

IB Extended Essay

The Environmental and Economic Impact of the Beef Industry in Colorado

Research Question: How can the Colorado beef industry be changed to be more environmentally and economically sustainable?

IB Subject: World Studies, economic and/or environmental sustainability

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Abstract

This essay was written with the purpose to inform about the beef industry and its effect on the economy, specifically the state of Colorado, and its effect on the environment. How can the Colorado beef industry be changed to be more environmentally and economically sustainable? To answer this question, information about the economic gains for Colorado as well as the United States were used to display the positive aspect of the beef industry and its contribution to Colorado and the U.S economy. The process by which cattle are bred through from farm to slaughterhouse and what they are fed are explained to give background information in order to understand any sort of standpoints and their respective reasons. A brief comparison of two opposite cities was added in the essay to give a perspective of outcomes from two different ways of living. Information about the negative contributions of the beef industry towards the environment were also explained to display information about greenhouse emissions and resource energy that is used and not necessarily talked about often enough. This essay was written to create an awareness of how much the beef industry affects the environment and the economy, and what can be considered as a solution to fix, or at least lower the dangers towards the environment without affecting the steady economic gains that are obtained through the beef industry in Colorado. In this essay, it was concluded that lowering the production of beef and therefor making beef more expensive as well as informing people about its effect on the environment in a way that can be fully understood will allow for a more sustainable environment as well as keep benefiting Colorado's economy.

Word Count: 280

Introduction

The environmental issues caused by beef production not only in the United States but worldwide are constantly exposed by social media and mass communication. Though people are exposed daily to the issues that consuming meat has on the environment, the demand for beef in the United States is still high at a constant rate of growth and does not seem to be slowing down any time soon. Aside from the exposure of the negative side of beef production, there is also a great amount of advertisement for the production of beef. In commercials and other sources such as nutritional videos beef is popularized for the amount of protein that it has. In most restaurants as well, the majority of the dishes have meat in them. Fast food chains offer more food with meat in them than salads or food with no meat. Most of the burgers that are considered to be in the dollar menu of many of these fast food chains barely have any lettuce or tomato in them; most of them are a beef patty with a bun and a slab of lettuce. However, the price is affordable and the taste is good, so people are not necessarily bothered by how unhealthy burgers actually are. The meat-eating culture that exists in the United States brings a negative connotation to other diets such as veganism because it makes not eating meat seem irrational.

Meat is so popularized in many places that the thought of not eating meat on purpose sounds outright silly to people which often leads to ridiculing people who chose to not eat meat without thinking about the fact that not eating meat is better for the environment. When people buy beef they generally don't go to the store with this information in mind, or in any other place around the world for that matter. This goes to say that people do not even think about how they are affecting the environment when they buy beef. They don't think about the environmental impact of feeding all the cattle, the transportation of the cattle from farm to farm, the water footprint of the cattle, exporting the beef, and many other factors that go into allowing people to simply go to a local market and buy packaged and pre-cut beef. If people were to be more conscientious about how they contribute to environmental degradation, and if they were to choose to consume less meat, would this be economically sustainable for the state of Colorado.

Economy of the beef industry in Colorado

The beef industry in Colorado is similar to any beef industry in the country. Overall, production of beef in the United States is pretty high. Around 30.3 million beef cattle are raised in the United States annually¹. There are close to 619,172 farms specializing in the beef cattle inside the U.S, which are spread mostly in the Midwest part of the country as there is vaster land available and it is more rural². The state of Colorado is ranked at 10th place out of all the states in total amount of cattle raised and produced for slaughter³. According to 2015 statistics, the economic impact of beef production in the United States is \$88.25 billion in farm gate receipts⁴. As for the state of Colorado on its own, there are around .870 billion existing feedlots with a capacity of 1,000 or more cattle within the state, ranking it up to number 4 out of all the states⁵. The average amount of cattle sent to slaughter each year in the state is around 2.65 million heads. The beef production's economic impact on the state is at around \$2.8 billion⁶.

