

**CATTLE RANCHING AND SOYBEAN CULTIVATION AS  
DRIVERS OF DEFORESTATION IN THE BRAZILIAN  
AMAZON, AND ON-GOING POLICY RESPONSES**

**by**

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## **ABSTRACT**

Deforestation in the Brazilian Amazon causes reduction of tropical forest, loss of genetic resources and biodiversity, as well as the decreasing ability of carbon sequestration. It owned the name of “the lungs of the world”, because it can help regulate the climate change, maintain carbon stocks and provided fresh oxygen. However, 20% of these areas have gone forever due to different social, political and economic purposes, especially the development of cattle ranching and soybean industry. With the development of exports and imports, the job opportunities in related industry are provided, and construction of infrastructures benefits the local people, in order to improve the living quality. Adversely, the destruction is going along. The disturbance of ecosystems, the water contamination, the increasing fire risk and lost homeland for indigenous people never stop. Furthermore, the latent loss can’t be recorded and calculated, such as the extinction of species (Blue Planet Biomes, 2003). Comprehensive understanding of the causes and outcomes of deforestation in the Brazilian Amazon will be helpful to make appropriate management decisions.

**KEYWORDS:** Deforestation, cattle, soybean, Amazon, management

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# **1. INTRODUCTION**

## **Environment/Ecosystem background**

The Amazon River Basin is a unique home to the largest tropical rainforest, which encompasses 6,915,000 km<sup>2</sup> (WWF, 2013). Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Suriname and French Guiana, these eight countries share it together. Almost 2,121,000 km<sup>2</sup> of it is covered by rainforest, with 60% of the rainforest is in Brazil (Rhett Butler, 2006). More than 80,000 plant species exist in the Amazon rainforest, and half of them are vital during controlling the global climate, purifying the air and making sure the ecosystem function well (Morales, K., & Vinicius, T.2005). Thousands of studies indicate there is huge flora and fauna existing in the Amazon Rainforest, it not only services for the local residents, but also for the whole world. Photosynthesis and evapotranspiration are basic functions of forests, which influence the oxygen amount and water cycle in the world. Furthermore, it directly or indirectly supplies medicines or foods in global scale.

## **Social background**

Before 1960s, the rainforest was restricted to access and the tropical forest was kept intact as laggard equipment and unenlightened thought. In the 1940s, the Brazil has started a series of program to develop and exploit this nature area. The president --- Getúlio Vargas encouraged that “The Amazon, under the impact of our will and labor, shall become a chapter in the history of human civilization... Everything which has up to now been done in Amazonas, whether in agriculture or extractive industry... must be transformed into rational exploitation” (Hall, A.L, 1989). After his suggestions, many programs were established to increase the economic development. The key turning point happened in 1970, the president of Brazil wanted to solve the poverty problem in the northeastern regions by developing and exploiting the forest resources.

Additionally, in 1970s, the government set up the National Institute for Colonization and Agrarian Reform (INCRA), the program of developing highway, such as the Trans-Amazonian highway, which is easy for accessibility of its timber and mineral resources (Xia Wu, 2013). And the pristine forest is opened up for logging and a new era starts.

### **Economic background**

After the Second World War (1939-1945), the demand of foodstuffs was climbing rapidly. At that time, the United States was the world's largest exporter of soybean and beef (Lester R. Brown, 2009). In the 1960s, the demand of beef in the international market has increased rapidly, it could bring with lots of profits and occupied market share, as well as remit the world hungry (Hall, A.L, 1989). While in the 1970s, the United States was stuck in solving domestic food price problem, stopped exporting temporarily. So the other importing countries were seeking for suppliers, at the same time, the Brazil was planning to plant other crops to improve economic growth. Due to large beef export, high demand of crops and economic incentive, the forest land has turned into pasture gradually, it's just the beginning. The Trans-Amazon Highway (Fig.1), was a significant change to Brazil Amazon's economic development (Hall, A.L, 1989). It goes through the Amazon rainforest and connected with seven states within Brazil, as well as provides accessibility of resources and easy transportation, more access to forest area and natural resources means more destruction.

