

Modeling of the Homeless Population in Louisiana and Introduction of Food Forests in Baton Rouge as a Means of Mitigating Homelessness

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Abstract

The homeless experience food insecurity since most of them cannot be employed. Lack of employment makes it difficult for most homeless people to get proper clothing and a place to call home. Some homeless people are not even admissible in some shelters because of their histories. Food costs money and the lack of it has led to large numbers of homeless people eating irregularly whenever they come across it. Lack of food has led some of them to commit a petit crime to get food and something to eat. Baton Rouge has a good number of homeless people. It is unfortunate that most people do not respect homeless people and view them as being useless and not worthy of being in society. Anybody can become homeless depending on circumstances. The objectives of the study were to model the homeless population in Louisiana versus and years, and to assess the potential impacts of urban forest food gardens on the health of the homeless people in Baton Rouge, Louisiana. The benefits of food forests were categorized based on health, financial earnings, and mental health, among others. Google scholar search engine was used to access Louisiana's historical homeless population data. The data was modeled with respect to years using Microsoft Excel statistical tool kit. Future homeless populations with respect to the time this work was completed were predicted using extrapolation. There was a sharp increase in Louisiana's homeless population in the years 2004 to 2006, and 2008 to 2009, respectively. A model developed in this study predicts the homeless population in Louisiana to rise to approximately 11 thousand by 2030. This study proposed the introduction of food forest projects to rehabilitate the homeless population of Ba-

ton Rouge through learning agricultural and forestry skills, entrepreneurial skills, and employment. The framework of improving the lives of the homeless Baton Rouge community can be applied to other cities with residents experiencing homelessness.

Keywords

Homelessness, Urban Forestry, Food Forest, Fruit, Vegetable

1. Introduction

An unsheltered homeless person is defined as an individual who lives in a place that is not meant for habitation by humans. Such places include vehicles, parks, sidewalks, abandoned buildings (on the street), etc. A sheltered is defined as a homeless person that resides in an emergency shelter. The Department of Housing and Urban Development (United States) defines sheltered homeless persons as all people, regardless of whether they are adults or children, who, on the night counting are carried out, are living in shelters for the homeless.

The state of homelessness is a serious issue in the United States of America because of misguided and faulty policies that have been in effect in the country for decades (Craven et al., 2022). According to the United States Council of Economic Advisers (United States Council of Economic Advisers, 2019), at least 500,000 Americans become homeless every night in the United States. Approximately 35% (about 200,000 people) sleep on streets or places which are not conducive for human habitation, such as parks, sidewalks, parks, vehicles, and derelict buildings. Currently, emergency shelters and temporary housing have been housing more than 350,000 protected homeless people.

Homeless people must choose from very limited options, often associated with extreme coercion, substance use disorders, untreated mental illness, or unintended consequences of well-meaning policies. Improved strategies are needed to address the root cause of the problem and serve more effectively to some of the most vulnerable members of society (United States Council of Economic Advisers, 2019).

According to (U.S. Department of Housing and Urban Development Office of Policy Development & Research, Housing for Youth Aging out of Foster Care, 2012) 25% - 50% of the youth in USA are aging out of foster have no stable housing. Ex-offenders in the United States have been found to face significant housing challenges on completion of their prison terms. This contributes to statewide recidivism rates that approximate to 50% (Louisiana Department of Public Safety and Corrections, Recidivism in Adult Corrections, 2014).

Many groups face further obstacles in finding quality homes. Elderly people in Louisiana often face the burden of housing costs, and even if affordable housing is available, they may not meet their specific needs for comfort and mobility.

The state has reduced chronic homelessness, but not officially homeless, but tens of thousands of inhabitants do not have permanent homes. Young people who are no longer in foster homes are particularly vulnerable to precarious housing conditions since they generally do not have formal or informal support. A national alliance to end the homeless estimates that 38,000 children in Louisiana are homeless or in precarious homes (*The State of Homelessness in America, 2014*).

In low-income communities, tighter lending requirements and fewer manufactured homes reduced home ownership opportunities. Although house prices have recovered since the recession, wages have not. Large numbers of households have experienced a loss of wealth in recent years, through either foreclosure, unemployment, or a decrease in fixed wealth. Since 2005, average home prices in Louisiana have grown almost twice as fast as the average household income (*The State of Housing in Louisiana, 2015*).

Studies have found that many households in Louisiana that can afford monthly mortgages may not be able to afford to pay the initial costs. Potential homebuyers cite the difficulty of paying a down payment as being among the paramount barriers to securing a mortgage (*State of Louisiana, 2022*). Younger households and minorities are experiencing significant net worth and income declines compared to the public and therefore, find it very hard to save in the current economy (*The State of the Nation's Housing, 2014*).

As lending has become tighter since the beginning of the housing crisis, borrowers also face additional challenges in obtaining loan approvals. A report from Harvard University's Joint Center for Housing cites tight credit markets as one of the biggest barriers to affordable home ownership. As lenders focus on safe loans for borrowers with a credit score of 740 or higher, the percentage of mortgages to people with a credit score of less than 700 (national median) is only 15% of all loans dropped (*The State of the Nation's Housing, 2014*).

Millions of people are losing their livelihoods across the country. The pandemic's impact on the economic benefits of New Orleans, whose reliance on tourism is heavy, was devastating. People who had never experienced homelessness before lost jobs in the hospitality and retail sectors. Hence, due to loss of livelihood, the only option was to go to streets (*Dreilinger, 2021*).

A major spring 2020 effort to move 616 homeless people to hotel rooms to protect them from COVID-19 has reduced the number of street homeless people in New Orleans and the Parish of Jefferson to just a few dozen. This is the lowest level in decades (*Dreilinger, 2021*). However, the dramatic gains in reduction of homelessness from these efforts are waning. Although government and non-profit partners are working hard to move homeless people from hotels to permanent housing, the number on the streets rising rise once more, mainly because a significant number of people have lost their jobs or homes due to the pandemic (*Dreilinger, 2021*).

The homeless go through difficult experiences such as food insecurity since

most of them cannot be employed. Hence, they are unable to get proper clothing and a home. Some of them are not even admissible in some shelters based on their histories. Since food costs money, many homeless people end up eating irregularly whenever it is available. Hunger has led some members of the homeless communities to commit petty crimes to get something to eat. This agrees with a study that found that a rise of 1% in food insecurity led to an increase of 12% in violent crime rates when other predictors of violent crime were held constant (Homeless Health Concerns, 2022).

