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The Detriment of Foot and Mouth Disease to Nepal's Livestock

Nepal, a small, landlocked country located between India and China, is one of the poorest nations in the world. The remnants of an ancient caste system, poverty, and low levels of education create a trap that restricts upward mobility. More than one third of the population lives in poverty (Rural Poverty Portal), and most adults are illiterate (World Bank 2013). Although the caste system is no longer a legal system of discrimination, it is still widely accepted by the populace, and the most disadvantaged group in the country is the lowest caste, called “dalits” or “untouchables” (Rural Poverty Portal). A vast majority of the Nepali population, including most untouchables, live in rural settings, seventy-five percent of the population works in commercial agriculture, and most rely on subsistence farming to feed their families (CIA World Factbook). The pervasive poverty in Nepal forces families to send their children off to work as laborers rather than attend school. This leads to a vicious cycle for poor families whose uneducated children become uneducated laborers who later cannot afford to send their own children to school (Rural Poverty Portal). There are few opportunities for upward mobility, particularly among the lower castes, so the poor remain poor, and devastatingly so.

Agriculture is central to Nepal's economy and the lives of its citizens, accounting for almost 40% of its GDP (CIA World Factbook). Almost 80% of the population are rural subsistence farmers; however, the focus on subsistence farming means that the farms' products are not being marketed or distributed to the rest of the population (Redding et. al). As a result, food prices are high and still on the rise (Shrestha). Farmers commonly keep water buffalo, cattle, and goats, (Redding et. al). Livestock products include milk, cheese, butter, meat, and wool. In addition, “Cattle and buffalo provide the majority of the draught (draft) power for cultivation and harvesting and the main method of transportation in rural areas, their manure is the main fertiliser for soil nutrient replacement (and is also increasingly used for fuel)” (Ferris et. al). Impoverished Nepali families' livestock is among their most valuable assets.

Mehkhu and her husband Puspa Gurung and their three children are an example of such a poverty stricken family. She was nineteen at the time of their marriage, and he was twenty one. The marriage was arranged by their parents; they had met only once before the time of their Arsha, a Hindu wedding ceremony. Once her dowry was settled, she moved with her husband to the village where his family has lived for many generations. They now live on a farm which can barely sustain them. It is half a hectare (about 5,000 sq meters) in size. They have a vegetable garden and several goats. She raises chickens and takes care of their tiny home made of clay and dirt brick walls and a roof thatched with bamboo. It is a two-room house, with a kitchen on the ground floor and a sleeping room above. She spends hours fetching water from the closest well nearly half a mile from their home. The water is often not safe for drinking, and is a constant source of worry for her.

Their eldest son Adesh has helped his father farm from a young age. Now fourteen, he herds their neighbor's cattle away from the village to graze each morning and returns each evening. He attended

school for two sessions years ago, and although his parents wanted him to be educated so he would have more opportunities and be more successful as an adult, they can not afford to lose his income after the death of his grandfather. Namita is a daughter in the family, who was born at home nine years ago. She was born with a cleft lip, a condition that could easily have been treated in the West., but there is no doctor near her parents' rural village, and certainly no surgical facility, so her condition went untreated. It was hard for her to nurse as an infant; she remains small and weak for her age. She has never attended school and probably never will. Her parents will search for a husband for her in their same caste and send her off with a dowry; they will be fortunate to find someone who will accept the small dowry as she is disabled. She spends her days looking after her one-year-old brother and her aging grandmother, who is suffering from early onset dementia and requires constant supervision and care. The family eats twice every day: once in the mid-morning and once in the early evening. Their meals are almost always rice and some vegetables from their garden. Only rarely is the meal supplemented with meat from their livestock. Two years ago the family nearly perished after buying a goat that had a small, nearly unnoticeable sore on its muzzle. Within a week their small herd of goats was infected with foot and mouth disease. Some of the goats died while others became weak and produced less milk or stopped milk production entirely.

The death or illness of livestock, whether epidemic or more local in scale affects the wellbeing of families and villages as well as the country's fragile economy. Nepali farmers' reliance on goats, cattle, and buffalo, all of which are susceptible to foot and mouth disease (FMD), exposes a large portion of the Nepali economy and the welfare of its citizens to loss from a single agent. This disease is an endemic of great concern for Nepali farmers. In 1992, it led to an estimated 10% reduction of income (Ferris et. al). Presently the endemic of foot and mouth diseases comprises a 20% reduction in milk production and 10% meat loss (Chandra). The estimated economic loss is US\$ 66 million per year, although the actual loss could be much higher due to reduction in breeding efficiency and draft power (Chandra). Infected animals become weak, no longer produce milk, lose muscle tone, and can no longer perform as draft animals due to sores in their feet, making them an expense, rather than a source of income. Because Hinduism is common in Nepal, many farmers object to killing their cattle, as cows are considered sacred. As a result, the infected cattle contaminate the rest of the herd, which eventually makes the entire herd almost useless to the farmer. They end up losing far more than only the few cattle they may have lost if they had culled them when the disease was first detected, rather than leaving them in the herd. In 2002, China did not allow Nepalese dairy products to enter the country because of the presence of FMD, and Tibet has restricted cross-frontier grazing (Chandra). Nepal has suffered significant economic losses due to the FMD endemic.

