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Costa Rica: Animal Agriculture

Contaminated Livestock Feed in Costa Rica

In our world today, there are many global food security issues. Food security is defined by the *World Food Prize* as availability, quality, and quantity of food. Many people around the world, mostly in developing countries struggle to financially to purchase enough safe and healthy food in their area. This is where the topic of food security becomes very important. Through collective efforts to improve food security around the world, we can improve many lives by helping to fuel their bodies with safe and healthy foods. One developing country who suffers from food security issues is Costa Rica.

Costa Rica is located in Central America with Nicaragua to the North and Panama to the South. Costa Rica is made up of 32,311.3 square miles of varying terrains including mountains, valleys, plains, and scattered volcanoes, some of which are active today. The climate is tropical and subtropical with the dry season lasting from December to April and the rainy season from May to November. This beautiful country is home to over 4 million people and maintains a stable economy. Despite maintaining a stable economy, according to the *Food and Agriculture Reviews*, Costa Rica "Agriculture's contribution (crops and livestock) to GDP declined from 13.7% in 1994 to 5.6% in 2013" (OECD). Although these declining numbers may seem concerning in terms of the importance of agriculture to Costa Rica, agriculture still plays a large role in the economy. This is due to agriculture's large contribution to Costa Rica's export earnings, as well as its role in feeding the local Costa Rican people. According to the UN, Costa Rica's number one export has become electronics due to lowering prices of tradition exports such as coffee and pineapple. Similar to that of a developed country, Costa Rica has a free elementary school system, which is mandatory for their residents. The Costa Rican family is very similar to a family in North America in that couples share household duties and raise their children together. A difference in family life in Costa Rica is their households are often multigenerational (Velzer). It is very common for children to live at home until they get married, and even stay at home when they have a stable job and are starting a family.

Costa Rica's agriculture industry helps maintain a stable economy as well as provide food for their country. Due to the importance of agriculture in daily life in Costa Rica, they take great care in the operations of their agriculture industries. Despite this, Costa Rica has a reoccurring issue of contaminated livestock feed in which these contaminates pass onto consumers. This issue falls under the category of animal health. Two occurrences of feed contamination detected in Costa Rica has been fungal contamination and the effects of unmonitored antibiotic resistant bacteria contaminating feed. According to the *Food Additives & Contaminants Journal*, animal feed is, "mostly based on cereals and grains; hence, their susceptibility is increased towards

contamination with mycotoxins (either contamination caused by the toxin itself or the toxigenic fungi that produces them) along the production line" (Chavarría, Guadalupe, et al.). Due to the main ingredients and production process of animal feed, the feed is very susceptible to becoming contaminated. This poses many health concerns for both animals and humans. One study conducted in the *Food Additives & Contaminants Journal* was focused on detecting aflatoxins in dairy products as a result of livestock consuming contaminated feed. Aflatoxins are defined as: "toxic fungal metabolites, which can be found in feed" (Chavarría, Guadalupe, et al.). Costa Rica is especially susceptible to feed contamination due to their tropical climate providing a perfect environment for fungus to thrive. Throughout the digestion process, this toxic fungus makes its way through the animal and into their by-products. With dairy animals in specific, aflatoxins pass into their milk and are not only present in raw milk products, but this fungus has also proved to withstand sterilization and pasteurization (Chavarría, Guadalupe, et al.). This poses a great concern to famers and consumers because dairy products are widely consumed and serve as a source of income for Costa Rica. With the contamination of aflatoxins, dairy products become a threat to human health as they could become the source of introducing this fungus to humans.

Another source of animal by-product contamination is through the form of antibiotic resistant bacteria. Contamination occurs when farmers administer drugs to treat and prevent bacterial infections among their livestock. The accumulation of antibiotic resistant bacteria could cause this bacterium to transfer their properties of resistance to the bacteria farmers are trying to treat. As observed by the Food Additives & Contaminants Journal, farmers in Costa Rica are failing to keep track of the amount of antibiotic resistant bacteria that is given to their livestock through their medicine. As a result, "antibiotic resistant bacteria may colonize their livestock, transfer their resistance traits to the pathogens that they intend to control, or reach consumers at the end of the production line" (Granados-Chinchilla, Fabio, et al.). The risk of feed containing antibiotics and passing on antibiotic resistant bacteria is that it could result in the creation of new forms of pathogens that are resistant to antibiotics. If this occurs, Costa Rica will experience an outbreak of disease among livestock animals. This outbreak would also spread to the human population of Costa Rica as the antibiotic resistant bacteria are transferred through animal by-products as well. So, if antibiotics continue to be administered through animal feed at unmonitored rates, residents of Costa Rica will be exposed to large amounts of antibiotic resistant bacteria through their meat and animal products (Granados-Chinchilla, Fabio, et al.). This bacterium could alter pathogens that effect humans and create an outbreak of multiple diseases among the human population in Costa Rica as well as the animal population.

The contaminants of fungus as well as antibiotic resistant bacteria in the livestock feed affect the health of the consumers in Costa Rica as well as create a large risk for the economy of Costa Rica. If animal products are contaminated, people will stop buying them, causing the agriculture industry to suffer and put a large strain on Costa Rica's economy. In addition, the health care system will be overwhelmed with patients and will require large amounts of funding to maintain the demand created by the agriculture industry.