Statement of the Problem

Baton Rouge has a significant homeless population. Models to address homelessness have been in use for decades. Among them are shelters for homeless communities. While these establishments have benefited many homeless people through the objective provision of food security at night, significant others have missed these benefits.

It should be noted that many people do not respect homeless people and view them as being useless and not worthy of being in society. Anybody can become homeless depending on circumstances. The food and security offered by the homeless shelters do not address the pride, self-confidence, self-esteem, and self-reliance that homeless people lack. Homeless people experience states of poor health, emotional suffering, and low esteem.

This study models the homeless population versus years in Louisiana and proposes the introduction of food forest projects as a means of addressing health, economic and emotional needs, and possible rehabilitation of the homeless population in Baton Rouge through learning agricultural and forestry skills, entrepreneurial skills, and employment. The food forests would supplement their food.

The homeless population has experienced harassment and despise by members of the communities who are not homeless and law enforcement agents. The government and non-governmental groups have provided some homeless people shelter and food, which is good. However, this cannot give the homeless people pride and confidence as people when they walk among the rest of the communities that are not homeless. Presently there is no study that suggests ways of restoring self-confidence, and pride for homeless people and equipping them with skills to be able to contribute to the communities they exist in. This is addressed by this study.

2. Causes of Homelessness

Hundreds of thousands of people in the United States are homeless every night. Some of these folks have been homeless for a long time, while others have only been homeless for a short time. The factors that drive people to homelessness are complex in nature. Homelessness has been attributed to factors such as poverty, unemployment, lack of affordable housing, sudden serious illness, domestic vi-

olence, mental and substance use disorders, divorce, trauma and violence, death of a partner or guardian, and divorce, among others.

Poor health can contribute to homelessness. And being homeless can contribute to poor health. Many of the problems that people experiencing homelessness face can make their health worse, including. Some of the factors that contribute to health issues among the homeless population include limited access to health care, security, unsanitary living conditions, exposure to severe weather, exposure to violence, stress, and difficulties in acquiring enough food (*Homeless Health Concerns, 2022*).

According to USDA, food insecurity may be broadly defined as limited or uncertain availability of nutritionally adequate and safe foods. It is also defined as the limitation or uncertainty in the ability to acquire acceptable foods in acceptable social ways implies food insecurity (*Caughron, 2016*).

2.1. Housing Affordability

Following the Great Recession, neither salaries nor new homes house buildings have kept up with Louisiana people's housing demands. As homeownership rates have fallen, the surge in the rental population has resulted in large reductions in vacancies and increased monthly payments. Even middle-class employees in expanding industries like medicine and education are finding it difficult to keep up with rising housing expenses. Without financial support, getting adequate affordable housing for low-income and especially minimum-wage workers has become practically impossible.

To afford a 2-bedroom apartment in Louisiana, a full-time employee must earn \$15.45 per hour, which is much higher than the average hourly earnings of Louisiana renters (\$12.71) (*Arnold et al., 2014*). A minimum-wage worker would have to work 85 hours per week to rent a two-bedroom apartment. For both very low-income (less than 50% of median income) and extremely low-income (less than 30% of median income) people looking for housing, there is now a shortage of over 105,000 affordable and available housing units. The number of moderately priced units has declined in recent years, and much new construction has focused on luxury flats and high-income people (*The State of the Nation's Housing, 2022*). At the national, state, and local levels, funding for affordable housing construction and repair has declined dramatically.

2.2. Rural Housing

Many areas of poverty persist in rural Louisiana, particularly in the Lower Mississippi Delta. Even though rural communities have a lower total housing cost burden than metropolitan places due to the high proportion of "free and clear" owners, new hurdles to homeownership have emerged in recent years. Because of financial constraints, low earnings, and rising land prices, housing affordability has declined. There are severe disparities between renters and owners, and minorities pay disproportionately heavy burdens (*The State of the Nation's*

Housing, 2022).

Compared to nearly half of renters, less than 20% of rural homeowners spend more than 30% of their income on housing (*The State of the Nation's Housing, 2022*). Between 2000 and 2010, rural homeownership rates dropped in Louisiana. Housing and transportation expenses in rural areas are higher than in cities, resulting in cost burdens not often addressed in housing studies. Since the recession, mobile home shipments have decreased. For low-income rural dwellers, manufactured housing has always been the most economical option.

2.3. Populations

Many people face additional challenges in their hunt for decent accommodation. Seniors in Louisiana frequently suffer housing costs, and even when inexpensive housing is available, it may not meet their specific needs for comfort and mobility. Even though the state has reduced chronic homelessness, tens of thousands of citizens are without a permanent home. Youth who have aged out of foster care are especially vulnerable to insecure housing because they typically lack any kind of institutional or informal support network. The percentage of Louisiana residents with disabilities is significantly higher than the national average (U.S. Census Bureau).

According to projections, by 2030, Louisiana will have approximately 300,000 more residents aged 65 and up. These seniors will require housing that meets their specific requirements. According to the National Alliance to End Homelessness, about 38,000 children in Louisiana are either homeless or living in unsafe housing. According to studies, 25 - 50 percent of kids aging out of foster care lack secure housing¹⁶. Ex-offenders have considerable housing issues after being released from prison, contributing to roughly 50% recidivism rates across the state (*Louisiana Department of Public Safety and Corrections, 2022*).

The shortage of adequate, affordable housing continues to be the most pressing issue in Baton Rouge. The deterioration of the old housing stock continues, resulting in terrible housing conditions for low-income families. High housing costs and overpopulation are the most typical housing issues. Most housing troubles are experienced by families and households with a significant housing cost burden, as well as small associated low and extremely low-income households. Across all income level brackets, the cost burden and overcrowding among renter households exceed that of owner households. Single-family households with incomes ranging from 0 to 30% of the region's median income are more affected than others. Renter households are four times as likely than owner households to encounter extreme overcrowding (*The State of the Nation's Housing, 2022*).