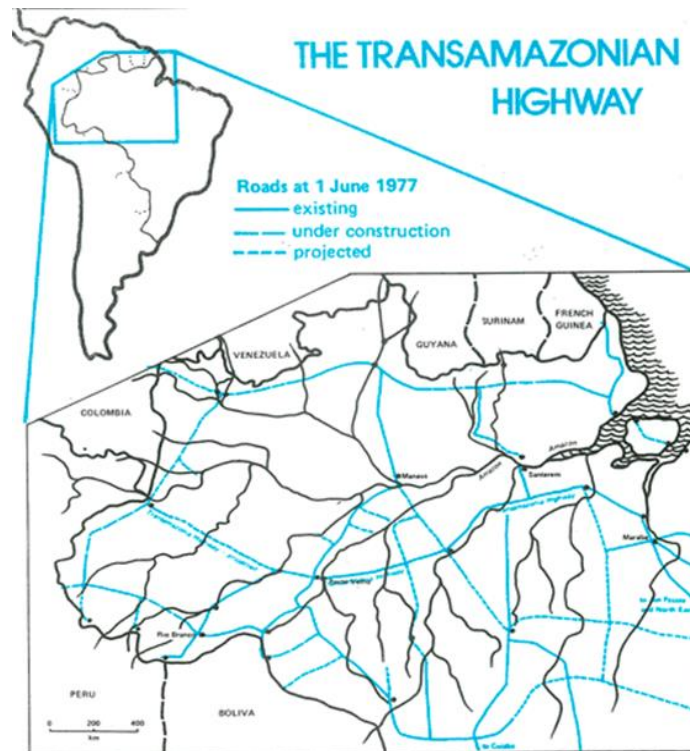
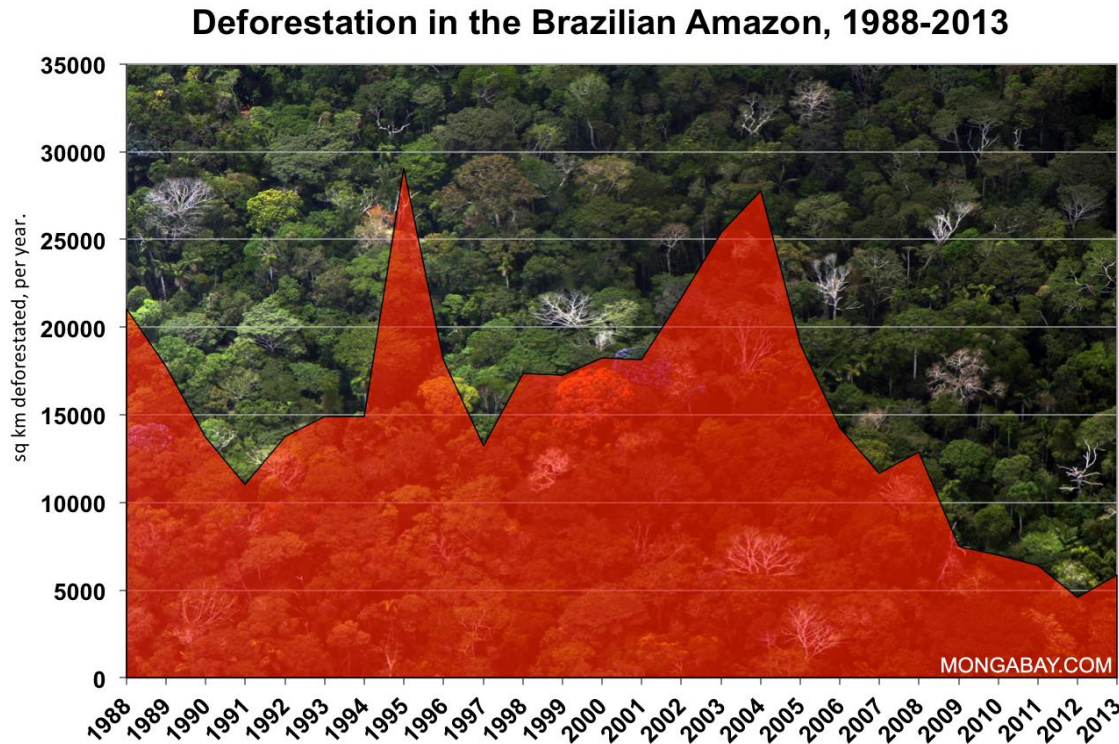


