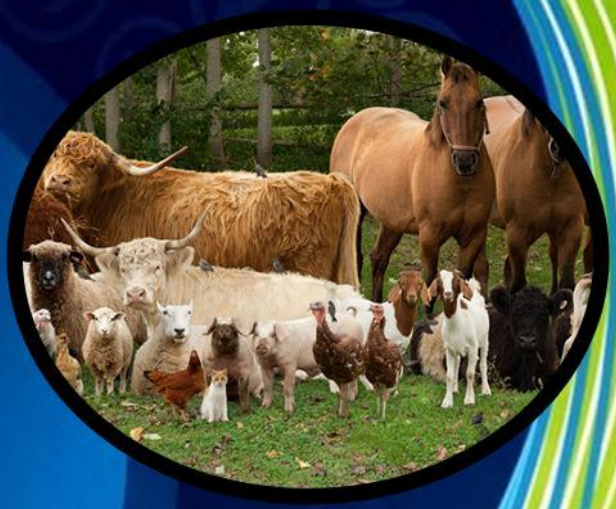

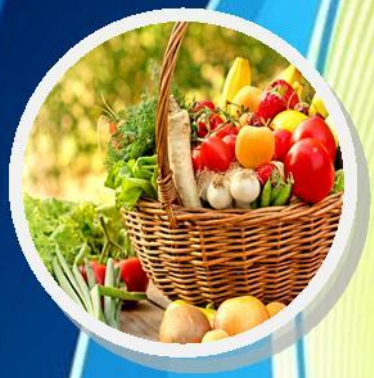

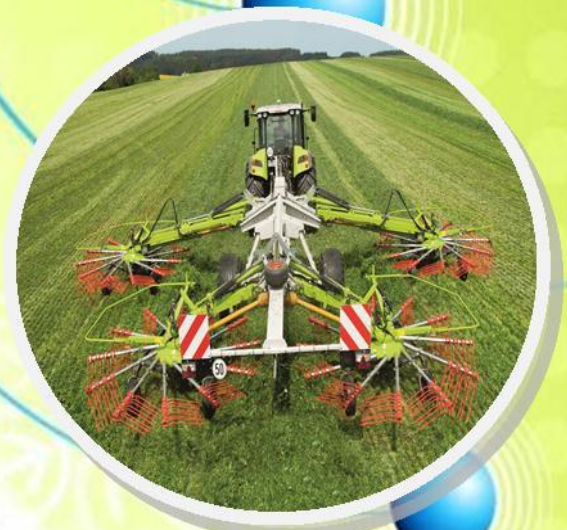

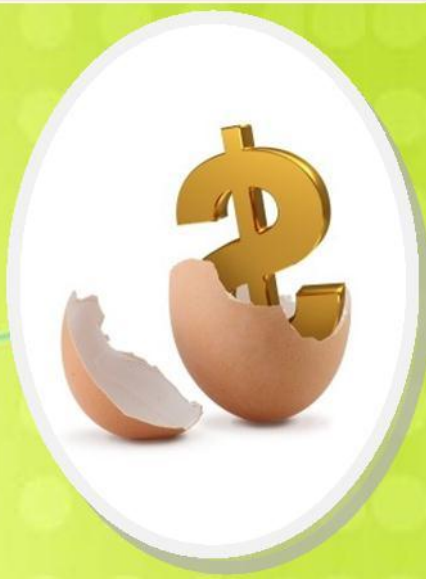

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NOTES

Towards A Regional Approach for Animal Health Services Provision and Disaster Risk Reduction: The Economics of the Caribvet Network

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Abstract

Climate change is expected to increase the frequency and intensity of natural disasters (Mechler et al. 2010) that impact the socio-economic development of nations worldwide, including those in the Caribbean, a region particularly vulnerable to natural perils (Macpherson and Akpinar-Elci, 2013). Global changes and climate change are also expected to have a significant impact on animal and human health, especially distribution and impact of vector-borne and zoonotic diseases which are considered particularly sensitive to climatic variables (Harvell et al. 2002).

An integrated approach of disaster risk reduction (DDR) and climate change adaptation (CCA) has been suggested to avoid unnecessary duplication of efforts and to improve program effectiveness (Dwirahmadi et al. 2013). Consistent with the call of the World Organization of Animal Health (OIE), for reinforcing the role of veterinary authorities at national levels for disaster risk reduction (OIE and World Bank, 2007), a similar strategy is needed at the regional level in the Caribbean.