The process of raising cattle

A factor of great importance to the production of beef is feeding the cattle, which greatly depends on agriculture. Newborn calves start off with a weight of around 70-80 lbs. when they are born. They are fed their mother's milk to get antibodies from the milk itself that they were not born with to be healthier later on when they are separated from their mothers. After 6 to 8 months of weaning they are then sent to feed lots, though not all of them are sent to feed lots; some are kept as dairy cows to breed more cattle as

¹ Association, National Cattlemen's Beef. *Beef industry statistics*. 14 Mar. 2016. <<http://www.beefusa.org/beefindustrystatistics.aspx>>.

² Association, National Cattlemen's Beef. *Beef industry statistics*. 14 Mar. 2016. <<http://www.beefusa.org/beefindustrystatistics.aspx>>.

³ Association, Colorado Cattlemen's. *Colorado cattlemen - Colorado beef statistics*. 2016. Web. 11 Sept. 2016. <<http://www.coloradocattle.org/coloradobeefstatistics.aspx>>.

⁴ Association, National Cattlemen's Beef. *Beef industry statistics*. 14 Mar. 2016. <<http://www.beefusa.org/beefindustrystatistics.aspx>>.

⁵ Association, National Cattlemen's Beef. *Beef industry statistics*. 14 Mar. 2016. <<http://www.beefusa.org/beefindustrystatistics.aspx>>.

⁶ Association, Colorado Cattlemen's. *Colorado cattlemen - Colorado beef statistics*. 2016. Web. 11 Sept. 2016. <<http://www.coloradocattle.org/coloradobeefstatistics.aspx>>.

well. The average weight of a cattle sent to a feedlot is around 600-800 lbs.⁷. The food that they are given in the feedlots is called feedstuff. It contains a variation of food: Roughages (hay, grass, grain hulls, oil seeds), typically high in fiber and low on energy to feed the cows more and make them fatter; grains (corn, barely, outs) that are high in energy and low in fiber with a moderate protein content; oilseeds (soybeans, canola oil) that are high in protein and energy; Byproducts such as distillers grains, sweet corn cannery waste, bakery waste grain screenings, and apple pomace, which are usually given in lower amounts due to the higher levels of sugar in them⁸. One cow eats an average of 24 lbs. of feedstuff a day. Considering the fact that 88% of the feedstuff is dry matter, overall their food intake would be around 27 lbs.⁹. Cattle in feedlots consume an average of 30 gallons of water per day each. This changes with the seasons, as around 1 gallon of water is needed per 100 lbs. during the cold seasons, and 2 gallons of water are needed per 100 lbs. during warmer seasons. Lactating cows drink twice as much as feedlot cattle. Once a cow reached a weight of around 1,320 lbs. it is sent to a slaughterhouse¹⁰.

Environmental impact of the cattle

The environmental impact of having so much livestock in such clustered areas is affecting the atmosphere, more specifically, cow farts are affecting the atmosphere. When feedlot cattle fart, they release a chemical compound called methane. This is caused by eating food that their digestive systems cannot digest correctly, such as corn. Colorado cattle in feedlots are feed feedstuff that contains a little less than 50% of corn¹¹. The economic advantage of corn is that it is cheap and easily accessible to cattle

⁷ State, Oregon. *Cattle 101: History, breeds, fun facts, terms*. 28 July 2016. <<http://beef2live.com/story-cattle-101-hist-breeds-fun-facts-terms-0-104671>>.

⁸ Printer, Queen's, and Ontario. *Basic beef cattle nutrition*. n.d. <<http://www.omafr.gov.on.ca/english/livestock/beef/facts/91-066.htm>>.

⁹ Rasby, Rick, and University of Nebraska- Lincoln. *Determining how much forage a beef cow consumes each day*. 2016. <<http://beef.unl.edu/cattleproduction/forageconsumed-day>>.

¹⁰ 2014. *How much water does it take to produce meat?* The Cattle Site, 26 Apr. 2016. <<http://www.thecattlesite.com/news/49594/how-much-water-does-it-take-to-produce-meat/>>.

