i-ACES Vol. 3 No. 1 (2017)
Inquiry in ACES: An Undergraduate Research Journal
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

i-ACES
{inquiry-ACES: Highlights of Undergraduate Research in ACES}

Food Self-Sufficiency and Sustainable Agriculture Development in the Bahamas

Ashley Liangyuan Yu[1*]

[1]Department of Agricultural and Consumer Economics, College of Agricultural, Consumer and Environmental Sciences
[*]lyu27@illinois.edu

ARTICLE INFO

Article history:
Accepted 21 April 2017

Keywords: Sustainable, Agriculture, Economics, The Bahamas, Compost

ABSTRACT

The United States has been reported to have a food self-sufficiency rate of 124% when last measured in 2010 by Japan's Ministry of Agriculture, Forestry and Fisheries. Being food self-sufficient is a feasible ideal for a majority of U.S. citizens and the country as a whole. The U.S. can achieve high yields of agriculture production with conventional farming. To the Bahamas, conventional farming is not realistic. For this reason, many Bahamians doubt that being self-sufficient in food is possible. Drawing on credible reports from the Food and Agriculture Organization (FAO) of the United Nations, Bahamas Country Review, and in-field research experience, this paper examines the economic, agricultural challenges and the benefits of sustainable agriculture development in the Bahamas. Government influences on agricultural issues are also discussed.

INTRODUCTION

The Bahamas is home to over 700 islands and some of the most beautiful beaches in the world, which have created advantages and disadvantages for its economic growth. According to the "Bahamas 2015 Country Review", almost half of GDP comes from tourism (Bahamas Country Review 2015). In fact, the United States is the primary tourism market: over 80 % of the tourists come from the US (Bahamas Country Review 2015). As for the labor force of the Bahamas, it contains over 156,000 people, in which 5% are in agriculture and 50% in tourism, 5% in industry, and 40% in other services. Tourism demands the largest share of the labor market which makes the employment rate highly reliant on the tourism sector. The Bahamian economy has been heavily impacted by the economic changes in the U.S. during the past twenty-four years since the market demand is heavily supplied by tourists from the U.S (World Data Bank, 2016). The investment overview section of the report from Country Watch points out that, despite the incentives that the government places on manufacturing and agriculture sectors, they show little growth and make up only a tenth of the national GDP (Bahamas Country Review 2015). The Bahamian economy is heavily dependent on tourism and financial services. As a result, the Bahamas has an underdeveloped agriculture sector, which is understandable because it is much easier to see instant returns on tourism than agricultural investment. However, the nation would be worse off because of the tradeoffs in these short-term tourism investments, especially in the non-sustainable tourism sector.

In addition, the undersized agricultural sector causes high food prices and cost of living in the Bahamas, which will eventually harm the tourism industry. The residents are desperately in need of affordable fresh produce.

With 80% of imported food supply, how can the Bahamas achieve food self-sufficiency? Hypothetically, making local agricultural products accessible and affordable should be the goal for the Bahamas in the next 10 to 15 years. This paper is dedicated to developing a better understanding of the

agriculture difficulties in the Bahamas, potential solutions, and methods to attain food self-sufficiency utilizing sustainable farming.

SUSTAINABLE AGRICULTURE

Under the Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA), the term sustainable agriculture is defined as, "An integrated system of plant and animal production having a site-specific application that will, over the long term, satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole" (FACTA 1990). Sustainable agriculture could increase crop, livestock, and landscape diversity, which also helps farmers respond quickly to market changes.

A more than 30-year long research project done at the Rodale Institute has provided an adequate amount of evidence that proves the benefits of organic farming qualifies it as sustainable agriculture. The agricultural system trial is American's longest running, side-by-side comparison of organic and chemical agriculture. Researchers started in 1981 to study what happens during the transition from chemical to organic farming, after more than 30 years of research in the Farming System Trial (FST), they found interesting facts about the difference between organic and conventional farming. The report demonstrates that during times of drought, organic farming yields exceed conventional methods by 31% due to improved soil quality (Rodale Institute 2015). In fact, researchers present that soil organic matter is capable of holding up to 20 times its weight in water. Moreover, the results show that organic farming yields are about the same as conventional yields under normal weather conditions. Also, organic farming uses 45% less energy than conventional agriculture. Organic corn and soybean crops have much higher levels of weed tolerance than the same crops in conventional systems. Researchers defined healthy soil as "soil that allows plants to grow to their maximum productivity without disease, fertility, or pests, and without a need for off-farm supplements" (Rodale Institute 2015). That is, organic farming reduces the need for chemical fertilizers and water consumption.