In the Caribbean, veterinary services, agricultural and veterinary universities, research institutes, and regional and international institutions in agriculture and health have garnered efforts to create a regional animal health network (CaribVET) in 2006 to assist in decision making and to advise on best management practices to mitigate the impact of animal diseases on livestock production and health, human health and welfare. Since 2012, the Epidemiology working group of CaribVET works on DRR in close collaboration with CENSA, which is the OIE collaborating center on DRR in animal health in Cuba (Gongora et al. 2012). According to CENSA's expertise, prevention and preparedness are the key components of the DRR cycle towards which CaribVET's efforts should be oriented.

In this paper, we propose a model that explains the economic rationale behind an animal health regional network as CaribVET. Then, the role of CaribVET in the improvement of knowledge on animal diseases, the development of tools that facilitates the provision of animal health, and the capacity development in the region is explained and associated to the well-known concepts of comparative advantages and economies of scale. We explain the role of CaribVET in DRR and the challenges to a regional approach on the deliverance of animal health services and DRR are discussed.

Keywords: Animal health economics; Regional networks, CaribVET

The model

The presence of externalities is the main economic argument in favor of a regional approach for the provision of animal health. When the Veterinary Service decides to implement actions to improve the level of animal health in its territory, it is indirectly benefiting other territories in the region. These externalities are generally not considered when planning individually resources allocation to disease surveillance and control thus leading to a sub-optimal allocation of resources on animal health provision in the region, which is a key problem in a framework characterized by the scarcity of resources, as the one faced by Veterinary Services in the Caribbean.

By implementing a regional approach for the provision of animal health, the internalization of these externalities is theoretically feasible and the indirect effects are included when deciding the allocation of resources towards control and surveillance activities. If we consider a set of k animal diseases, we can construct the maximization problem of the Veterinary Service of a territory i in a region comprising of m territories as follows:

$$\max_{cs^i, ss^i} U^i = \quad n\left(y^i, cs^i, ss^i\right) * [L] \quad + \quad ne\left(y^{-i}, cs^{-i}, X^i, ss^i\right) * [L] - e\left(cs^i, ss^i\right)$$

Where:

- U^i – the utility function that is maximized by the Veterinary Service of territory *i*, which in this case is expressed in monetary terms [1x1].
- n – a function characterizing the number of infected animals by disease that depends on the characteristics of the territory and the control strategy implemented [1x*k*].
- y^i – the characteristics of territory *i* that define its natural propensity to host a disease (ecosystem and environment, animal population, location, historic outbreaks, infrastructure, social and economic development, etc.).
- cs^i – the control strategy implemented by territory *i* [*k*x1].
- ss^i – the surveillance strategy implemented by territory *i* [*k*x1].
- L – the economic loss associated to cases of infection by disease (negative domain) [*k*x1].
- ne – a function characterizing the number of infected animals by disease due to the characteristics of neighboring territories, their control strategies, the degree of integration between territories, and the surveillance system implemented [1x*k*].
- X^i – a vector that characterizes the degree of integration between territories [*m*x1].
- e – an expenditure function associated with the control and surveillance strategies [1x1].

The ne function characterizes the externalities associated with the control strategies implemented by veterinary services of other territories. A naïve solution to the problem would be not to take into account this component, so the allocation of resources for surveillance will be lower than socially optimal. When the externality component is incorporated, the solution of the

problem leads to the optimal allocation on surveillance but the allocation on the control strategy remains socially suboptimal. The only way to obtain the socially optimal allocation is by pooling resources and letting a social planner to choose the corresponding allocations for control and surveillance strategies for all countries/territories (first best allocation).

Improvement of knowledge on Animal Diseases in the Region

The existence of a regional network contributes to the improvement of knowledge on animal diseases, through improved coordination and communication among members. Indeed, it allows the exploitation of the comparative advantages of each territory and to share and impart knowledge among members. Moreover, environments that foster interactions between different types of institutions (such as CaribVET) have been described as a fruitful mechanism for innovation (Porter and Stern, 2001). Indeed, CaribVET promotes the collaborations and coordination by exploiting the comparative advantages of its members (Veterinary Services, research institutes, laboratories, and regional and international organizations) for optimal partnership that provides favorable conditions for research collaborations in close link with regional priorities which are addressed within its working groups.