¹¹ Andrews, Ryan. "Cattle feedlot: Behind the scenes." *Blog*. Precision Nutrition, 23 June 2010. <<http://www.precisionnutrition.com/cattle-feedlot-visit>>.

farmers. Currently the methane emissions in the United States are up to 11%¹². The water footprint of cattle is also affecting the environment greatly. The global water footprint average of beef cattle is 15,400 liters per kilo. An average sized feedlot cow's water footprint is at around 9,220,625.26 liters of water¹³. Feedlot cattle aren't necessarily let out to graze on land freely because their feces can contaminate nearby waterways, or other wild animals can come in contact with their feces which then spreads any potential diseases that the cattle's feces may have, such as E. coli in most cases. However, cows are vaccinated to reduce the potential spread of disease¹⁴. Another environmental impact of cattle are the carbon dioxide emissions of transportation of the beef. Transporting cows from far to feedlots within the United States accounts for around 5% of the total carbon dioxide emissions in the country¹⁵. Colorado, however, exports meat to different countries, including far overseas countries like South Korea and Japan¹⁶. This adds to the percentage of oxides of nitrogen and carbon dioxide emissions. A full grown beef cattle yields around 490 lbs. of beef, and one quarter pound patty takes up 1,036 BTUs of fossil fuel energy¹⁷.

Comparing two cities

Thinking locally in Colorado, in Colorado Springs around the downtown area of Palmer High School, there aren't any restaurants that are mainly vegetarian. Mostly all eateries have dishes with meat in them, though many have lots of vegetarian options. Skirted Heifer, a burger joint near the school, seems to always be packed with people. Their burgers are about the size of one hand with outstretched fingers and have thick beef patties with a skirt of cheese on them, depending on what burger people choose to

¹² EPA, US. *Overview of greenhouse gases*. 9 Aug. 2016. <<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>>.

¹³ 2014. *How much water does it take to produce meat?* The Cattle Site, 26 Apr. 2016. <<http://www.thecattlesite.com/news/49594/how-much-water-does-it-take-to-produce-meat/>>.

¹⁴ BCRC. *Environmental footprint of beef production - beef cattle research council*. 2016. <<http://www.beefresearch.ca/research-topic.cfm/environmental-footprint-of-beef-production-6#water>>.

¹⁵ BCRC. *Environmental footprint of beef production - beef cattle research council*. 2016. <<http://www.beefresearch.ca/research-topic.cfm/environmental-footprint-of-beef-production-6#water>>.

¹⁶ Colorado, State of. *Department of agriculture – markets*. 2016. <<https://www.colorado.gov/pacific/agmarkets/colorado-beef-exports>>.

¹⁷ Barclay, Eliza. *A nation of meat eaters: See how it all adds up*. NPR.org, 27 June 2012. <<http://www.npr.org/sections/thesalt/2012/06/27/155527365/visualizing-a-nation-of-meat-eaters>>.

order. Their burgers are a good example of the meat-eating culture in Colorado. In contrast to Colorado Springs, veganism is growing in popularity in the city of Portland in Oregon. Portland has become the most vegan-friendly city in the United States. Recently, a vegan mini mall was opened in the city area of Portland, where not only vegan restaurants are included but also clothing shops and grocery marts. Overall, the city consumes less meat than many other cities, including Colorado Springs. Though Colorado Springs has many people with an environmentally conscientious way of life, buying from local markets that have grown in popularity, it is still greatly attached to the meat-eating culture. Even without buying food at a local farmer's market, which can be a bit expensive, when buying groceries people still buy a lot of meat. The average price of beef at a grocery store is at \$6 a pound, making vegetables mostly cheaper than beef at most grocery stores. Something that needs to be considered, however, is that many families eat take-out or in restaurants rather than a home cooked meal because many parents do not have the time to cook at home, and often times it is easier for families to eat out, especially large families. For large families living in the lower income range, buying from fast food chains is more affordable and tastes better than eating something like vegetables, so when given the option people will generally chose to eat from fast food chains rather than a vegetable or a piece of fruit from the grocery store.

