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Bolivia, Factor 4: Animal Health

The Future is Preventative Medicine

The country of Bolivia is located in tropical South America and has long been surrounded by poverty. This poverty stems from the country's history of poor dictatorships and its loss of access to the sea after the War of the Pacific concluded in 1884. The economic state of Bolivia sharply declined after this, and has shown no sign of improvement to this day. With a shockingly low GDP of \$7,500, and a poverty rate of 39%, health care is inaccessible to most (Plurinational State, n.d.). In addition to this, clean water is rare, and its widespread contamination negatively affects both the country's people and livestock. This lack of clean water is often due to poor waste management programs, and can potentially lead to disease within the livestock (Plurinational State, n.d.). The issues faced by Bolivian farmers are plentiful, but animal health is undeniably necessary to improving their economic status and positively impacting their food security. Elevating the health status of herds provides families with a stable income and, depending on the animal being raised, a steady source of food. Bolivia's landscape is heavily saturated with grasslands, establishing an ideal environment for raising cattle. In turn, over a third of the population is steadily working in agriculture, increasing the urgency and necessity to improve their citizens' understanding of ways to improve animal health and prevent disease transmission (Culture, n.d.). Placing a strong emphasis on educating both the current agricultural worker and the upcoming generation in preventative animal care lays the foundation for an increasingly stable, healthy herd. The human world of medicine is innovating through prioritizing preventative care; the world of veterinary medicine has no reason to stand behind.

In order to innovate effective solutions, it is crucial to evaluate and understand the circumstances of a standard Bolivian family working in agriculture. Although they are farmers, that is only their job. More importantly, they are people raising families that they love, value, and are trying to feed. The first step is not to separate them from Americans and only see their differences, but instead to see how at the core, their goals are the same. The average Bolivian family includes a mother, father and three children that are Spanish speaking. (Plurinational, n.d.). The children will move through an education system that is government funded and mandatory for students age six through thirteen, but education past this is not compulsory. As a result, only one fourth of students reach the secondary level (Arnade, McFarren, 2019). This amount of education provides them with literacy and basic skills, but as the students move into the workforce, it does not support them if they later choose to pursue higher education. Progressing into their diet, carbohydrate dense foods are common, primarily including potatoes, maize, and various grains such as quinoa, barley and rice (Culture, n.d.). Bolivians also eat various meats, primarily from cattle, alpacas and llamas, but also from guinea pigs (Culture, n.d.). Guinea pigs may seem odd as they are not part of a traditional western or European diet, but in Bolivian culture they are a delicacy and eaten during spiritual ceremonies and special occasions. They are not a staple or frequent part of Bolivian cuisine, but hold a noteworthy place in their diet.

Moving from examining the standard family to considering a standard farm, the grassland terrain they live upon creates an ideal environment for raising cattle for meat and dairy products. Past the food element of animal agriculture, it is also common for farmers to raise alpacas and llamas. While they can be used for food, they are primarily raised for their fibre, leather and waste. The farmers fully use the waste product from the animal through repurposing it as fuel (Arnade, McFarren, 2019). This is incredibly innovative. Given that Bolivia is fully entrenched in poverty, using every piece of the animals that they raise is both a

popular and necessary tactic to save money, so despite the initial shock to Americans, this includes utilizing dried feces for fuel. This creativity transfers into their use of space given that the average farm is a mere 0.89 hectares — or 2.11 acres (Rapsomanikis, 2015.) As a means for comparison, a 2013 USDA report stated that the mean average American farm was 234 acres — over one hundred times larger (Hopp, Korb, MacDonald, 2013). When raising their animals, they must utilize space-conscious farming practices, even if that includes only husbanding a small herd. They use as much as they can in order to maximize yield and profit.

With a developed understanding of a typical family and farm, it is crucial to identify the barriers that are preventing them from growth. One of the largest factors negatively impacting the lives of Bolivian citizens is the financial burden instilled upon them by the country's failing economy. Surprisingly, Bolivia is a country rich with natural resources such as mineral deposits, petroleum and natural gas (Arnade, McFarren, 2019). Despite this abundance, the country lacks investments and is landlocked, resulting in these resources being virtually untouched. This economic barrier has kept Bolivia in an impoverished state and prevented them from capitalizing upon a potentially valuable resource. As a result of this economic state, citizens can not make a livable wage and the country's infrastructure has crumbled. In turn, the transportation system has also failed. With the lack of transportation, access to food markets are limited, constructing another barrier for Bolivian families aiming to attain adequate nutrition. Each factor leads into another, building one small roadblock into a large barricade. While the majority of the country is employed, they are making very little. Currently the economy is being held together by aid from organizations such as the World Bank and Inter-American Development Bank (Arnade, McFarren, 2019). From an agricultural point of view, the small size of farms places a restriction on how many animals or crops can be raised. This further limits their income and food supply as they can only sell, cook, or butcher as much as they can grow or raise. The constricted space prevents farms from being efficient and productive as farmers are forced to work knowing that they will hardly profit. The low wages leave them unable to afford to purchase food, and the barriers to transportation makes reaching food markets challenging. The economic consequences leach into the lives of Bolivians in nearly every aspect — not just their wallets.