2.4. Homelessness and Health

According to a study by (*Wiecha et al., 1991*), a significant number of homeless people eat fewer meals daily, go without food more frequently, and are more

likely to have inadequate diets and poor nutritional status than housed Americans. Despite many homeless people being eligible for food stamps, they do not receive them. Although public and private organizations supply nutritious food to the homeless, the availability of the services is not guaranteed. Many members of the homeless population do not have access to adequate health care. Hence, nutrition-related health issues are common among them. Growth problems, anemia, and alcoholism are more common among homeless people than among housed people. Pregnancy rates among homeless communities have been found to be higher than in-house communities.

The risk of malnutrition, diet-related health problems, substance and alcohol abuse, and mental illness varies among homeless people. For example, fewer homeless householders are drug addicts in comparison to single adults, and the prevalence of mental illness varies among single men and women, and parents among homeless families (Wiecha et al., 1991). Homeless people need easier access to food, nutrition, and medical services.

To lower food insecurity a combination of food forests and food gardens can be introduced to communities. Such garden models could serve as the best sources of fresh healthy food for residents, while also offering wider benefits such as social connections, reduction of food costs, and enhancement of physical activity (Bukowski & Munsell, 2018). Children could also benefit from such forests through hands-on outdoor learning experiences while having fun. Studies in Baton Rouge have also shown that trees lower local ambient temperatures significantly (Namwamba, 2021) and forests lower ambient temperatures over wider areas. Food forests could impact crime reduction positively by boosting food security and lowering the ambient temperature.

Food forests can address the accumulation of health challenges in diverse ways while providing curative building blocks for dealing with poor nutrition, obesity, diabetes, psychological disorders, deficient growth of infants, substance abuse, civic detachment, and suicide rate. Urban agriculture is also a cost-efficient, trans-generational cross-cultural, multi-disciplinary tool that can be used to address the issues just stated.

Three events in the last decade have had a significant impact on Louisiana's affordable housing market. Hurricanes Katrina and Rita destroyed a large portion of the housing stock in various counties across the state in 2005. Three years later, the Great Recession's economic effects resulted in a decrease in new development, as well as lower earnings and fewer financing alternatives for poor and middle-income families. More recently, federal and state budget cuts have impacted local governments' already stretched ability to respond to residents' housing needs. As a result, the demand for affordable housing vastly outnumbers the resources available in Louisiana.

2.5. The Importance of Food for Health

Food is important for human life. It not only provides the body with the essential

nutrients it needs but also plays an important role in our overall health and well-being. Food also plays an important role in social inclusion since it is an important component of cultures and traditions. Eating and sharing food with others promotes happiness and social connection among people (Coufopoulos & Mooney, 2012).

Nutrition and food are among the essential aspects of effective growth and development, as well as health and well-being. Food provides individuals with the energy they need. The energy used by humans to perform jobs and activities is provided by the food they consume. In addition, individuals can treat a variety of health problems and illnesses. Food also keeps humans healthy (Kapur, 2020). As a result, people of all ages, regardless of their communities, categories, and backgrounds must pay close attention to their diet and nutrition regularly. Kapur mainly considered the meaning and significance of food and nutrition, the functions of food, the functions of nutrients, and factors that influence food and nutrition (Kapur, 2020).

2.6. The Concept of Food Forests

Unsustainable practices in industrialized food systems contribute to climate change, natural resource depletion, economic disparities across the value chain, and negative effects on public health. Food forests, on the other hand, have the potential to provide healthy food, adequate livelihoods, environmental services, and spaces for recreation, education, and community building (Albrecht & Wiek 2021). According to the findings of Albrecht & Wiek (2021) most food forests perform well on social-cultural and environmental criteria such as capacity building, food provision, biodiversity enhancement, soil regeneration, etcetera. However, to have a broader impact, food forests must go beyond providing social-cultural and environmental services and improve their economic viability.

Among unsustainable developments associated with industrialized large-scale industrial food systems are degradation of land, water pollution, change of climate, adverse health effects, and unequal distribution of economic benefits (Garnett, 2011; Swinburn et al., 2011; Tilman & Clark, 2014).

These challenges can be addressed by alternative nutrition solutions, like food forests. Food forests are multifunctional biodiversity agroforestry systems that are composed of multiple layers of plants of various heights (layers), including trees, shrubs, and ground cover plants. The number of layers ranges from 3 to 7. They have the potential to provide space for food, livelihoods, environmental services (habitat, heat mitigation, carbon storage), recreation, education, and community building. Many edible forests exist for self-sufficiency and have little formal organization and approval. However, this study focuses on edible forests that affect the broader food economy.

Imitation of nature in the food production chain is frequent in agricultural production systems based on the indigenous and traditional modes of operation.

Such are frequent in the 4000-year-old tropics (Belcher et al., 2005; Kumar & Nair, 2004). In Europe, the concept of woodland gardens originated in Britain in the 1980s (Hart & Ahuja, 1996; Sholto Douglas & Hart, 1984). Around the same time, the permaculture movement began in Australia, with “food forests” as the main result (Mollison, 1979, 1981) and larger-scale professionalization efforts (Shepard, 2013).

2.7. Physical and Mental Health Benefits of Food Forests

Apart from contributing to the moderation of temperature and mitigation of climate change, food forests also serve as a source of food for people and fauna in ecosystems. They can also play in the improvement of human mental and physical health.

Research by (Maas et al., 2006; Maas et al., 2009) supports the existence of a correlation between amelioration in health and the quantity of surrounding green space. Pretty et al. (2003) showed that exercising in green environments (trees, shrubs, and understory) can improve markers of mental and physiological health. Subsequent preliminary evidence at the physiological (Park et al., 2010; Ward Thompson et al., 2012), psychological (Thompson Coon et al., 2011; Barton & Pretty, 2010; Barton et al., 2012), biochemical (Ward Thompson et al., 2012, and social levels; Barton et al., 2012), green exercise for primary and secondary prevention of illness. It suggests that it plays a useful role. In addition, there is evidence that green exercise plays a role in rehabilitation programs (Barton et al., 2012).

Also, occupying sedentary people with green exercises can be a powerful way to drive behavioral change by improving compliance with exercise programs (Ward Thompson et al., 2012). More studies on mechanisms leading to health benefits associated with natural environments should be carried out (Thompson Coon et al., 2011; Bowler et al., 2010). Knowledge of nature’s positive interaction with human sociobiology could benefit health and the environment, respectively (Kaplan & Kaplan, 1989).