There are many possible ways to combat the issue of contaminated feed in Costa Rica. The most cost efficient and widespread way to improve the use of contaminate livestock feed is through educating the farmers about how feed becomes contaminated and implementing preventative measures. This education can be done through communicative learning. Communicative learning is focused on local farmers working with experts to share ideas and improve the community's farming practices. This type of solution to improving livestock operations in Costa Rica has already been implemented by the Instituto Costarricense de Electricidad (ICE) with farmers to protect watersheds from erosion and contamination (Sims and Sinclair). Positive effects of this solution as described by *Adult Education Quarterly*, include farmers, "learn that they make an impact and they can work together to improve their environment and agriculture stability because it's up to them to take action" (Sims and Sinclair). In the case of Costa Rica's contaminated feed, college students who are studying food security could create trips to Costa Rica in order to present information to the local farmers. During this time, the college students can inform local farmers of better feed management practices to reduce the probability of their livestock feed being contaminated with aflatoxins. These students could also present the farmers with tactics to monitor the amount of antibiotics fed to their livestock. Through these educational sessions, local farmers would also be given the opportunity to connect and brainstorm additional ways to improve the productivity and safety of their farming operations. The colleges themselves to improve the experience of their students could fund this project. Students could also raise money to provide the traveling costs for their trip, which would serve as a learning experience in their college career and broaden their experiences in the agriculture industry. Funding for this would be easily achieved due to the only true cost of this project to improve Costa Rica's feed management practices is the traveling expenses for the students who are serving as the educators. This project could be sustainable by making it an annual tradition for college students to travel to Costa Rica as a project in order to teach and discus new practices with local farmers in order to minimize livestock feed contamination.

In addition to this project involving college students as a way to improve the education of famers in Costa Rica, the country could establish education farm such as the North Florida Research and Education Center. At this research farm, experts raise local crops with different techniques such as different pest management or growing different varieties of one crop. They use their knowledge to educate local farmers on the most cost effective ways to farm their local area that will produce the most yields, thus maximizing profit. From this research farm, local farmers are not only educated in how to improve their profits but also in how to farm in a way that promotes the environment and food safety. Having local research farms such as this one in North Florida would provide a permanent education resource for Costa Rican farmers to rely on to receive crucial information on how to farm in a way that is not only safe but will also maximize profits.

Another solution that could help improve the amount of contaminated livestock feed in Costa Rica is a solution that has recently been implemented in the United States (US). In the US, the Food and Drug Administration (FDA) has implemented the Veterinary Feed Directive. The directive states antibiotics intended to be administered in or on animal feed is now required to be prescribed by a licensed veterinarian (FDA). If implemented in Costa Rica, this directive would solve the issue involving the spread of antibiotic resistant bacteria. This would eliminate the

spread of disease among livestock and the human population. Along with the positive results, there would be many arising issues. Along with implementing this directive in Costa Rica, the need for regulatory agencies to ensure farmers are abiding by this directive would need to be put in place. This would create a huge cost to the Costa Rican government. Another issue with implementing the Veterinary Feed Directive as the US has would be the need for veterinarians to be available to make farm visits in order to prescribe antibiotics to livestock. Along with the need for more veterinarians available in Costa Rica, the cost of paying vet bills would impose a large economic burden on farmers. Currently, farmers in Costa Rica are able to self-prescribe and administer drugs to their livestock. This allows for the most cost-effective operation for farmers but is not safe in terms of disease prevention in livestock as well as humans due to antibiotic resistant bacteria. Implementing a solution similar to the Veterinary Feed Directive in the US would serve as a very costly and controversial solution for Costa Rica to address the issue of contaminated livestock feed.

In conclusion, the food security issue present in Costa Rica is attributed to their animal agriculture practices. There have been studies conducted in Costa Rica showing contaminated livestock feed in which these contaminants are passing through the livestock and into the byproducts they produce. As a result, consumers in Costa Rica are buying potentially dangerous animal products to feed their families. This is a food security issue in Costa Rica. Of the three possible solutions discussed in this paper, establishing an education farm for the farmers is the most plausible. The Veterinary Feed Directive present in the US is not feasible in Costa Rica as their economy is not currently set up to handle the costs that are involved. The solution of a program supported by foreign college students educating the farmers is dependent on universities providing funding that is not guaranteed during poor economic times or change in leadership of university programs. The most feasible and realistic solution is an education farm where experts teach local farmers how to use different crop growing techniques and pest management strategies. The farmers will benefit from using cost effective farming methods that will produce the most yield, thus maximizing profit. Local farmers will improve their profits but farm in a way that promotes the environment and food safety. The education farm would not only inform farmers on how to maintain and properly monitor their livestock feed but would also create community relationships. Through this program, farmers would be armed with tactics to keep their livestock feed from becoming contaminated with aflatoxins as well as antibiotic resistant bacteria. This would result in a reduced risk of disease spreading from local livestock to the people living in Costa Rica. With education, Costa Rican farmers would receive the knowledge to keep fungus from growing in their livestock fed with proper production and storage practices. In addition, with the knowledge on the effects of administering antibiotics through their livestock feed and the risk of the spread of antibiotic resistant bacteria, farmers can begin to monitor the amount of antibiotics their livestock receive. Through these education opportunities, Costa Rican farmers can greatly reduce the amount of contaminated feed being fed to their livestock. This will result in safer food as well as prevent the spread of disease in Costa Rica.

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