Animal health is a keystone to the issues described above. The economy lies at the root of these issues, and with such a large percentage of the population working in agriculture, their income holds power to change their economic state. By improving animal health and strengthening herds, the economy can be improved. Currently, Bolivian farmers are not practicing preventative techniques such as implementing herd management plans and administering vaccines. As a result, they are losing more animals and poorly managing the resources coming from their herds. This limits the economy. The more animals being lost, the less product farmers have left to sell. If they are eating a portion of their animal products, unexpectedly losing another animal from their herd may not leave them with enough. Educating families on preventative care in their herd impacts themselves and ripples through the economy. Overtime, the stabilization of one family's income has the potential to exponentially grow into stabilizing an entire community and beyond. The solution is educating farmers in prevention.

So often the focus placed on animal health is on what happens once the animal is already sick, but this ignores prevention — the most effective method of disease control. There is limited research regarding the implementation of preventative measures within animals living in underdeveloped countries, but it is a growingly popular topic in human medicine. Johns Hopkins University conducted a human study and discovered that the success of preventative medicine relied on getting the people involved in their healthcare, both individually and from a communal stance (Department, n.d). These preventative techniques in human medicine can be transferred. While animals can not physically become involved in

their health management like humans can, this same principle of community involvement has the potential to be highly beneficial. Binding a community together through group educational endeavors can work toward the elimination of issues that span from small common illness to potential mass disease outbreak. From an outreach perspective, sending veterinarians to serve in Bolivia long-term is not sustainable and provides no long-term support. The most valuable form of outreach is education, creating a society where Bolivian farmers are largely self-sustaining. When experts are sent, it is crucial that Bolivian farmers and veterinarians are trained and educated on the foundation of preventative medicine and sustainable, cost-effective farming. Through training farmers in preventative care, they become adequately equipped to prevent the very diseases that veterinarians are currently being sent to treat. Avoiding illness within livestock grants the animals a chance to live healthier lives, which in turn allows them to be more profitable. In cattle, this is born through a higher level of health, allowing them to produce steadily higher quantities of milk and a better quality and quantity of viable meat.

Education ultimately leads to prevention, and implementing educational programs focused on agriculture has the potential to improve the economic and food security state of Bolivia. This burden of forming educational programs does not need to be carried solely by outreach groups. Instead, the government has a place to accept an extent of responsibility. Government leaders naturally want their country to rise out of its impoverished state and seize opportunities for growth. By implementing agricultural education policies this can occur on a national scale. Schools can be required to teach small sessions of agricultural learning programs developed by the country's government on topics such as effective herd management techniques, space-conscious farming procedures, simple animal care procedures and entrepreneurship. These learning sessions could even be held at the end of their school day and open to family members. For those who may not have children in the schooling system, community learning sessions can be held. In these sessions, trained personnel could come to a farming community and teach these modules to farmers. Community session instructors can then travel throughout multiple areas of Bolivia teaching. The topics within the modules can be richly saturated with preventative animal health practices, but they also hold the potential for expansion into soil management, sustainable farming techniques, agricultural business practices and much more. Agricultural learning modules would set the younger generation of farmers up for success and equip them with the information to carry home to their parents, while simultaneously educating the current generation of agricultural workers. It directly involves both parents and students, improving the present and impacting the future.

The potential for educational content within these modules is endless, but in regards to animal health, herd management and proper vaccine application techniques are two key concepts that could be incredibly beneficial. Centering animal health modules on these topics provides farmers with the foundation for preventative medicine.

In the developed world, herd management is held to a high standard, greatly focused on improving the sustainability of the herd, and decreasing elements such as soil degradation, water contamination, and greenhouse gas emissions. Seminars and lectures inform farmers on the importance of biosecurity and the necessity for the implementation of waste management plans and dewormer rotations. Needless to say, Bolivia lacks all of these things. The need for animal agriculture is growing exponentially, but sacrificing soil and water conditions in order to raise cattle prevents Bolivian farmers from continuing positive change.