Development of Tools and Capacities in the Region

In the procurement of animal health services and the management of disasters, as in any other production process, labor (human capabilities) and capital (tools and equipment) are fundamental. As the labor (or capital) capabilities of a territory increases, the expenditure associated to any control and surveillance strategy is reduced. If territories can, not only invest in their control strategy and surveillance strategy, but also allocate resources to train other territories or provide tools (capital) that can help them to reduce their costs linked to the provision of animal health services or to DRR, they can indirectly benefit via the regional externalities. This increases the set of possible actions that a country can implement to better control diseases or improve the management of disasters.

Training sessions are organized to improve the capabilities of the staff of Veterinary Services and laboratories, such as trainings in new laboratory diagnostic tools, risk assessment, and outbreak preparedness. The optimal level of training is characterized by the equi-marginal condition between training and the control and surveillance activities: a territory will prefer to contribute to a training benefitting other territories if the indirect marginal benefit (per dollar spent) of doing it is larger than the marginal benefit of increasing the level of the control and surveillance.

Moreover, CaribVET is a platform that allows the identification of most common training needs in the Caribbean, the implementation, follow-up and ideally evaluation of impact of such training programs. A training program can be seen as a transfer of knowledge, skills and competences from developed/experienced to less-developed/less-experienced countries/territories such that the capabilities of the receiving countries/territories increase due to the transmission of knowledge by the trainer. The indirect benefits of trainings extend to the whole region and are not restricted to the territory being trained.

Role of CaribVET in DRR

The role of CaribVET in DRR is very important when dealing with biological disasters, but its contributions can be extended to other type of natural disasters, such as floods or earthquakes. CaribVET contributes in three different dimensions to the DRR problem:

1. On the prevention of disasters, by developing a regional disaster plan and providing countries with recommendations and advising about good practices and specific measures to develop national disaster plans. The joint work of experts/experienced persons from different countries along with researchers and international organizations increases the quantity of information and knowledge that is necessary when designing emergency plans and to identify weaknesses and strengths of VS to participate in the DRR.

2. On the level of preparedness of ministries of agriculture in the Caribbean to face a disaster, by organizing training workshops, simulation exercises that improve the capabilities of veterinary authorities to react properly and on time when a disaster arrives, together with other agencies and collaborating sectors in the countries/territories.

3. On the response to disaster situations, by increasing the responsiveness of veterinary authorities, promoting the early detection and early reaction, and facilitating the flow and exchange of information in the region, and by the strategic development of the Caribbean network of laboratories allowing identification and use of regional laboratories and facilitation of sample shipment to reference laboratories for quick disease diagnostic/confirmation (due to a biological or a natural disaster that increases the risk of diseases).

Challenges and Final Remarks

Language and sometimes political barriers, free-riding, and turnover of personnel of veterinary authorities in the countries are some of the challenges to the efficient implementation and success of a regional strategy such as the one developed by CaribVET. These challenges are derived from the great heterogeneity of countries/territories and the public good nature of animal health but also from the history of each individual country/territory in the region. Mechanisms to avoid the free-riding problem are hard to propose in an international framework, in which sanctions are not feasible.

In the last 10 years CaribVET has shown that a regional approach that encourages communication and cooperation in a region is feasible and the results are very promising. The efforts to construct regional animal health networks should continue despite the difficulties. The capacities in surveillance and diagnostic built from these efforts can be useful for different interests such as mitigating climate change effects, the provision of human health services (One Health approach), and the control/surveillance of antibiotic resistance that are of regional and worldwide importance. In an integrated world, the need for integrated approaches and solutions at regional levels arises. Since single countries/territories cannot efficiently manage animal health in isolation, the interconnection of neighboring and farther countries sharing similar constraints and in link with different regions in the world makes animal health a global issue where regional networks can become adapted structures to build a functional world-wide platform of animal health.