Green space is important for mental health and has been linked to longer life and a lower risk of mental illness in Japan (Takano et al., 2002), Scandinavia (Grahm & Stigsdotter, 2003), and the Netherlands (De Vries et al., 2003). Green exercise activities of all kinds improve self-esteem and negative mood subscales like tension, anger, and depression (Barton & Pretty, 2010; Li et al., 2011). When compared to the same activity in an urban environment devoid of any vegetation or plantation, both viewing alone and walking in the forest environment resulted in significantly lower systolic and diastolic blood pressure (Park et al., 2010; Li et al., 2011; Park et al., 2007).

Participation in maintenance and other activities associated with food gardens has been shown to give homeless people hope and a sense of belonging (Growing Hope Gardens, 2022). Growing Hope Gardens, based in Los Angeles, California, is a nonprofit social and environmental organization dedicated to

empowering homeless people and those who experience low-income challenges through the creation of, organic urban regenerative gardens in shelters, service centers, bridge housing, affordable housing, and on vacant land. The gardens promote plant and human growth by connecting people to healthy food g (Growing Hope Gardens, 2022).

2.8. Health Benefits of Forest

When compared to walking through city regions, Song et al. (2018) found that walking through forest areas decreased the bad emotions of “depression-dejection,” “tension-anxiety,” “anger-hostility,” “fatigue,” and “confusion,” and boosted the participants’ good mood of “vigor.” Additionally, studies on people who had walked through forest areas, found that a strong association existed between individuals’ trait anxiety levels and changes in the POMS subscale “depression-dejection.” Participants with high trait anxiety levels had a more effective reduction in the sense of “depression-dejection” after walking through forest regions than those with average and low trait anxiety levels Song et al. (2018). The psychological benefits of walking through woods were demonstrated in this study. The study also found that there was a substantial link between psychological responses to walking through forests and trait anxiety levels.

Spending time in the woods boosts immunological processes of the body (Li et al 2007; Li et al., 2008), with the effects persisting for about a month (Li et al., 2008). Furthermore, studies with elderly people and adults at risk for stress- and lifestyle-related disorders such as hypertension, diabetes, and depression indicated that participating in diverse forest activities had favorable effects (Ohtsuka et al., 1998; Song et al., 2017). It found that walking around and viewing trees improved emotional states such as tension and anxiety, despair and dejection, anger and hostility, vigor, perplexity, and weariness, leading to psychological calm. Walking and staying in forests, according to Morita et al. (2007) reduces feelings of aggression and despair and increases liveliness.

3. Methodology

Baton Rouge, the capital of the state of Louisiana, is the parish seat of East Baton Rouge parish on the eastern bank of the Mississippi River. According to the United States Census Bureau, the city has a total area of 79.1 square miles (204.9 km²), of which 76.8 square miles (198.9 km²) are land and 2.2 square miles (5.7 km²) (2.81%) are covered by water. It is a low elevation area which lies on an altitude of 56 to slightly over 62 feet above sea level. This city has a longitude and latitude of -91.14 decimal degrees and 30.46 decimal degrees respectively (Twumasi et al., 2022).

According to (Macrotrends, 2023) the population has been rising steadily since 1950 and is expected to reach 825,000 by 2030. The United States Census Bureau, Baton Rouge’s population census in 2010 recorded a total population of 229,493 but witnessed a decrease by 2020 with a projected total of 227,470. In

view of this, the World Population Review reported that the city is currently declining at a rate of -0.90% annually (Figure 1).

3.1. Data Acquisition

In this study, the population of homeless people in Louisiana and corresponding homeless rate data were acquired by using search engines and downloading from authentic sources on the internet. One of the websites used is 2020 AHAR: Part 1—PIT Estimates of Homelessness in the U. S (2023). On this website are listed links to various data sets pertaining to the homeless communities in the United States of America. Clicking on the link for homeless statistics at state levels opens a page from which the Louisiana data was downloaded. The area for establishing food forests will be determined by using ArcGIS software to locate a space that is public and undeveloped or undeveloped private land for purchase.

The Data displaying the number of unsheltered, sheltered homeless, total homeless, and Louisiana’s homeless rates is presented in Table 1, Courtesy of SOH State and CoC Dashboard.