In order to combat this, training farmers and educating them on proper herd management techniques is crucial to the growth of the Bolivian economy. Additionally, improving the efficiency of animal

agriculture allows farmers to maximize their use of small herds. A study published by the University of Arkansas evaluated important techniques within farm efficiency and management. One especially notable technique included the importance of developing a herd health management plan, stating “A herd health management plan is vital to profitable beef production. Many animal health problems can be controlled with good management, proper nutrition, and vaccination against infectious diseases (Simon, Troxel, n.d.)” Unsurprisingly, the solution returns to the two key elements of reforming animal health — education and prevention. Having a herd health management plan reduces the amount of damage that the “surprise” factor has when a herd health issue develops. Farmers become directly involved in helping their cattle succeed as they uphold a plan that they helped create to prevent disease and manage the ones that exists already or may arise. Teaching families how to form a plan will result in a decrease in the amount of disease spread through their cattle, resulting in decreased veterinary expenses and a reduced amount of deaths. This improved efficiency increases the profit farmers receive if they choose to sell their cattle or animal products, and increases the amount of meat and dairy available from the herd. Although the study specifically targeted the management of beef cattle herds, these principles carry into maintaining dairy cattle and additional animal herds as well. Having a sufficient care plan for all animals being raised maximizes the benefit for the farmer. Previously, this knowledge has been unavailable to Bolivian farmers, but if access to this education is increased through training programs and outreach, these skills will benefit them long term.

The second potential primary educational topic, vaccine application, holds great potential for raising stronger herds and preventing disease. As previously described, the key to change is educating farmers on the proper way to use vaccines. A study published in *Vaccine Journal* specifically targeted vaccine use in Bolivia. The study concluded that, “uptake of livestock vaccination was unlikely to improve without knowledge transfer that acknowledges local epistemologies for livestock disease (Hefferman, Nielsen, Thomson, 2008).” Educating farmers on proper vaccine application is crucial to growing their use, which will lead to preventing disease transmission. In addition to this, hearing viewpoints from locals is crucial to forming plans that are feasible for them. This education also contributes to lessening vaccine resistance as vaccine rotations and routines will be properly developed. Overall, as the efficiency of present vaccines grows and education is increased, animal health and agriculture will be improved upon greatly, leading to more stable herds.

These educational modules hold an untouchable amount of potential, but their success truly calls for speculation. Although there are few ongoing programs specifically targeting animal health in Bolivia, there are two programs that show the power implementing education programs has on Bolivian citizens. The first is WCS, or “We Stand for Wildlife: Bolivia,” and the second is an agriculture based program provided through the Louis Dreyfus foundation.

The organization “We Stand For Wildlife: Bolivia”, also known as WCS, is a current project within the country acting with the goal of providing veterinary care to areas of Bolivia, preventing the transmission of diseases and deadly parasites, and training domestic health care promoters. WCS stated, “disease monitoring in livestock, as well as timely prevention and attention conducted by 220 families, led to a reduction in livestock losses due to diseases, from 10 animals per family in 2004, to as low as 2 animals in 2007 (Domestic, n.d.)” The success in farms that WCS impacted should not be limited to just where they reached, it has the potential for success throughout the entire country. Moving forward, rolling out similar training practices will develop a network between the community of farmers and their local veterinarians — improving their knowledge of basic herd health practices and prevention. The benefits of training are not unsupported, WCS even stating that, “Training of community veterinarian promoters alongside the creation of a network of epidemiological surveillance in the TCO Tacana, contributed to the

development of preventive and curative methods, consequently reducing the risk of disease transmission from domestic animals to people and wildlife (Domestic, n.d.).” When farmers and local veterinarians are educated, animals are healthier, herd losses are decreased and lives are being impacted. The urgency of this crisis can not be ignored, and action has to be taken. Training Bolivian farmers and veterinarians does not mean sending hundreds through veterinary school, but it does include equipping farmers and current veterinarians as well as possible. By educating these farmers, they are less reliant on outside assistance and become in control of their farms future.

Moving into the second program, the Louis Dreyfus foundation has projects working toward training Bolivians in effective agricultural entrepreneurship and offering three year technical education to citizens. This program shows great potential to be scaled up and innovated to involve animals. The techniques they train in entrepreneurship transfer into animal husbandship as farmers must be knowledgeable about the business element of selling their animals, managing funds, and increasing the efficiency of their farming (Supporting, n.d.). Technical school training leads students into financial autonomy, providing them with the opportunity to grow the economy and support their families. Although this may seem unrelated to animal health superficially, it is not. The technical school is focused on agriculture. While it currently focuses on sustainable plant farming techniques, it leaves an incredible amount of room for expansion into animal care. Training could expand into topics such as vaccine application and basic veterinary care. There are no boundaries for the potential benefits that the expansion of this project could bring.

The growing hunger crisis in impoverished countries such as Bolivia can not be ignored. Animal health is a keystone to the success of the economy from both an individual family and nation wide scale. If preventative care is prioritized in the realm of animal health in the same way it has been in human medicine, the effects will be tremendous. Bolivian farmers will have more stable and healthy herds, which then leads to both a prosperous economic climate and increasingly plentiful food state. The root of this success is in the underlying education. Implementing programs that involve both parent and child will prepare the new generation to change their future while improving upon the current state of agriculture at the same time. So often the focus turns solely to what happens once the animal is gravely ill or the disease has spread to the majority of the herd, but this logic is flawed. The solution is not the best method of disaster control, but instead preventing the disaster all together.

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