In the early stages of FMD, animals show a rise in temperature, go off their feed, separate themselves from the rest of their herd, and may be found lying down. They salivate copiously, and there is a noticeable quiver in the lips. Blisters form on the animals' tongue, dental pad, muzzle, gums, and the bulbs of the heels. In later stages of illness, animals lie down almost constantly, and can only hobble lamely when forced to move. Blisters may begin to pop, leaving raw, open wounds. In sheep, mouth wounds are often not noticeable, but they develop a severe limp. The FMD virus is highly contagious among livestock, as it is present in liquid from the blisters, milk, saliva, and dung. It can also be airborne or transmitted by anyone or anything that comes in contact with it, like tires, people, vermin, dogs, cats, or nearly anything else ("Foot and mouth").

Currently, a number of nations have successfully eliminated FMD from their livestock, but few of those countries had a situation comparable to that in Nepal. Neighboring China successfully expunged the disease by culling affected animals and developing strict regulations regarding livestock transportation (Chandra). Presently, if an outbreak is reported in the nation, all susceptible livestock exposed to the disease are destroyed (China Research and Intelligence Co., Ltd.). China's and many comparable strategies used to expel FMD from within a nation have been largely successful, however Nepal presents significant obstacles to implementing similar plans. Mandatory culling of infected or exposed animals conflicts with most Nepali farmers' religious beliefs; such a strategy would likely create distrust and non-compliance with the system among the farmers. Because of its culture, unique compared to most FMD-free nations, the approach to eradicating FMD in Nepal must also be unique.

Barriers to curing or reducing the prevalence foot and mouth disease in Nepal include lack of funds, uneducated farmers, and lack of available veterinary service. Farmers may be uninformed about FMD, or may be hesitant to report an outbreak, allowing the disease to spread. They also lack the necessary information about how to handle an outbreak, and they usually do not have a veterinary consultant to help. There is now a laboratory in Nepal's capital, Kathmandu, specifically for FMD research, and there is a vaccine to prevent the disease. Unfortunately, many farmers cannot afford to vaccinate their livestock or do not have access to vaccinations. The nation struggles to control outbreaks and prevent repetitions of previous catastrophes involving FMD, like they recently experienced in 2006 (Department of Livestock Services).

The government of Nepal must take the lead in the struggle to prevent FMD in livestock. Most importantly, the government must work to educate farmers about the disease in order to spot and report an outbreak before it becomes widespread. The high illiteracy rate requires face-to-face instruction with small groups of farmers. If religious and community leaders are taught about the symptoms of FMD and given instruction on how to teach the material to local farmers, there can be significant advantages over using print or broadcast media. First, this method would allow two-way communication between the local leaders and the farmers, allowing the teachers to verify the successful transmission of information and the farmers to ask for and receive clarification of issues. Also, using local leaders to teach local farmers allows the educators to tailor the delivery of the information so that it will be best received by their population, thus making teaching faster and more effective. Third, using local religious leaders gives a farmer the peace of mind that his or her religious beliefs have been represented in the plan. Lastly, when questions or problems arise later, the local leaders are still near enough to consult, monitor, and verify farmers' understanding and compliance with the program.

Along with well-informed farmers, the other keys to eradicating the FMD virus in Nepal are vaccinations and surveillance. The Nepali government must isolate livestock in order to minimize the risk of spreading the disease. Distributing the vaccine can be complicated, as currently available vaccines must be kept refrigerated and no one vaccine protects against all different serotypes. There are seven serotypes of FMD, which means that the distributor of the vaccine must first identify the serotype in an area before distributing the appropriate vaccine (Rushton et al.). The vaccines cost between US\$.40 and US\$ 3 to produce and distribute. The difficult conditions in rural Nepal and the cost of refrigeration would make transporting the vaccine challenging; therefore, the price would be in the upper range for the nation (Rushton et al.). Also, the vaccines are effective for only four to six months, so they would have to be

given two or three times annually (Rushton et al.). If vaccines were produced and distributed at a price of US\$ 3 to all of the estimated 22.16 million FMD-susceptible livestock in Nepal three times each year, the cost would be almost US\$ 200 million each year (Chandra). It would take several years to completely eradicate the virus. If a five year vaccination and culling program were put in place with the intention of eradicating the FMD virus from Nepal, after which vaccinations would no longer be needed, the cost would be almost US \$1 billion. In those five years, it can be assumed that the estimated annual loss of US\$ 66 million due to FMD would decrease each year as the virus became less prevalent. Excluding the money saved during the five years of the program, it would take fifteen years of such savings to show a financial benefit, but if the government maintained strict policies on livestock transportation and surveillance to keep the FMD virus out of the country, the wait would be worth the money.