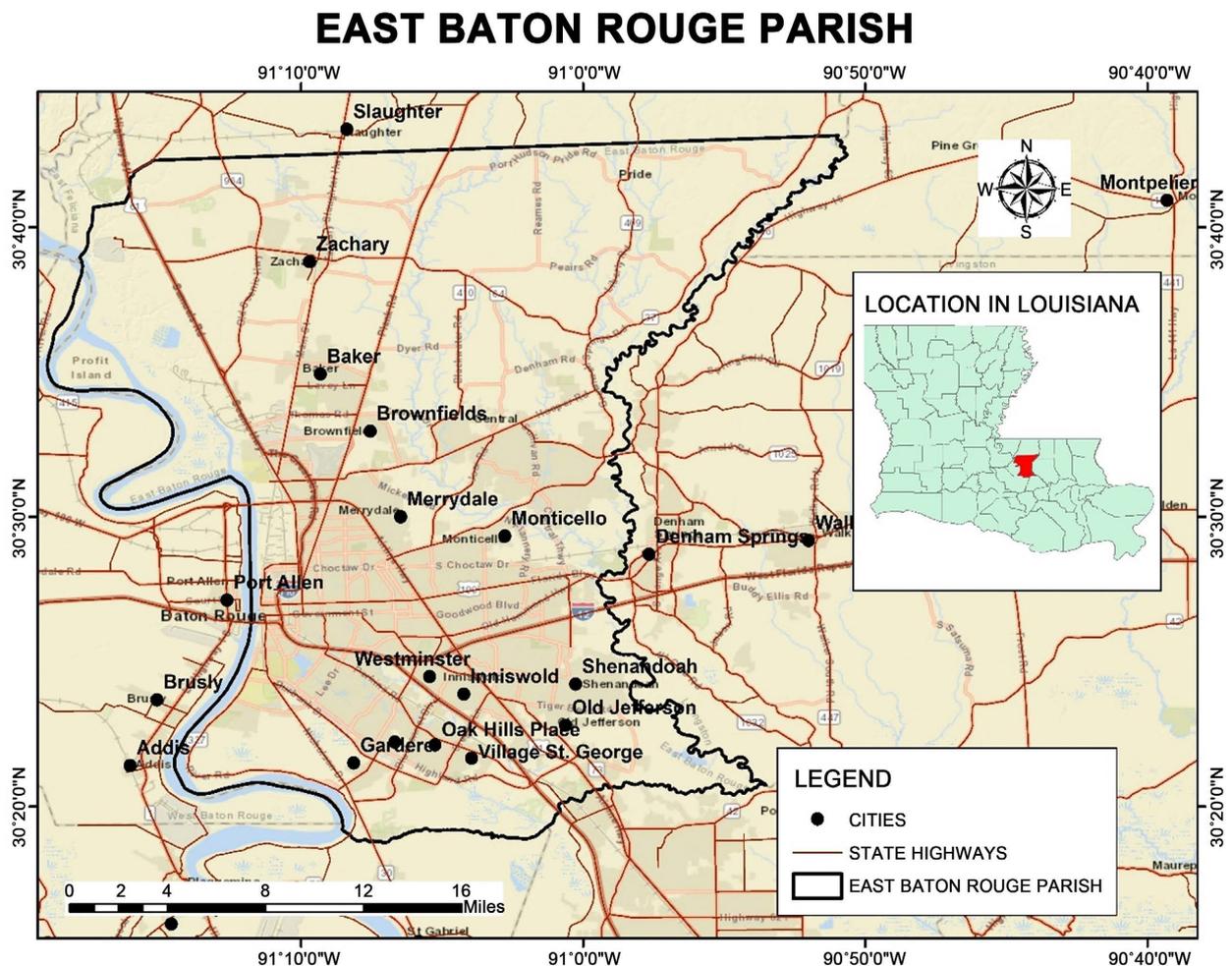


Figure 1. Study area map—East Baton Rouge Parish.

Table 1. Unsheltered, sheltered homeless, total homeless and LA homeless rate. Courtesy of SOH. State and CoC Dashboard.

Year	Sheltered No.	Unsheltered No.	Total homeless	Rate No.
2005	4037	1267	5304	
2006	5529	1408	6937	
2007	3917	1577	5494	12.8
2008	3700	1781	5481	12.5
2009	4118	8386	12,504	28.2
2010	4096	8386	12,482	27.8
2011	3405	5886	9291	20.4
2012	3807	3965	7772	17
2013	3651	1575	5226	11.4
2014	3503	1103	4606	10
2015	2890	1191	4081	8.8
2016	2853	1141	3994	8.6
2017	2330	975	2941	7.1
2018	1994	1065	3059	6.5
2019	1967	974	2941	6.3
2020	2020	1153	3173	6.8

3.2. Analysis

Statistical software was used to analyze the data used to develop prediction models. Data for the benefits of forests to humans were obtained from studies related to health and forests. Statistical analysis of the data was carried out for developing models and correlations. The models were predicted by curve fitting using Microsoft Excel statistical tool. A model was accepted if its R square was about 70%. It should be noted, however, that apart from the magnitude of R square the practicability of the model is also important. Models were examined to assess their practicability.

4. Results and Discussion

Results From the scatter plot (**Figure 2**), the registered homeless population generally rose sharply from 5300 to about 12500.

A model for the total homeless population versus years for 2010-2020 was built with the help of a Microsoft Excel statistical tool kit (**Figure 3**). Several portions of the scatter plot show sharp increase in homeless population. These are 2004 to 2006, and 2008 to 2009, respectively.

According to the model represented by **Figure 3**, the number of registered homeless people started to decrease from 12,500 in 2010 to about 3000 in 2018. Just after 2018, the homeless population in shelters started to increase, and by 2020 it was about 3000. Microsoft excel statistical tool kit was used to determine

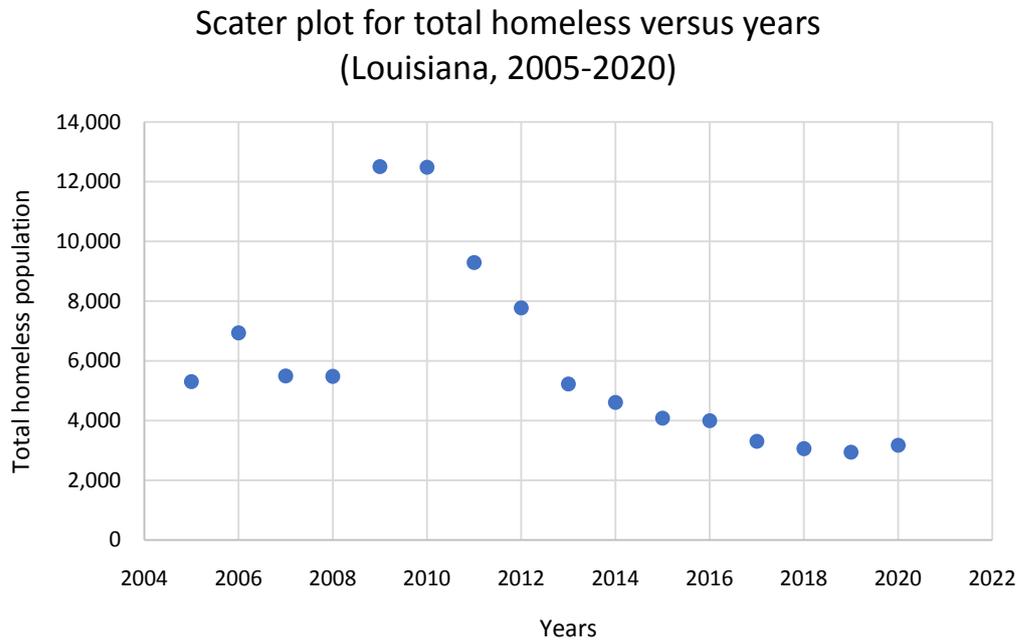


Figure 2. Scatter plot for homeless population versus years for Louisiana for 2004 to 2020.