Figure 1. Route of Trans-Amazonian highway. Sources: New Internationalist magazine.

### Current Deforestation State

The Amazon basin is the world's largest remaining rainforest, as well as the shelter to abundant wildlife and plants, it is home to almost one-third of all species in the world (The Nature Conservancy, 2014). However, since several decades ago, deforestation has become accelerated in this rainforest. According to the statistics provided by WORLD PRESERVATION FOUNDATION, the rate of deforestation in the Amazon is highest in the world, and more than 15% of forest has lost since 1970 (WPF, 2010). To be more specific, in the latest data provided by the Brazilian Spatial Institute from August 2012 to July 2013, the annual deforestation rate rose 28%, rebounding after years of declining (WWF, 2013). However, it doesn't disturb the slowing deforestation trend, the figure 2 demonstrates annually specific deforestation area in the Brazilian Amazon from 1998 to 2013. In general, it fluctuated since records began to 2004, and keeping declining trend in recent years.





*Figure 2. Deforestation in the Brazilian Amazon, 1988-2013 (Butler Rhett, 2013).*

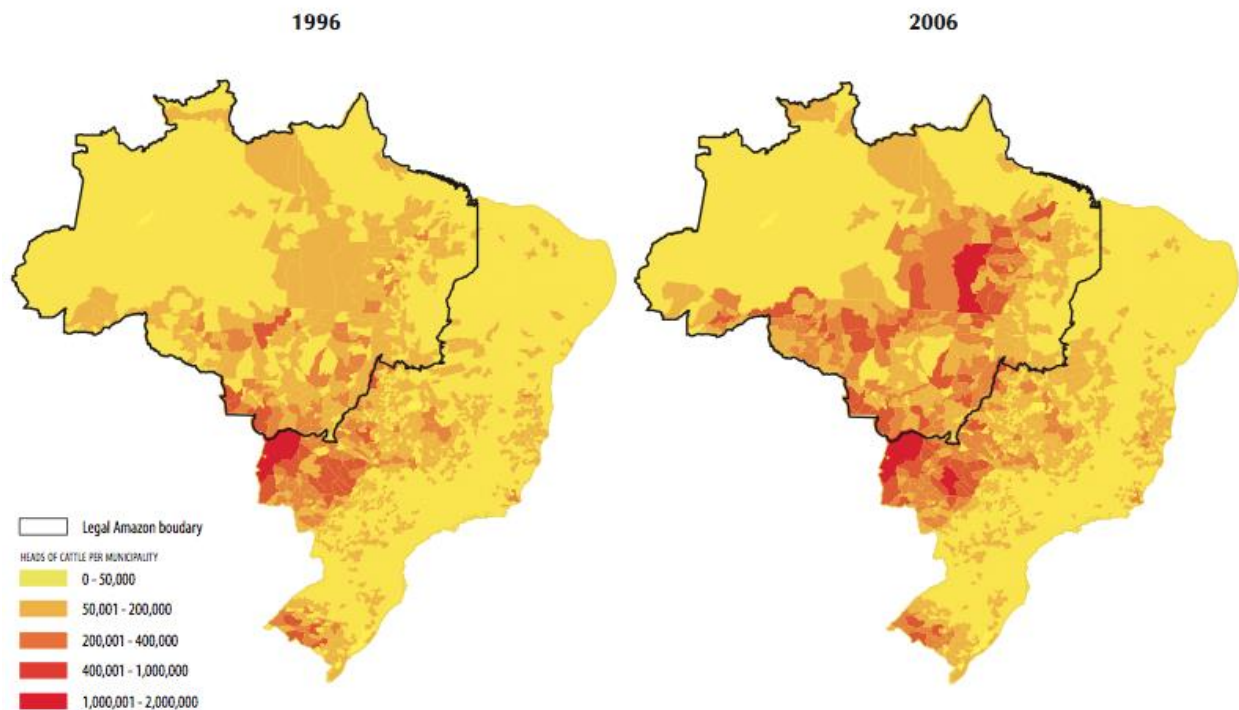
The leading causes of deforestation in the Brazilian Amazon are four: cattle ranching, large-scale agriculture (commercial agriculture), small-scale agriculture (colonization) and logging.