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The Impact of Hurricane Sandy (2012) on Local Farmers in the Bahamas

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Abstract

Natural disasters have the potential to have substantial impact particularly on the economy and food security of developing countries. The Bahamas, one of 52 small developing island states, is particularly vulnerable to the detrimental forces of nature which often strike without warning. Hurricanes and tropical storms are the predominant natural disaster events which affect The Bahamas and many other Caribbean nations. The purpose of this paper is to evaluate and assess the damages that incurred as a result of Hurricane Sandy (2012) on food security in The Bahamas. The paper begins by establishing the parameters by which to determine the level of food security of The Bahamas. Due to the dependence on imports to feed the general populace, it was found that The Bahamas is not a food self-sustaining country and thereby has a low level of food security. Secondly, the impact that Hurricane Sandy had on local farmers was examined. Several local farmers were interviewed to establish a first-person descriptive account of Hurricane Sandy. The types of damage were divided into two main categories: crops and livestock. Overall, most of the losses incurred came from crops, with banana production being the crop that suffered the most. Using an estimation provided by the Food and Agriculture Organization of The United Nations (FAO), the amount of damage that the storm inflicted upon the agricultural sector is approximated at B $98.7 million.

Keywords – Natural Disasters; Agriculture; Self-sustainability; Food Security; Bahamas; Assessment

Introduction

During the 1996 World Food Summit, food security was defined as “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996).” The basis of food security is access to healthy food and optimal nutrition for all. Food access and food availability are strong interrelated components of food security which makes it reliant on a wholesome, nutritious and maintainable food system (WHO, 2015). Food Availability refers to whether or not there are sufficient quantities of food available. Food Access refers to the ability that one has to buy or own food, or the ability to produce food for one’s own consumption in some cases. Lastly, food quality looks at food from a nutritional perspective. It also integrates food safety as it is concerned with the sanitation of food. The French Agricultural Research Center for International Development (CIRAD) produces an additional pillar, Food Stability, which is the ability to acquire food over time. The three pillars must be able to be maintained to ensure true food security. Food stability “incorporates issues of price stability and ensuring incomes for vulnerable populations (CIRAD, 2014).”

Food Security in the Bahamas

The Bahamas is an archipelago that consists of 700 islands and cays in the Atlantic Ocean. It is situated northeast of Cuba, northwest of the Turks & Caicos islands and in reference to The United States of America, it is southeast to Florida. One can assess the level of food security in The Bahamas via the four pillars identified by WHO/CIRAD. Pertaining to food availability, The Bahamas appears to be secure as most of the food is imported from countries such as the U.S.A. The Minister of Agriculture and Marine Resources, The Hon. Alfred Gray, has stated that "more than 90% of food and agricultural products are imported to The Bahamas (Nixon, 2012)." Food access is no different as once again, because of our close proximity to the U.S.A. most Bahamians are able to afford and physically obtain food.

Examining the food quality of The Bahamas presents a problem, as the uncertainty of whether or not the quality and nutritional value are optimal, will always be present since the produce comes from abroad. How will on be truly able to know what has gone into the processed foods that are imported such as rice and corned beef – which are the key ingredients in a staple Bahamian diet? Lastly, with respect to The Bahamas' ability to maintain the three (3) pillars, it is evident that the stability is primarily due to the suppliers to the north.

Every pillar of measurement references the USA in some way. However, The Bahamas is not the USA therefore, in the instance of a drought or another substantial shock that would force the USA to retain their food stock for long indefinite periods (such as Russia's export ban on grain in 2010 (Welton, 2011)), The Bahamas would be left in a state of national food insecurity because it is not self-sufficient. Agricultural production accounts for less than 1% of the country's economic output and sustainable agriculture and self-sufficiency appears to be very low on the development agenda of the country (Hedden, 2011).

A Threat to Food Security: Natural Disasters

Natural disasters have the potential to inflict a substantial amount of damage to a country's economy and food security. According to the FAO, on average, damage to agriculture absorbs 14.1% of the total economic impact caused by natural hazards. Of all the damage and loss done by climate-related disasters, such as floods, droughts and tropical storms, 25% is inflicted upon the agricultural sector (FAO, 2015). Hurricanes and tropical storms are the predominant natural disaster that affects The Bahamas and many other Caribbean nations, even though the Bahamas has been proven to be susceptible to tsunamis, tornados and earthquakes. In 2012, Hurricane Sandy progressed through the Bahamas with violent winds and torrential rain after ravaging through other Caribbean islands such as Jamaica, Cuba and Haiti. The effect that it had was tremendous especially for the agricultural sector which is often neglected by the general public as many do not understand the magnitude that the sector has on the country's economy and food security. This paper seeks to evaluate the impact of hurricane Sandy on food security in The Bahamas by assessing the damages and losses incurred by local farmers.