But why is organic farming more suitable in the context of the Bahamas than conventional agriculture? Conventional farming relies heavily on machinery, large amount of fuel energy, chemicals, biological manipulation, and packaging. It is true that the Bahamas has a limited supply of natural resources, which makes it difficult to afford all of the financial and environmental costs that would result from conventional farming. In other words, large scale agriculture is not a solution for the Bahamian agricultural industry, because the agribusiness sector generates large amounts of unmanageable wastes, toxic runoff, water contamination, environmental damage, and unnecessary animal suffering. Instead, sustainable agriculture integrates three main goals: environmental health, economic profitability, and social and economic equality. Also, sustainable agriculture is easier to achieve on small-scale farms, which is practical for Bahamians to do in their yards.

For the Bahamas to achieve food self-sufficiency without conventional farming method, organic agriculture will not only help them feed their population, but also increase soil quality and better the economy.

CHALLENGES IN THE AGRICULTURE SECTOR

Agriculture challenges in the Bahamas include poorly developed soil, lack of natural mineral fertilizers, limited fresh water supply, bugs and diseases, small government incentives, hurricanes, and a decrease in the future farmer population. This paper will look at challenges created by soil quality and the declining number of farmers.

There is a severe shortage of arable land in the Bahamas: According to the World Factbook, only 1.4% of the Bahamian land is suitable for agriculture use. The type of Bahamian land is limestone, $CaCO_3$. According to Neil Sealey, a geography professor at the College of the Bahamas, the limestone in the Bahamas is young and very pure, both characteristics of considerable significance to agriculture. Moreover, Sealey points out that "all Bahamian protocols are alkaline, usually in the range 7.5 to 8.5, but the red soils are less so" (Sealey, 2010). Despite the open agriculture land, the geography of the Bahamas does give it a nice climate for some crops. John Hedden, a horticulturist for the Ministry of Agriculture at GRAC, insists that the sub-tropical climate of the Bahamas makes it the ideal place for crop production (Hedden,

2011). However, at the same time, the tropical weather also draws hurricanes and other tropical storms, which cause extensive flood and wind damage in some areas.

My in-field research took place on the campus of the Cape Eleuthera Institute in Cape Eleuthera, the Bahamas. The institute is near full self-sustaining. They encourage the use of renewable energy, such as solar energy and wind energy. Furthermore, the facility collects 100% of rainfall and turns them into drinkable and usable water. Interestingly, the food they consume is mostly grown on campus. After touring the farm, I had the pleasure to interview Elidieu Joseph and Johnny Alexis, who are the directors of farming, livestock, and landscaping at the CEI (Joseph and Alexis 2016).

Figure 1. The Compost System on the CEI Farm.

In addition to its soil problems, the aging population also affects the Bahamian farmers. One surprising fact that was expressed in the interview was that the younger generation does not have enough interest in agriculture careers. Instead, they prefer jobs in office settings because the wage is much higher working in an office and less physical work than farming. The Ministry of Agriculture and Marine Resources (MAMR) has taken the lead in improving food security as well as nutrition by integrating "garden-based learning" in the curriculum of primary schools. Many schools have started educating children about the importance of agriculture to raise their curiosity and interest toward farming. However, few children expressed interest in pursuing a career in the agricultural sector when they grow older.

Fortunately, job opportunities have been created in the process of agriculture development. Cynthia Ferguson-Fowler, who is a native of the island of New Providence, has gained new career opportunities in educating the general public about backyard gardening. One of her published books, entitled, *Backyard Gardening in the Bahamas and the Caribbean*, includes chapters on fruit, vegetable and herbal gardens, and types of pests to expect and how to control them (Nixon 2013). The book also teaches readers how to utilize limited space on the property, understanding climate, a planting guide, the benefits of including fruits and vegetables in your diet, creating compost, preserving a harvested crop and recipes that range from soups to energy drinks and desserts. The successful story of Cynthia demonstrates that agriculture development creates diverse job opportunities. For instance, an increase in insurance companies could be established to provide hurricanes and flood insurance services. In my in-field research, I also encountered a number of local Bahamian people who were not optimistic about finding employment and were not actively looking for jobs. Many Bahamian businesses are family-run; thus, someone outside of the family may struggle to find a job in a local company.

ACTIONS AND POTENTIAL SOLUTIONS

The greatest obstacle for growing food in the Bahamas is the lack of fertile soil (FAO 2009). To solve this problem, the CEI has set a good example. According to the California Integrated Waste Management Board, the definition of compost is "the product resulting from the controlled biological decomposition of organic material" ("Organic Materials Management" 2016). In fact, compost is a low-cost way to gain rich soil in a short amount of time.

Compost is the most feasible solution to the problem of lacking fertile soil in the Bahamas. Compost is a valuable soil conditioner that enhances soil structure. The organic matter in compost improves soil nutrient-holding and water-retaining capabilities, which, in turn, reduces fertilizer requirements and erosion while increasing soil tilth. Composting is easy to do, and there is no upfront payment required. However, the general public has not widely adopted the practice of composting.

Figure 2. A Pile of Compost.