## **2. THE DRIVERS OF DEFORESTATION**

Extensive cattle ranching has become the biggest cause of deforestation for decades, according to a new report by Brazil's National Institute for Space Research (INPE) and its Agricultural Research Corporation, cattle pasture has caused 65% of area deforested until 2008 in the Brazilian Amazon, in recent year, it's even up to 75% (Rhett Butler, 2012). More than half of Brazil's annual GHG emission is due to forest loss, Brazil is the third largest GHG emitter, after China and the U.S (Bustamante, M. M. C.*et al.* 2012). Brazil has gone through progressive

waves of land colonization for decades, the forest land has been converted into for pasture for raising cattle, swine or chicken.

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*Figure 3. Cattle ranching in the legal Amazon between 1996 and 2006. (Greenpeace)*

The area covered by livestock farming in the Brazilian Amazon has increased nearly 10 million hectares from 1996 to 2006 (Fig.3) (Greenpeace, 2009). Moreover, the development of the soybean industry has helped Brazilians become second largest exporter of soybean after United States (Bickel U. and Dros J. M., 2003). The plantation of soy has become a recent and influential factor to deforestation in the Brazilian Amazon, as the Amazon rainforest has adequate rainfall, adaptive climate and rich soil that suitable for soy industry. Soybean industry has started since 1970s when agriculture rapidly developed, Brazil's government wants to replace US as first exporter in the world. The following parts will discuss about the different drivers of deforestation caused by cattle ranching and soybean expansion.

## **Environmental/Ecosystem drivers**

There are two significant reasons for growth in soybean production: environmental conditions and land limitations in other countries. Soybean prefers nutrient-rich, slightly acidic and well-drained, loamy soils, and are usually planted in the land has been deforested or used by cattle ranchers. Besides, the climate around the equator is suitable for many crops as they have longer growing season.

In the Brazil, most of the climate is semitropical or tropical, while the climate is temperate in United States. Most of rainfall can be absorbed by forest and soils, so it's wetter than United States and the fluctuation of temperature is more stable than United States (George Flakerud, 2003). Cost on shipping is a big deal to cattle and soybean, so, well-developed transportation system is an important factor. Actually, there are many programs set up for transportation efficiency, like highway BR-163, which even has a nickname as "soybean highway". It connected Mato Grosso and the Amazon River port, save lots of time and money spent on the shipping cost.

While, the conversion of forest land has brought with economic and social benefits, the Brazil's cattle and soybean industry has directly helped with the development of economy. They hold large market share of these productions on global scale, with rapid development of economy, many infrastructure construction programs has been promoted, such as, schools, hospital, related processing industry and transportation system. These don't only benefit the economic steps but also for the residents. More connections with other countries also bring with cultural communications and lots of investment. Employee rate increased quickly with so many industries and sectors coming which alleviating employment pressure, and provide chance for the local people to learn more about advanced technology, practical and sustainable way to manage forest

resources. Cattle ranching and soybean industry provide food for all the world and ease pressure of the global energy.