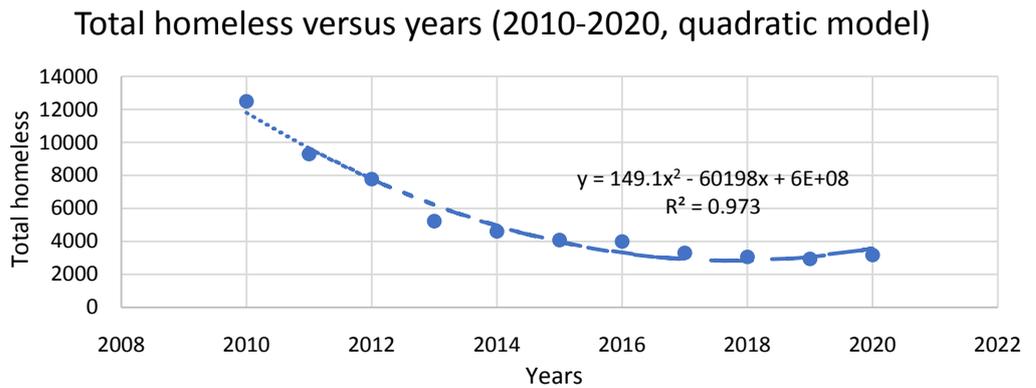


Figure 3. Model for homeless population versus years for Louisiana for 2010 to 2020.

whether the variation of the total homeless population in Louisiana versus years for 2009 to 2020 was statistically significant. The results are presented in **Table 2**. The variation was found to be statistically significant ($P < 0.05$). Hence, the change with respect to years from 2009 to 2020 was statistically significant (**Table 2**).

To model the future total homeless population in Baton Rouge area, data for 2015, 2018, 2019 and 2020 was used. This data was selected because it suggests a rising trend for the homeless population. A polynomial model to predict the total homeless population for Louisiana in 2030 was developed using this data (2015-2020) using Microsoft Excel statistical tool. The model is presented in **Figure 4**. The R square for the model is 90%. According to this model, Louisiana’s homeless population is expected to be approximately 11 thousand by 2030. The models and regression summary are presented in **Figure 4** and **Table 2**.

Table 2. Regression summary for homeless population versus years 2010-2022.

SUMMARY OUTPUT 2010-2022								
<i>Regression Statistics</i>								
Multiple R	0.880367							
R Square	0.775046							
Adjusted R Square	0.750051							
Standard Error	1.658142							
Observations	11							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	85.25508	85.25508	31.00822	0.000348			
Residual	9	24.74492	2.749435					
Total	10	110						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	2020.13	1.048212	1927.216	1.39E-26	2017.759	2022.501	2017.759	2022.501
Total homeless	-0.00094	0.000169	-5.5685	0.000348	-0.00132	-0.00056	-0.00132	-0.00056

Modeled total Louisiana Homeless population versus years based on 2015-2020 data.,

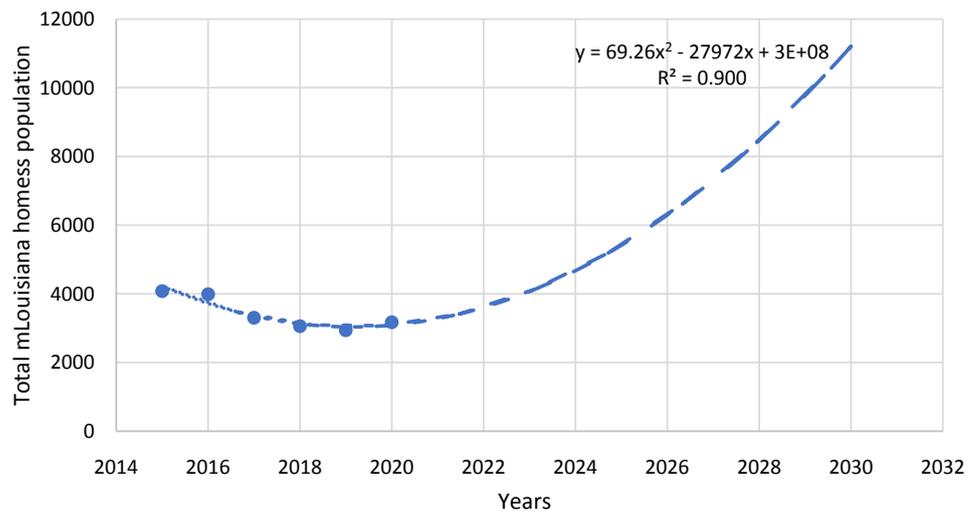


Figure 4. Model for homeless population versus years for Louisiana for 2015 to 2030.

Discussion

Modeling of the homeless population and population rates in Louisiana indicates that this community will increase on the streets and leave in poor health conditions. While efforts have been made by the government and nonprofit organizations to cloth and feed this community, these actions that deserve recognition have not impacted much on the sense of belonging and pride of the homeless community at large. The possibility of people being to cross from

homelessness to owning homes has also not been addressed by the source of free food and shelter (the government and benevolent nongovernmental nonprofit organization).

In determining the data to use to model the homeless population for the year 2030 two requirements had to be fulfilled by the models. The models had to have a large magnitude of R square. R square greater than 70% was good enough. The models also had to be examined to see whether their predictions were realistic or practical. Modeling the total homeless population of Louisiana with the data of 2010-2020 would yield two strong models, a linear and a second order polynomial. However, the linear model suggests that the homeless population in Baton Rouge would be 0 (zero) before 2025. This cannot be true unless the local government arrests all the homeless people. The second order polynomial model suggests that the homeless population in Louisiana would be expected to be 25 million in just 8 years from 2022. This is not realistic. However, the 2015-2020 data yields a realistic figure of 11 thousand. The polynomial models suggest that the population of the homeless community will keep on increasing unless steps are taken to address the increase. While homeless shelters are good in providing the homeless community with shelter and food, they do not address rehabilitation of the homeless people. Many homeless people suffer emotionally to the extent that some lose self-confidence and the meaning of life. This study has proposed to have the designed food forest projects used to give the homeless a chance to learn agricultural, forestry, accounting, and financial management skills. It also proposes to have the homeless run most of the food garden operations to cultivate self-confidence and sense of ownership; this would help reintegrate the homeless back to the communities where they can stand and support themselves independently.