Taking the Cape Eleuthera Institute (CEI) as a case study, the school recycles all waste and sees them as resources. The compost system, as seen in Figure 1, which has been used for eight years, is simple but well-developed. Farmers collect food waste from the dining hall. Depending on the type of waste, some leftover food is given to the pigs, the chicken, or the compost. The compost piles are created with merely dry cinderblocks on top of pallets. The final expectation is to break down all the seeds while decomposing food waste into nutrient-rich soil. The process taken inside the compost piles lasts for three months on average. The compost is shoveled out of the compost pile to form a stack of fertile soil on the ground. It only takes a maximum of four months for the compost to be ready to use. Every six months, farmers mix compost with pig manure, seaweed, and sand as soil before they grow new crops. Tree branches can also be broken down into usable soil, the average time for the process is 2 to 3 years.

Besides compost, the use of mulches, which can be made out of invasive species in the Bahamas, such as Casuarina, and drip irrigation also help to conserve water and reduce erosion. Crop rotations will invite beneficial insects to the land and discourages unwanted pests.

The government also plays a critical role in encouraging local agriculture developments. While other countries continuously invest in their agricultural sectors, the Bahamian government has focused more on the development of the lucrative tourism industry, leading to a dependence on food from international producers. The approach to educating the general public will raise awareness of the importance of farmers. Also, increasing government incentives in agriculture careers can be helpful for younger generations to pursue their passion for farming. Government incentives could include government subsidies, marketing extension services, price guarantees, financing programs, and providing proper training. The Ministry of Education is fully on board with this activity as well as the Ministry of Health. In furthering of the objectives of this exercise, workshops have been conducted in various communities. Participants of the community workshops have been given a starter kit including planting material, irrigation tubing, fertilizers and an essential gardening booklet; and workshop implementers were supplied with the necessary equipment to facilitate the process. Further investment and development in these relationships could lead to improved performance in the sector to the benefit of the society as a whole.

For example, community workshops which give out starter kits that include necessary planting material, irrigation tubing, fertilizers and an essential gardening booklet. Also, the Long Island local government launched the "backyard gardening program" as one of the steps towards greater food security (Thurston 2008). Furthermore, the Bahamas Agricultural and Marine Science Research Institute in North Andros is marketing agriculture as a science that draws students and community members to learn more about it.

CONCLUSION

Although the growth of combined manufacturing and agriculture sector only accounts for a tenth of Bahamian GDP (Bahamas Country Review 2015), the Bahamas is progressing as a country towards self-sufficiency by learning and adopting new methods of sustainable agriculture. Since the Bahamas is in the early stage of sustainable agriculture development, the use of compost would greatly help to solve soil challenges. In addition, educating and providing necessary subsidies for farmers will increase the interest of younger generations towards agriculture developments.

REFERENCES

Bahamas 2015 Country Review. (2015). *Bahamas Country Review*, 1-231.

Organic Materials Management: Compost and Mulch. (2016, February 3). Retrieved February 19, 2016, from

http://www.calrecycle.ca.gov/organics/compostmulch/

Farming Systems Trial. (2015). Retrieved February 19, 2016, from http://rodaleinstitute.org/our-work/farming-systems-trial/

Thurston, G. (2008, September 22). Backyard Gardening Eagerly Launched. Retrieved February 19, 2016, from http://www.thebahamasweekly.com/publish/bis-news-updates/Backyard_Gardening_Eagerly_Launched_printer.shtml

Nixon, A. Bahamian Author Cynthia Ferguson-Fowler Pens Caribbean Gardening Guide. (2013). Retrieved February 19, 2016, from http://risewiththia.com/2013/10/25/bahamian-author-cynthia-ferguson-fowler-pens-caribbean-gardening-guide/

Sealey, N. (2010). *Soil and Land Resources of The Bahamas* (pp. 1-4, Rep.).

World Development Indicators| World DataBank. (n.d.). Retrieved February 19, 2016, from http://databank.worldbank.org/data/reports.aspx?source=2

(1990) *1990 Farm Bill: proposal of the Administration.* Washington, D.C.: Office of Publishing and Visual Communications, U.S. Dept. of Agriculture.

Joseph, E., & Alexis, J. (2016, January 14). Challenges in the Bahamian Agriculture Sector [Personal interview].

"The World Factbook — Central Intelligence Agency." *Central Intelligence Agency.* Central Intelligence Agency, 2011. Web. 24 Apr. 2017. https://www.cia.gov/library/publications/the-world-factbook/fields/2097.html

Hedden, John. *Bahamian Agriculture, An Overview*. 1st ed. Abaco, Bahamas: The Nassau Institute, 2011. Web. 24 Apr. 2017. https://www.nassauinstitute.org/files/Hedden-%20BahamianAgriculture.pdf

"Agriculture Sectoral Plan for the Bahamas." November 2009. United Nations Food and Agriculture Organization. 24 Apr. 2017. https://www.bahamas.gov.bs/wps/wcm/connect/27b04e0e-44fc-4a1b-a55b-76e578db713e/Rapid+Assessment+of+the+Agricultural+Sector.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=27b04e0e-44fc-4a1b-a55b-76e578db713e