### **Social drivers**

For the national drivers, demand of domestic market by climbing population and tenure arrangement is key factors. Most of communities or tribes in the Amazon Rainforest have been relying on the natural resources for thousands of years. Exporting of beef and soybean is not only one of the income, but also a part of lifestyle. Beef and other livestock is a kind of food resources that could be used directly, or used for making leather goods. Soybean is often extracted and purified as vegetable oil or used as meal. In 20<sup>th</sup> century, with the population kept increasing, the demand for soy is expected to expand. It could relieve the pressure of foodstuff demanding and provide job opportunities for the local people. The establishment of transportation is vital factor of soybean expansion, such as the Madeira Waterway, the Itacoatiara soybean terminal, and the BR-333 Highway (Fearnside, 2000), which connected the crop land with the importing harbor.

In the global scale, the beef demand stimulated the forest destruction, "The deforestation is being fuelled by beef exports, with cattle ranchers making mincemeat out of the rainforests," said David Kaimowitz, director general of Cifor (John Vidal, 2004). Factors contributing to promotion of soybean industry include high demand for soybean from international market, especially China – largest consumer in soybean market; as well as the infrastructure improvement in the local benefits the exporter; and the arable land in Brazilian Amazon is more than other countries, as China and US have land limitations. They can't get more access to arable land, so in the future, the main producer countries will be Argentina, Bolivia, Brazil and Paraguay (Jan Maarten Dros, 2004). With the growing desire for soybean, it's expected to increase over 300

million tons every year in 2020, it obviously isn't enough area to meet this demand and still needs additional cropland (Jan Maarten Dros, 2004).

### **Economical drivers**

As largest beef exporter country, the country wants to take up more market share in global scale. The total beef export value has climbed to \$1.9 billion in 2005, which was decuple compared with \$190 million in 1996. During 2002 to 2004, the Brazil Amazon went through a significant agricultural industry expansion, which contributing 35% of the gross national product (Daniel C. Nepstad, 2006). Most of people in the Brazilian Amazon rely on the forest industry or correlated industries, cattle ranching is a traditional industry for local people's daily life. Both domestic and international market demand for beef and leather is increasing in recent decades, as increasing population and life quality. Huge profit can be obtained from massive conversion to pasture for both local residents and government. Any parts in cattle could bring with profits, leather could be made into shoes, handbags and clothes; bones, hooves and horns always could be made into piano keys, knife handles and many things even you can't image, every parts could make values. (Fig.4). And most of farmers have a complete product line, and transportation around the world becomes easier than before. Imported foodstuff can be found in anywhere around you. According to the the Brazilian Ministério do Desenvolvimento Indústria e Comércio Exterior (MDIC), in 1994, beef and leather export could make nearly 500 million US dollars, whereas, beef export could make more than 5000 millions dollars in 2008, and leather export could make approximately 2000 million dollars (Nathalie Walker *et al*, 2013). Huge profits accelerated the step of forest conversion. National and international economic drivers mixed and interlaced together to promote the blossom.