5. Food Forest Design, Conclusion, Recommendation, Proposed Polices and Limitations of Study

Planting fruit trees may bring many benefits to communities. Once the fruit trees start producing fruit, one no longer needs to go to grocery stores to purchase the fruit. Also, extra fruits from the trees can be canned or kept in the freezer, for later use. That way, one can enjoy homemade fruits even when the trees are in bloom during the season. Many species of fruit trees are also capable of providing food for a long period of time. The species that grow well in Louisiana include, Blackberries, Fig trees, Citrus (Orange, Lime, Lemon), Blueberry, Pomegranate, Persimmon, Pecan, Plum (Methley, Santa Rosa, Morris), Mayhew, Satsuma, and Kumquat, among others (Puls Jr., 1988).

Each food forest proposed should be large enough for the establishment of a food garden that caters to food production and adequate space for recreational walks. The trees and other plants to be planted in the food forests are presented in the literature review.

Before presenting the proposed food forest design for Baton Rouge's homeless

population. Several species of plants were proposed. They are presented and discussed in this paper briefly.

Fig trees do not require much maintenance to be in a healthy state and do best in well-drained soils. This species can easily survive in a wide variety of soil conditions. The fig tree is among the best fruit trees that can be planted in Louisiana's climate.

Another low-maintenance category of fruit trees for Louisiana, which requires minimal pruning is the citrus (Orange, Lime, Lemon). These types of fruit trees require minimal pruning. They are, however, usually vulnerable to low temperatures, if possible, they should be protected from freezing temperatures. This category of fruit trees can be planted in any rows.

Blueberries grow on bush-like trees and require low-maintenance. These plants thrive in acidic soil and mulch for naturing their shallow, fibrous roots. They start producing a full crop of fruit just about three years after planting (Puls Jr., 1988). Blueberries do best when planted in areas that are full of sun. Multiple varieties should be planted to guarantee cross pollination and healthy fruit production. Some varieties of blueberries include Tif blue, Brightwell, Climax, and Premier (Hence, plant in rows 1 and 9).

Pomegranates are delicious fruits that grow well in Louisiana. This species of plant grows in the form of a large, 15-foot shrub, and does very well in sandy soil with even moisture. They do well even in cooler winters and hot, dry summers.

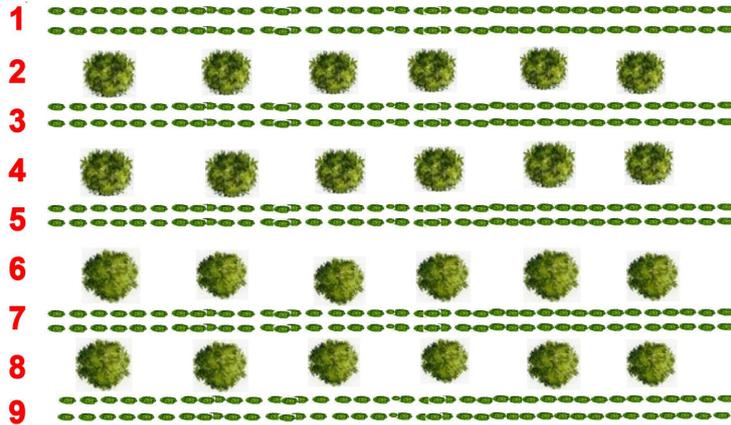
Both native and oriental varieties of persimmons are grown in Louisiana. The oriental ones are the best since they do well in Louisiana's climate and are frequently 7 - 10 times larger than the native ones. Also, the oriental variety has significantly fewer seeds and hence, more pleasurable to eat. To thrive best, they require locations that allow for partial sun or partial shade, respectively. Loquats need enough sunlight and hence, should be planted in rows 2, 3, 6 and 8. They require minimal maintenance. Once they attain a height of 5 feet, they may never need any maintenance. They can even do well in the wild unmaintained. Designs A and B are not presented to scale. They present the planting arrangement, which takes into consideration sunlight. Hence the food forest is designed to operate as an agroforest. Rows 1 and 9 will have vegetables planted on them since they cannot compete with trees and shrubs for sunlight. Each of the designs A and B represent designs for half acer plots. The project will initially be carried out on 30 acres composed of two 15-acre blocks. Each block will be made up of 30 one half acre plots, namely Design A and Design B, respectively. Each plot is provided with walking paths for the homeless to walk and relax. The details of the vegetable species will be provided (Figure 5, Figure 6).

A budget for initiating and operating the project for the initial 3 years is presented in Table 3.

11 acres are shown in Figure 7, in the area proposed for acquisition of land for the establishment of food forests. The area has 128 acres available for sale at a price of less than 2 million dollars.

Table 3. Food forest design budget for Baton Rouge.

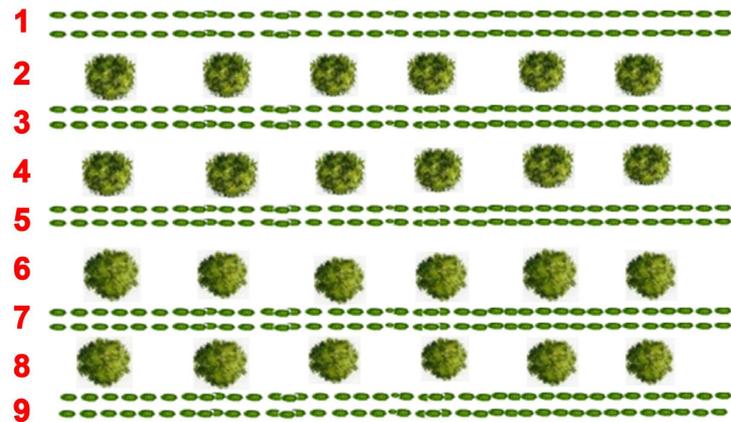
Purchase of land @10,000 per acre.	\$1,000,000.00
Purchase of fruit tree seedlings.	\$50,000.00
Stipends for 3 years	\$100,000.00
Skills training for the homeless	\$200,000.00
Overheads	\$60,000.00



Key for **Figure 5.**

Number	Plant species
1	Vegetables
2	Blueberries and pomegranates
3	Orange
4	Plum
5	Persimmons
6	Plum
7	Vegetables and blue berries
8	Blueberries and pomegranates
9	Vegetables

Figure 5. Graphic representation of food forest A.