In order to deal with infected cattle, religious leaders should be approached to work out a solution. Negotiating with them to help support their communities will be the most effective way to find a solution that the farmers will agree to. Faith leaders should recommend that farmers cull sheep, goats, buffalo, and pigs to stop the virus from spreading to their other livestock. If the population cannot be convinced to cull their cattle, the process of eradication will be slower and cost more in that area, but eradication of the virus is still possible.

Although the plan would eventually pay for itself, Nepal would first need money to implement the comprehensive plan. As one of the world's poorest countries Nepal has very few resources available to undertake such a program on its own. The country's neighbors, China and India have a natural interest in an FMD-free Nepal. Currently, China is FMD-free and India has ranked FMD as their number one priority for control (Venkataramanan). Both countries have stable economies and are greatly affected by the status of FMD in Nepal. It is in their best interests to help the poorer nation control the disease in order to protect their own livestock and their efforts towards eradication. Protecting their borders is costly, and even if they prevent infected livestock from entering the country, the disease could still be transported across the border on any materials that have come into contact with the disease, and cause an outbreak. Already in the spring of 2013, China dealt with such an outbreak, although the source was unconfirmed (Zhongqi). These outbreaks are expensive and dangerous, so China and India might assist the government of Nepal to help protect their own livestock.

If Nepal cannot find the money to start up a five-year plan, there is a second option: eradication by zone system. In this system, rather than a full-fledged effort directed at country-wide eradication, areas may be zoned for individual attention. Thus, resources may be directed toward those areas most likely to comply with restrictions and therefore most likely to succeed. Following successful initial programs, the resources could be spread. Although it is less expensive to begin, the zone system has several problems, including possible contamination across zones, its more lengthy time frame, and the cost of purchasing more vaccines required in that longer time frame. This system has been successful in India and other nations, and could be in Nepal, as well, with proper security precautions surrounding the zones.

In the coming years, there is hope that the FMD virus will be completely eradicated from the world. Many first world countries like the United States are already FMD-free zones, one of the seven serotypes hasn't been reported since 2004, and there is a global effort to fight FMD. Now, resources must be focused on impoverished rural nations that need to save their livestock, like Nepal. Recently, scientists in the U.K. used a cyclotron to map the surface proteins of the FMD virus and made a new synthetic FMD vaccine. Although it is still far from being ready to distribute, according to research leader David Stuart, it is “close to the holy grail of (FMDv) vaccines” (Lundeen). This vaccine is safer to produce than its predecessors because the empty shell it uses can not revert back to its infectious form (Lundeen). Although production will be expensive, the distribution will be made easier and cheaper because this vaccine does not require refrigeration. Once it is approved for global use, this vaccine could be the light at the end of the tunnel for families like Mehkhu’s in developing nations, allowing more consistent production which would lead to a better quality of life. With breeding efficiency, milk production, and overall value of their livestock improved, these families may be able to afford to educate their children and meet their own health needs.

Works Cited

- Chandra, Vijay. "Situation of Foot and Mouth Disease and its Progressive Control Initiatives in Nepal." Web. 21 December, 2012.
- CIA World Factbook. "South Asia: Nepal." *Central Intelligence Agency*. 26 March 2013. Web. 29 March 2013.
- Department of Livestock Services. "Livestock Statistics of Nepal." *Government of Nepal Ministry of Agriculture Development*. Web. 28 March 2013.
- Ferris, N.P., Donaldson, A.I., Shrestha, R.M., Kitching, R.P. "A review of foot and mouth disease in Nepal." *Rev. sci. tech. Off. int. Epiz.*, 1992, 11 (3), 685-698. Web. 12 January, 2013.
- "Foot and mouth." *DEFRA*. 8 February 2013. Web. 14 March 2013.
- Lundeen, Tim. "New FMD vaccine signals advance in global disease control." *Feedstuffs*. 28 March 2013. Web. 31 March 2013.
- "Nepal." *World Bank, n.d.* Web. 12 February 2013.
- Norman, Marie Kamala. "Nepal." *Countries and their Cultures*. Web. 28th March, 2013.
- Redding, Laurel; Chetri, Dipesh Kumar; Lamichhane, Dirga Kumar; Chay, Yoon; Aldinger, Lauren; Ferguson, James. "Animal production systems of small farms in the Kaski district of Nepal." *Springer Link*. October 2012, Volume 44 Issue 7, pp 1605-1613. Web. 30 March 2013.
- "Rural Poverty in Nepal." *Rural Poverty Portal*. IFAD, n.d. Web. 30 March, 2013.
- Rushton, Jonathan; Knight-Jones, Theo. "The impact of foot and mouth disease." Web. 30 March 2013.
- Shrestha, Deepesh Das. "Nepal: High Food Prices Make Life Difficult." *World Food Programme*. 23 October 2012. Web. 30 March 2013.
- Venkataramanan, R. "India Foot and Mouth Disease Control Initiatives." *Indian Veterinary Research Institute Bangalore*. FAO, n.d. Web. 19 July, 2013.
- Zhongqui, Zhang. "China (People's Rep. of) notifies one FMD outbreak." *World Organization for Animal Health*. 10 July, 2013. Web. 17 July, 2013.