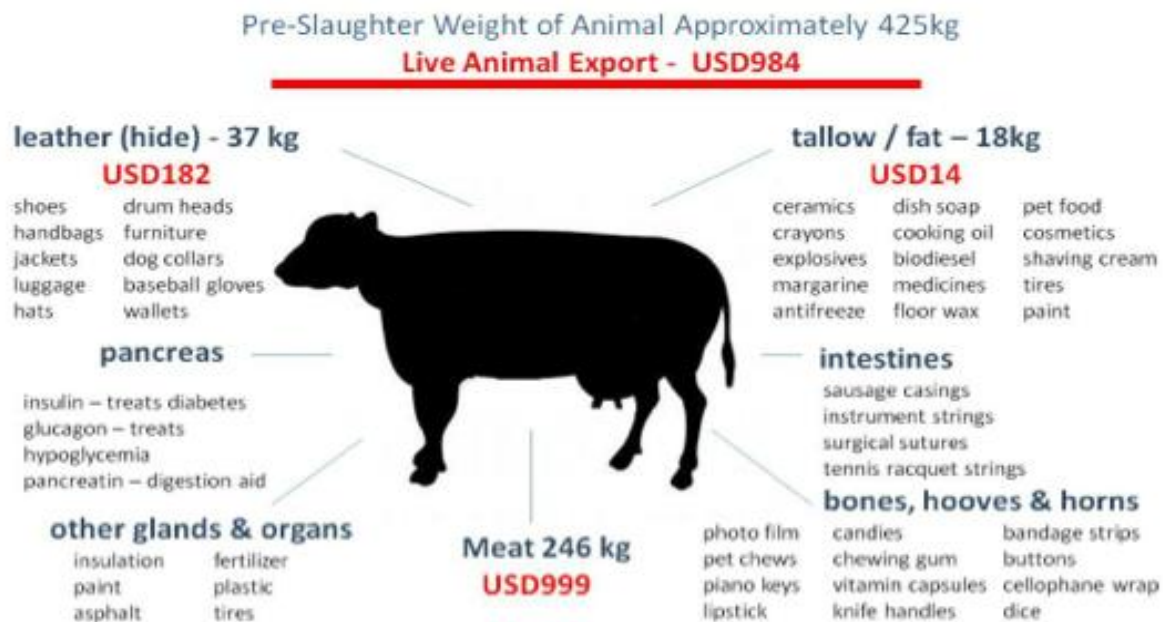


Figure 4. Export value for each product in cattle in 2010 (Nathalie Walker et al, 2010). Source: MDIC (2011), California Department of Food and Agriculture (2011), Oklahoma Cooperative Extension Service (2011), Oregon Foundation (2011), Meat & Livestock Australia (2011), PETA (2012).

There are three main reasons for expanding cattle ranching in the Brazilian Amazon, increasing demand and huge profits by exports; large continental area for agricultural development and convenient transportation network. Also, there also many factors provoke the step, such as, interest rate, labor salary and control over foot-and-mouth disease.

Combining with more convenient road access and less trade barriers, the exporting process is easier that generating more farmers and agricultural industry. For both development of cattle and soybean exporters, the accessibility of sources and trade barriers are definitely vital for them. Since 1990s, most of countries in the world joined into the global market to export or import product from each other, many trade barriers has been reduced, the process of cattle and soybean

export is stepped-up. Such as, export taxes on raw material and semi-manufactured products were eliminated in 1996 by Imposto sobre Circulação de Mercadorias e Serviços (ICMS), which greatly benefit exporter ((Schnepf, Dohlman and Bolling, 2001).

### **3. IMPLICATIONS OF CATTLE RANCING AND SOYBENA BOOM**

#### **Disappearance of biodiversity and natural resources**

The colonization for cattle ranching and large-scale agriculture have caused loss of habitat for wildlife, especially endangered species. Recent research showed more than 40,000 plants species, 1294 birds, 378 reptiles, 427 amphibians, and approximately 3,000 fishes exist in the Amazon. Currently, 5-10% of species goes extinction every decade, although extinction is natural process that occur, extinction is becoming more of a consequence that come with the economic activities human have induced (WWF, n.d). However, the stress from irrational land-use compelled lots of species run away from their habitat. It's not only species extinction but also loss of medical research. Every time species extinction happens, the ecosystem would be broken as each species in the earth has its value and position in food chain. Despoiling of goods and services from the forest that human always take for granted. Stated by the World Conservation Union, if we calculate the values made by the ecosystem as money, it would be \$33 trillion per year (WWF, n.d). Every year, approximately 50,000-70,000 precious plants could be used for medical research and development. Nowadays, more than one quarter of western pharmaceuticals are come from rainforest materials, and rich alkaloids (secondary metabolites) have high value in medical domain (Medicine Hunter, 2014). Inexhaustible treasure exists in forest but they are fragile when they suffer from the deforestation.

