve in the streets without the aid that they are receiving.

A hierarchy of needs can explain the poor results on the knowledge assessment for questions about pests and pesticides shown in Table VII. The society of the Plateau has had trouble meeting the basic needs of sustenance. Having food is of more importance to these people than the dangers of poorly handled pesticides. It does not matter if the pesticides give them cancer in twenty years if they die of starvation within a month. Due to the placement of food as a higher necessity than future illness or disability, it can be concluded that the children's education would be focused on the ability of pesticides to increase food yield instead of the dangers the chemicals may pose. These results show us that further education is needed for the proper use and the dangers of improperly used pesticides.

During the interviews, both the teachers and students indicated that the school garden makes things better. They believe that the garden has improved life on the

Plateau through the food that they have attained from the garden and through the children's hands-on experience in farming. Only the children and the teacher of the Baby Class indicated that the garden was not helpful. This could be expected for the youngest children. It would not be expected that students this young would be capable of learning to any great degree in the garden. Still, the positive attitudes of the older children and the other teachers would be expected to have an effect on the youngest children.

After the Straw to Bread team left the Nyakach Plateau, the school attained a new headmaster and reorganized their efforts in the garden. The school garden is now only visited by children in Grades 4-8. The younger children were removed from the garden so that the plants would not be harmed by the playing children. Also, the younger children did not seem to be gaining very much knowledge by going to the garden.

It can be concluded that the children have gained knowledge about farming from their work and education in the school garden.

Nutrition

It was reported by the majority of students that eating fruits and vegetables is important. Nevertheless, some students reported only the staples of the Kenyan diet (maize and beans) as important to eat. While it is critical that the students learn about and plant maize and beans as a part of their nutrition, it is also encouraging that most of the students recognized fruits and vegetables as important to plant. Beans are an excellent source of protein, but beans do not provide a complete source of all vitamins or micronutrients necessary to life. Maize is an excellent source of carbohydrates and generally forms the bulk of a typical Kenyan meal. Maize is low in essential vitamins

and micronutrients that could be provided by a varied diet of fruits and vegetables. A lack of macronutrients would obviously lead to starvation, which was a common occurrence before Straw to Bread began supplementing the diets of the orphans on the Plateau. It is hoped that one day the Nyakach Plateau will no longer require nutritional support but will be able to produce sufficient food to support the local community.

The teachers at the school reported that the children learned about different types of foods from the garden. Throughout the interviews, many of the children reported that they liked the different types of foods that they had been able to harvest from the school garden that they had not previously grown in their home plots, such as carrots and tomatoes. Even the teachers in informal comments after the interview reported that they had learned of foods they could grow in the climate of the Plateau that they had never attempted to grow before. From these interviews, it can be assumed that the school garden was effective in teaching both the students and the teachers about the importance of eating a diverse diet.

Limitations of the Study and Potential Sources of Error

Systematic Error

Translation errors of the survey questions to the students could have led to confusion in answers and resulting problems with construct validity. Often, the children were very timid in their answers. The children also often wished to answer the interview questions in English instead of their mother tongue of Luo. This made answering some questions difficult for the students as they struggled with the answers themselves, as well

as the language in which they were delivering the answers. While the translator was always available for the children's benefit, many of the children chose not to speak in their native language.

It is unclear how much response bias played a role in producing positive results. The findings might have been somewhat less favorable if it were possible to deliver the interviews in a way that made the children more comfortable. Furthermore, they were likely to give answers that they perceived were acceptable to the interviewer. However, the fact that there was variation in the answers suggests that this systematic bias was not as much of an issue as it could have been.

Random Error

With a small sample size and its potential for random error, it is appropriate to view these results as pilot data from which future research can grow. Given that interviews were done with every student and teacher present at the school, the information gained is useful for evaluating this particular project on the Nyakach Plateau. Sample size limits the generalizability of these results. However, with the goal of using community-based research to evaluate this particular project, the results are valid and encouraging.

Future Research

Future research on the school garden should repeat the same interviews with the students and teachers of the school. By completing a follow-up on the students, it could be determined if increased exposure to the garden increases the knowledge and positivity

of the students. It would also be interesting to give the knowledge assessment and positivity questions to students from the surrounding schools that do not have a school garden. A comparison could then be drawn between the knowledge and attitudes of children who are exposed to a garden during school versus the knowledge and attitudes of children that have no exposure to a garden during school.

A new headmaster was established after the departure of Straw to Bread in June 2013. It has been reported that this new headmaster is more positive about agriculture. Future efforts should consider the effect that this new headmaster has on the attitudes and knowledge of the children about agriculture.

Community Based Research: Using Data to Build on Successes

Education in the Garden

Teachers reported that the garden was almost exclusively used to teach the children about farming technique. While this is what the garden is intended for, education in the garden could be expanded. The garden could be further used to teach the children about math, colors, nutrition, and science.