MATERIALS AND METHODS

A qualitative research method was used to attain a personal and detailed account of the Hurricane in addition to the document analysis method which provided information to evaluate the results against. There were 5 interviewees chosen with a minimum of 5 years of farming experience. All of the farmers that were interviewed operate a crop and/or livestock farm on the island of New Providence.

Document Analysis

A small selection of reports, newspaper articles, research papers and other relevant documents to the topic were analyzed and examined. The documents were compared and contrasted to retrieve as much accurate information as possible. A key document is the Climate Change Risk Profile for The Bahamas (CARIBSAVE**,** 2012**)** which provided damage to crops, livestock and fisheries for hurricanes between 1992 and 2004. This was used to formulate a hypothesis that the most damage sustained by Hurricane Sandy in agriculture would be to crops.

The Semi-Structured Interview

A self-designed and semi-structured questionnaire was used as the survey tool. Questions and prompts were designed ahead of time but the interviewee was allowed to control the pace of the interview. The interviewee was encouraged to expand on answers and express new information that they thought was relevant to the interview. The interviewee was ensured that names would never be connected to the results and instead, a letter (Farmer A) would be used for identification purposes. The questionnaire included three parts: the first part was the general situation including gender, age, years of experience and type of farm; the second part was the impact of hurricane Sandy on the farm including a descriptive overview of the damage; the third part focused on the idea of The Bahamas becoming a self-sustainable country. A combination of a tape-recorder and a notepad were used to record the results.

RESULTS

Damage of Previous Hurricanes

The Bahamas Environment Science and Technology Commission (BEST, 2005) carried out research evaluating 4 major hurricanes from 1992 to 2004 inclusive of Hurricanes Andrew, Lili Floyd, and Michelle (CARIBSAVE, 2012). The research showed that Hurricane Andrew in 1992 caused “severe salt intrusion on one of the major farming areas” in the islands. Heavy rains by Hurricane Lili 1996 led to major flooding of agricultural land causing a leaching of fertiliser and delay in replanting. According to the research, Hurricanes Floyd and Michelle in 1999 and 2001 respectively also resulted in extreme losses in the agricultural sector. Hurricane Floyd in 1999 caused severe damage to agriculture across 11 Islands of The Bahamas with crop damage totalling B $27 million, including 100% losses in bananas and major losses in citrus (CARIBSAVE, 2012). The livestock sub-sector sustained B $3.8 million in losses that year (CARIBSAVE, 2012). For each hurricane, the damage was divided into three subsectors: crops, livestock and fisheries and in each instance, crops sustained the most damage. According to the FAO, crops account for 42% of agricultural damage post-disaster (FAO, 2015).

Hurricane Sandy and the Family Islands

Hurricane Sandy advanced mainly through the north-eastern islands with significant damage on Eleuthera, Abaco and New Providence. In Eleuthera, The Hearty Mow Farmlands in Hatchet Bay lost virtually all of their crops which included tomatoes and banana trees. Mr. Daniel Nixon from Wemyss Bight lost crops such as peppers, watermelon, pigeon peas, and cassava as well as the sheds for his livestock (Eleutheran, 2012). In Abaco, Pepper Pot farm owner Mel Wells, lost 85% of his banana trees. Another farmer Mr. Rowan Higgs noted that a substantial amount of avocado trees were either partially or completely uprooted. At Big Bird Chicken farm,

avocado and lime trees also sustained a lot of damage. Loss of fruit tress was the common complaint from these farmers in Abaco as well as the loss of most vegetable crops such as tomatoes, onions, arugula and herbs. (Santillo, 2012)

Interview Results from New Providence

From the 5 farms selected on New Providence all 5 were affected by hurricane Sandy. Each of the farms produced crops whereas only 2 reared livestock. According to Farm A, most of the damages were against the crops. Farm A had lost B $10,000 worth of avocado and citrus trees which were ordered prior to the hurricane. The crops that sustained the most damages were banana trees and citrus fruits. There were no losses among the livestock. There was flooding in some areas of the farm as well as minor structural damage against fences. Farm B was a glass greenhouse farm that mainly produced cucumbers and lettuce via hydroponics. The storm did not cause physical damage to the farm, however, due to power outages, Farm B estimated a loss between B $0 and B $30,000. Farm C experienced severe damages against avocado and banana trees as "they broke off." The vegetables grown closer to the ground such as kale, collard greens and lettuce did not sustain as much damage as the banana trees.