Economic and sustainability issues

The beef industry has an overall positive effect on Colorado's economy. Colorado's beef exports represent around 91% of the whole country's total exports, adding up to the amount of \$497 million. The overall beef exports for the United States adds up to around \$3 billion¹⁸. In contrast with the positive contribution to the state's economy, the beef industry contributes negatively to the sustainability of the environment as a whole. Beef and meat production in general has not decreased enough to start to create a change that indicates people are starting to consume less meat. If anything, meat consumption is slightly

¹⁸ Colorado, State of. *Department of agriculture – markets*. 2016. <<https://www.colorado.gov/pacific/agmarkets/colorado-beef-exports>>.

rising at a steady level in the United States. There is a large portion of people that prefer to buy organic beef over inorganic and feedlot cattle beef, but ultimately it comes out to be the same. If anything, buying organic and grass-fed beef is more damaging to the environment because the demand for beef is still relatively high, and producing beef out of an unsustainable and uncontrolled environment is more expensive and calls for more tedious work. Grass-fed beef is harmful to the environment because there are too many cows grazing on land that needs to be taken care of constantly and is of limited supply, meaning that the cattle can overgraze and also damage the land. Not only is this damaging to the environment but it is also damaging to Colorado's economy. In the end it will cost more to produce grass-fed beef and the supply won't be leveled with the demand for it. Feeding cattle feedstuff is much cheaper and much more efficient in fattening up the cattle for slaughter. Generally speaking, when buying healthy food the diet that people choose is ultimately influenced by their own need to stay healthy, which in a way excludes any decision making based on trying to achieve an environmentally sustainable diet. This is in part caused by the fact that veganism, the most environmentally sustainable diet, is hard to keep up with. Oftentimes this is because many people do not enjoy or have the time to cook, so eating a dish that doesn't contain animal products is quite hard to do. Also, since people do not like to cook, eating only fruits, vegetables, and beans seems like one of the most boring diets, and probably is when people do not know how to prepare a good vegan meal. A vegan diet, when it isn't practiced in a healthy way, can lead to lack of protein and mineral levels and cause health issues; being vegan is hard work so it is much easier to not try in the first place.

Economic Advantages

Families in the United States consume large amounts of meat annually. This is considerably a great advantage for all the family owned cattle farms. The hundreds of thousands of ranching families are the epitome of family farming in the U.S. They dominate the cow-calf sector and are responsible for most

of the 33 million beef calves produced each year¹⁹. Most cattle farm families earn enough income to live within a stable economic income, allowing them to pass on their business to younger generations within their family. Family owned farms as well as corporate owned farms also contribute to keeping a steady level of employment. In all, companies involved in meat production, along with their suppliers, distributors, retailers and ancillary industries employ 6.2 million people in the U.S. with jobs that total \$200 billion in wages²⁰. The beef production industry has been providing a steady employment rate, therefor providing a positive aspect towards the nation's economy as a whole. Not only is the beef industry in itself providing a positive aspect towards the economy, but how the remains of the cattle are used also contributes towards the economy. Almost everything from that was left after the slaughterhouse is used in making everyday products, such as shampoo, lotions and cosmetics, pet food, some human food, and many other products. But whatever the contents they will, like food processed for human consumption, have gone through a thorough cooking process designed to eliminate bacteria and moulds and ensure a hygienic end product²¹. Another economic advantage that the beef industry provides is the fact that the U.S exports large amounts of meat to other countries annually. Japan (\$1,080 million), Mexico (\$852 million), South Korea (\$778 million), and Canada (\$925 million) are the top markets for U.S beef, taking up over 90% of all exports in 2015²². The beef industry is a considerably great advantage for the economy as a whole.

Environmental standpoint

When it comes to greenhouse gas emissions, it's sometimes odd for people to think of cattle as a source of gas emissions. There are those who know of all the methane emissions from cow burbs because

¹⁹ Kay, Steve. "Beef Industry Makes A Colossal Contribution to U.S. Economy." Beef Magazine, 8 Oct. 2014. <<http://www.beefmagazine.com/blog/beef-industry-makes-colossal-contribution-us-economy>>.

²⁰ "The United States meat industry at a glance." 2015. Web. <<https://www.meatinstitute.org/index.php?ht=d/sp/i/47465/pid/47465>>.