Challenges in the Garden

Farming on the Plateau comes with many challenges. The school garden has not had a fully successful harvest due to drought. The children also reported that watering the garden was one of their least favorite activities. This is because water is very heavy and has to be carried long distances to the garden. With the changing climate on the

Plateau, farmers do not know when to plant their crops for fear that the rains will not come, or that the rain will stop too soon and the plants will die. In addition, when the rains do come they are very severe, causing substantial soil erosion and sometimes bringing hail that can destroy the plants. A possible solution to the lengthening dry season could include installing a large tank for rainwater collection on site that could be used to water the garden in times when rainfall is absent. Digging a well would be another solution, but both of these options are costly. There has only recently been a feasibility study for digging a well. This task would be difficult even if it were determined that water could be found due to the bad condition of the roads that lead up to the Nyakach Plateau.

Conclusion

From interview data, it is reasonable to conclude that the Bethlehem Home school garden has been effective at improving the attitudes of the children about farming, at introducing new foods to the children and surrounding community, and at teaching the children about farming techniques. Through interview questions, we can deduce that the most important thing that the students and teachers recognized as coming from the garden was food to expand the meals offered at school. This is in accordance with the objective of the garden, which is to provide quality nutrition to the children at the school. Even with a small sample size, it was significant that, as the children were exposed to more schooling, their knowledge increased. The Bethlehem Home school garden was a novel concept for this community and has been well received. The garden has improved positivity about farming and provided knowledge and food to the students at the school

and the surrounding community. The expansion of the Bethlehem Home school garden program should be encouraged in light of these positive results.

This study of children and teachers' knowledge and attitudes adds support to the literature showing that the introduction of agricultural interventions to combat hunger at schools is effective on many levels. The promotion of agriculture and a hands-on approach to agricultural training in schools would be helpful in reducing hunger in other areas of Kenya, Sub-Saharan Africa, and the world.

Perhaps, one school at a time, we can plant a seed of hope in the hearts of future farmers that will help to feed the 870 million undernourished people in world. By getting our hands a little dirty, by nurturing a harvest of plenty, by wiping the sweat from our brow and standing tall in the sunshine, we can cultivate a world free of hunger and full of beauty and promise.

APPENDICES

APPENDIX A

Interview Guide: Assessment of the Effectiveness of the Bethlehem Home School Garden

Adult Interview Questions

Ask position at the school (teacher with grade taught, administrator, community member, etc.)

1. How often were the kids in the garden?

2. When did the kids work in the garden?

3. How many minutes have your students spent in the garden each time they had the opportunity to go?

4. What did the kids do in the garden?

5. How was the garden used to teach the kids about farming?

6. How was the garden used to teach the kids about nutrition?

7. Was the garden used to teach the kids about things other than nutrition/farming such as numbers, colors, science, etc.? If so, how?

8. What was the curriculum that accompanied the garden?

9. To what degree did you see any of the kids become more interested in farming throughout the year in the garden?

10. Did you see any of the kids become more inclined to become farmers in the last year? If so, how many?

11. Did you see any of the kids that did not like the garden or working in it? If so, how many?

12. Was there an improvement in the knowledge of the children about farming technique? Explain.

13. Did the children become more interested in eating many different kinds of foods? Explain.

14. What would you say did not work well about the garden?

15. What would you say worked well about the garden?

16. What was the most important thing that you saw come from the garden?

17. What do you need to help you use the garden more effectively?

APPENDIX B

Older Child Interview Questions

18. Gender

19. Date of birth

20. Current school grade

21. Bethlehem home orphan

22. List the names of foods that:

A. I like to plant	B. I like to harvest	C. I like to eat	D. It is important to eat	E. It is not important to eat	F. If I had a garden of my own I would plant

23. How do you feel about farming as a job? Has the garden made you feel differently? Explain.

24. How much support do you receive from friends/family about farming as a job? Has the garden changed this? Explain.

25. Do you want to learn more about farming? Has the garden changed this? Explain.

26. Do you think you could learn more about farming? Has the garden had an impact on this? Explain.

27. Do you like to work in the garden?

28. Do you think friends encourage you to farm more now than they did before the Bethlehem home garden? Explain.

29. Do you think that the people you live with encourage you to farm more now than they did before the Bethlehem home garden? Explain.

30. Do you think the school garden makes life better for you? Explain.

31. Do you want to farm as a job in the future, or in addition to another job? Has the

garden changed your ideas about this? Explain.

Knowledge Assessment

32. What is soil erosion?

33. How do you prevent it?

34. Can soil get tired, and begin to make less food?

35. What do fertilizers do?

36. It is important to plant many different fruits/vegetables? Why?

37. What types of pests can hurt your garden?

38. How do you avoid/get rid of them?

39. Are there any bad things about pesticides? If yes, what?

40. It is important to plant different things in different places from season to season? Why?

41. When should you harvest your garden?

42. If storing the produce, how should it be kept?

In the last year:

43. I usually go to the garden ____ days per week

44. What do you think you have learned from the garden?

45. What do you do in the garden?

APPENDIX C

Youngest Children Interview

46. Gender

47. Date of birth

48. Current school grade

49. Bethlehem home orphan

50. What do you like about going to the garden?

51. What do you do in the garden?

52. Is there anything you don't like about going to the garden?

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