Farm D reported damages against fruit trees which included banana and citrus trees. The damage however was not extensive. Farm E reported damages against crops and livestock. The most frequent crop damaged was banana trees. Animal mortality was attributed to flooding which led to the drowning of poultry. Due to heavy winds, animals were also lost to the collapse of their stables. However, the loss was minimal among the pigs and goats reared at the farm. Each farm was unable to give an exact dollar figure as to how much, overall, was lost financially. Each farm reported that the government did not lend any assistance in the months following the hurricane. Farms A, C, D and E reported wind damage as the major cause behind the loss of fruit trees. All farms are advocates for the Bahamas being able to provide its own food.

DISCUSSION

In order to achieve a figure for total damages in agriculture caused by Hurricane Sandy, the 14.1% average of damage in agriculture estimated by the FAO (FAO, 2015) was used in conjunction with the total economic damages of Hurricane Sandy estimated at B $700 million. The result was an approximate for the damage in agriculture valued at B $98.7 million. From the document analysis conducted, it was hypothesized that crops would account for most of the damages from Hurricane Sandy in 2012. This was proven to be true as overall, crops carried most of the damages in the 5 farms interviewed as well as according to the information gathered from the family islands. Among the crops, banana trees were the greatest loss followed by citrus and avocado trees. Farmers in The Bahamas can adopt integrated practices of farmers in Haiti which help to reduce the natural hazard impacts on bananas. Farmers in Haiti traditionally apply actions such as leaf removal and the staking of the bananas. Furthermore, there is the "anticipated harvesting of marketable fruits" which are either stored or immediately sold at the end of the cropping cycle. This allows farmers to obtain some income from their harvest against the destructive impacts of hurricanes (TECA). The farmers linked self-sustainability to food security which meant that for The Bahamas to achieve a higher level of food security, more needs to be done to advance local food production.

Farms A and E suggested that the Bahamian diet be modified and shifted towards crops that are easier to produce for The Bahamas. This would mean substituting crops such as rice

and wheat, which according to the Inter-American Institute for Cooperation on Agriculture (IICA) is depended upon to meet more than 40% of domestic demand, for more feasible crops that can be grown in The Bahamas on a large scale such as cassava. The lack of government assistance, as none of the farms interviewed reported any, also needs to be addressed in order for the country to attain greater food security. Farm A mentioned that at a recent agriculture expo, the government planned to assist farmers in packaging any crops that could be salvaged however, it is not enough. Although the government has not directly assisted the interviewed farmers, it has undertaken several programs with the objectives of increasing production, introducing new technology and fostering linkages with the community in regards to agriculture in The Bahamas such as The Bahamas Agricultural and Marin Science Institute.

The results of the interviews is not representative of the entire Bahamas as only farms on the island of New Providence were interviewed. The results obtained from the document analysis therefore serves as representation for the family islands. The information for the two family islands was obtained from their respective local newspapers and hence does not provide the element of personal experience as in the case with the farms from New Providence. However, it was observed that the farms on Abaco and Eleuthera experienced crop loss as the most significant amount of damage due to Hurricane Sandy. The main crops that were lost also included banana, avocado and citrus trees which correspond to the major crops lost by the farms on New Providence.

The high impact of natural hazards and disasters on agriculture and the food security of The Bahamas calls for enhanced mainstreaming of disaster risk reduction and resilience building within the agricultural sectors. Overall, most of the losses incurred because of Hurricane Sandy came from crops with banana trees being the crop that suffered the most. This means that Hurricane Sandy affected the food security of The Bahamas greatest through food availability. In spite of this, many Bahamians did not feel the loss of local produce due to the fact that 90% of the domestic demand is imported. The Bahamas is therefore not a self-sustainable country which creates vulnerability as its food availability greatly depends on a third party. Hence, The Bahamas can be categorized as a country with low food security. Increased awareness to the agricultural sector of The Bahamas is needed, which could stimulate further advances to be made in terms of self-production and self-sustainability. More support is needed from the local government to invest in local agriculture and decrease the exorbitant amount of food imports.

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