

1 **Appendix A:**  
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- 3 • As the global human population increases, rapid changes in land-use and water scarcity are impacting many areas  
4 in Africa including Rwanda. Deforestation and human encroachment of farms and grazing lands has led to  
5 competition for water, environmental degradation, decline of wildlife, economic competition between businesses,  
6 communities, and animals, and the increase in transmission of zoonotic diseases including bovine tuberculosis  
7 (TB) and brucellosis among others.[1] Those who raise traditional livestock, often disproportionately women,  
8 depend upon water for both grazing and drinking; agriculturists depend upon water for crop production.[2 3]  
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- 10 • Around the world, thousands of children die from diarrheal diseases that are linked to the human-animal-  
11 environmental interface. Cow mastitis is one common cause of diarrheal disease in children. Lactating cows  
12 become infected either from farmers who pass the infection between animals (unhygienic conditions in the  
13 environment, hands of the milker, or contaminated milking machines.) Milk is rarely pasteurized and is usually  
14 consumed in its raw form resulting in diarrheal disease and brucellosis. Not only does infected milk place human  
15 health at risk but it also places a family's income at risk and thus their own food security.[4]  
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- 17 • Aflatoxins are naturally occurring toxins found in commonly consumed grains including corn and sorghum. They  
18 are particularly common when grains are stored in warm, moist climates such as Rwanda.[5 6] The toxins,  
19 produced by a common fungus (aspergillus) found in soil, and are highly carcinogenic often resulting in liver  
20 cancer.[7] Not only are the toxins found in infected grains but they can also be found in poultry and dairy milk  
21 when cows are fed contaminated feeds.[8] Unfortunately, they resist pasteurization temperatures.  
22
- 23 • Multi-drug resistance bacterial infections are increasingly common among humans and animals . This is due to  
24 the fact that it is a common practice for people to consume milk from cows and meat from poultry that haven been  
25 treated with antibiotics. These antibiotics cannot be easily detected by the technology and they create difficulties  
26 treating human diseases given a very limited formulary found in most resource poor nations.[9] [10]  
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29 **Appendix B:**  
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32 **Girinka and One Health – an Example**

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34 In an attempt to reduce childhood malnutrition, promote poverty reduction, and provide livestock education one local  
35 policy, known as Girinka, provides one cow per family. The tradition dates back centuries when a cow was given to  
36 another to show respect, appreciation, or as a dowry. To date, nearly a quarter of a million cows have been provided to  
37 poor families. While the policy was successful in many of its goals it created new unintended problems related to animal  
38 husbandry and zoonotic disease. People and animals needed to co-habit areas that were until recently solely the domain  
39 of humans. Competition for water, crops, and space created misunderstandings among and between families and villages  
40 with the result being poor health and early mortality of cows. Diseases once confined to the animal population were  
41 emerging in humans, and poor hygiene among villagers lead to mastitis in cows, poor milk quality and childhood diarrhea.  
42 Solutions will come from a ONE HEALTH approach.[11]  
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