²¹ Cross, Sue "Slaughterhouse waste - it all has to be dealt with: A case for the Vegan option continued." 14 Feb. 2013 <http://www.huffingtonpost.co.uk/sue-cross/horse-meat-slaughterdhorse-veganism_b_2684502.html>

²² "USDA ERS - statistics & information." 6 Oct. 2016. Web. <<https://www.ers.usda.gov/topics/animal-products/cattle-beef/statistics-information.aspx>>.

of their diets, but many other people are unaware that the beef industry produces a high amount of greenhouse gases. The beef industry is not very considerate of the environment, but business is business and people still want to eat meat. In an article by CNN written by John B. Sutter in November of 2015, the writer travels to various parts of Texas explaining the environmental impact of eating beef, specifically his own impact after eating a 1.27 lb. of brisket plate. He called it his 70 mile meal, since all the carbon emissions from the process of getting that meal to his table for him to eat was the equivalent of driving a gas-fueled car for 70 miles. In the article, it is explained how not only raising large amounts of cattle adding to carbon emissions, but what the cattle are fed is doing so as well. The fertilizer that is used to produce the corn that is then fed to the cattle in feedstuff is grown with fertilizer that releases nitrous oxide into the atmosphere, with it being about 300 times as potent as carbon dioxide²³. Not only does the beef industry affect greenhouse gas emissions, but it also affects land and water use. Cattle water footprint is something that should be considered by people as well, since the water used for the cattle cannot be compensated for thereafter. This includes the water the cattle drink, the water that is used to grow their food, the water that is used for the farms and lands towards breeding and growing the cattle, etc. In the US to produce one pound of steak requires around 1,799 gallons of water on average²⁴. In order to fully understand the environmental impact of the beef industry there should be a comparison available for buyers to see and ponder with, just as the writer compared his meal to a 70 mile car ride.

Solutions to consider

When dealing with the issues of how cutting back on meat production will affect Colorado's economy, which seems to be more important to people than its environmental impact, there is no need to start taking any drastic measures such as cut off all beef production. This would cause a huge outrage with a large population of not only the state but the country as a whole, and it would greatly impact

²³ Sutter, John D. "Why Beef Is the New SUV." *CNN*. CNN, 25 Nov. 2015. <<http://www.cnn.com/2015/09/29/opinions/sutter-beef-suv-climate-two-degrees/>>.

²⁴ 2014. *How much water does it take to produce meat?* The Cattle Site, 26 Apr. 2016. <<http://www.thecattlesite.com/news/49594/how-much-water-does-it-take-to-produce-meat/>>.

Colorado's economy. The beef industry contributes a lot of money towards the state's economy as well as towards employment rates, so cutting back on meat to a larger extent in a short period of time would be irrational. The cattle themselves are not an issue, as cattle reproduce on their own and are not at an unsustainable level, but the effects of having so many cows being bred and fed is the problem. The environmental impact of these cows should be lessened, and in order to do that there needs to be a change in their diets and a gradual change in the amount of cattle that is being bred. A change in their diets could be replacing corn by simply adding more of the other ingredients to the feedstuff, though doing so would be a bit more expensive. This will cause the price of beef sold in grocery stores to be a bit higher. Since meat is in such high demand, people won't stop buying meat because the price is higher but maybe they will start to buy less. Others who are at an economic disadvantage will only buy meat on certain occasions because of the higher prices. Another change that can be made that, if done slowly and in low numbers each time, can lessen the environmental impact of beef is breeding less cattle. By increasing the price of meat there will be a bit of a decrease in the amount of sales made but the economy won't be as greatly affected as it would be if beef production was to be reduced greatly, though doing so would be great for the environment. Something that can be easily done and would be of a great advantage is to educate people about the environmental impact of their eating habits. On the label packaged beef there could be information about how much resource and energy it took to produce that package of meat. Doing something like comparing beef consumption to an everyday task such as driving a car would increase people's awareness of how much the environment is being affected by the beef industry.

Colorado's economy as well as its people benefit from the beef industry, and if people are willing to make a small sacrifice, the environment will also slowly benefit. If the production of beef is limited to a constant minimal extent, Colorado's environmental sustainability will benefit and its economic sustainability will keep benefiting at a sound rate.

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