Key for **Figure 6**.

Number	Plant species
1	Loquat
2	Blueberries and pomegranates
3	Orange
4	Plum
5	Persimmons
6	Orange
7	Orange
8	Blueberries and pomegranates
9	Loquat

Figure 6. Graphic representation of food forest B.

STUDY AREA MAP-EAST BATON ROUGE PARISH

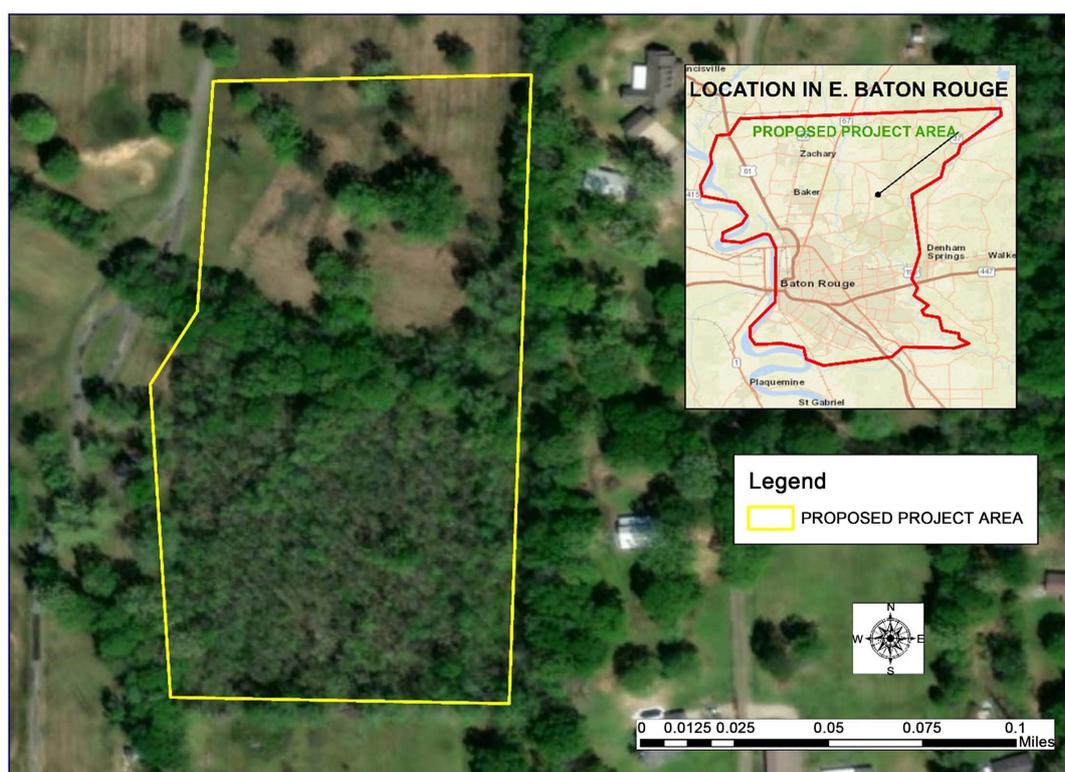


Figure 7. Illustrating 11 acres in area of purchase for land to establish food forests.

5.1. Conclusion

This study has shed light on hardships the home population experiences, especially being linked to crimes they may have not committed. The study also shows that some crimes committed by homeless people may be driven by a lack of necessities. The study proposes activities that can keep the homeless busy and make them productive. At the end of this study, the benefits of this study will be

assessed and evaluated. It will hopefully benefit the homeless population of Baton Rouge and Louisiana as a whole.

Planting fruit trees may bring many benefits to communities. Once the fruit trees start producing fruit, one no longer needs to go to grocery stores to purchase the fruit. Also, extra fruits from the trees can be canned or kept in the freezer, for later use. That way, one can enjoy homemade fruits even when the trees are in bloom during the season. Many species of fruit trees are also capable of providing food for a long period of time. The species that grow well in Louisiana include Blackberries, Fig trees, Citrus (Orange, Lime, Lemon), Blueberry, Pomegranate, Persimmon, Pecan, Plum (Methley, Santa Rosa, Morris), Mayhew, Satsuma, and Kumquat, among others (Puls Jr., 1988).

5.2. Recommendations

The literature review has shown that the homes suffer from uncertainty of getting the next meal. At the same time, many might suffer from malnutrition. Since most cannot be employed, they lack money to meet their basic needs. While those at shelters might be sure of their meals and accommodation, this still does not make them take pride in whatever they have. Food forests would take care of the problems just listed here. They would provide them with fruits and vegetables to supplement their nutrition. Since they will be working in the food gardens, they will develop a sense of ownership, pride, and confidence. The food gardens can be well organized, and they could sell some of the products. Hence this project recommends that food gardens be established in Baton Rouge to give the homeless community a chance to demonstrate their skills in contributing to the Baton Rouge community at large and eventually break off from homelessness. The food forests would also provide places where they could relax in the greenery environment and exercise, which is good for their health.

5.3. Proposed Policies

- The city government should introduce food forests to improve the lives of the homeless citizens.
- The government needs to provide security for the homeless in the environs of their food forests.

5.4. The Limitations of the Study

The data used for modeling in this study was based on data for registered homeless population in Louisiana.

Models rely on data that may not be comprehensive or reliable (such as self-reported surveys, census data, etc.), they can only provide estimates of the homeless population. This means that the actual size and scale of homelessness may be much larger than what the models suggest.

Homeless people can be difficult to track or locate due to their transient nature and tendency to avoid services or shelters that could help them. This makes

it difficult for models to give an accurate representation of the total homeless population, as individuals may not consistently be present in the same place.

Homelessness is often associated with other issues such as substance abuse and mental health, which can make an accurate assessment of the homeless population even more difficult. Without a comprehensive understanding of the multitude of issues that contribute to homelessness, it is impossible to accurately project the total homeless population.

Homelessness can vary greatly depending on region and demographics. This makes modeling homeless populations even more challenging as models must consider the unique challenges that homeless individuals face, as well as the resources available in each location.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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