Until now, nearly 20% of forest land has lost and never come back again, due to illegal logging and commercial profits, some tall, healthy and old trees were cut down, which is marked changes in wildlife habitat and ecosystem. They could defend with sun, wind and extreme weather conditions, like a protective umbrella. Virtually, loss of forest equals to loss of canopy, canopy is home to many bird species, and canopy is a filter to rainfall purifying the rainfall automatically. If rain falls directly into the Amazon Basin, it would bring contaminant, and most of wildlife prefers to inhabit near the water resources, polluted water may cause animal sick or even die. In fact, the Amazon Basin occupied with one-fifth fresh water in the global. Canopy is usually used as sunshade, as the weather in tropical is scorching in summer, many plants and animals can't be exposed under the direct sunlight in order to refrain from water loss. Canopy acts as a buffer between external conditions and the Amazon inner space, especially its function in controlling temperature, canopy stops the sunlight and blocks the sun direct heating on the ground. And dropping leaves on the ground is a kind of fertilizer. However, deforestation has removed lots of surface vegetation, which contributes to soil erosion and degradation as there isn't any protection underground, the soil is exposed to sun, wind and rain directly. When floods or heavy rainfall happened, the soil with contaminant would be washed into the river then the sea, which harms water system and drinkable water. There are also other serious problems came after deforestation, such as soil compaction and soil nutrient loss (Philip M. Fearnside, 2005). Soil quality is closely associated with productivity, in reverse, low productivity would influence the pasture quality and crop quality, actually anything grows on the ground. In terms of soybean plantation, it depletes the soil faster than other crops (WWF, 2014).

### ***Water cycle system and fire risk***



Deforestation also leads to the disturbances for aquatic system. One of the basic functions of forest is storing water in roots or soils, then they could release water vapor through transpiration. The plantation in the Amazon can retain more than half water, which is quite important function in regulating climate and hydrological regime (Jessie Szalay, 2013). When forest area was removed for pasture or cropland, less precipitation can be held in the water and soil, and past remaining water evaporate quickly without the protection of trees. In the water cycle, less moisture retained on the ground means less evaporation, as a result with less rainfall, which finally decreased the annual precipitation in the Amazon, and the drying problem, Furthermore, declining soil quality would cause flooding, which contributes much containment to the water system. According to the research by Salati E. and P.B. Vose in 1984, they found the more than half of water could be recycled in the Amazon Basin; while, only 20-30% of water is recognized as recycling water by the research conducted by Lean, J., C.B. Bunton, C.A. Nobre, and P.R. Rowntree in 1996. As human knows, water is one of the most important parts in any life organisms, less water or polluted water has negative effect on both human and creatures. Slump of precipitation would induce the desiccation and other watersheds, and desiccation or drying season would easily cause fire in the Amazon forest, once forest fire happens in large-scale, it can't stamp out immediately, as all trees are flammable. And the following consequences needs lots of time and money to repair.

### ***Greenhouse gas emission and population growth***

Healthy and mature forest can absorb and purify the greenhouse gas (GHG) and make efforts to relieve global warming. The sequestration of carbon becomes less and more greenhouse gas stay in the atmosphere as deforestation. From 2000 to 2010, the 30% of carbon dioxide emissions in the Brazil was coming from export of beef and soybean (Jonas Karstensen *et al*, 2013). Also, logging

operations and artificial or natural fire also release lots of GHG into the air. Now, the annual greenhouse gas emission in the Brazil ranked third in the world. According to the organization – The Pachamama Alliance, the rainforest in the Amazon is responsible for one-fourth oxygen in the world, but the forest land declining every moment, if it can't be prevented, we would lose “the lung of world”. However, in recent research conducted by more than 30 non-government organizations found that the annual greenhouse gas emissions are dropping (Fig.6). Within the reasons contributing to green gas emissions, land-use change and forestry took more than 50% (Fig.6). After 1995, with the deforestation rate dramatically dropped, the GHG emission declined simultaneously.

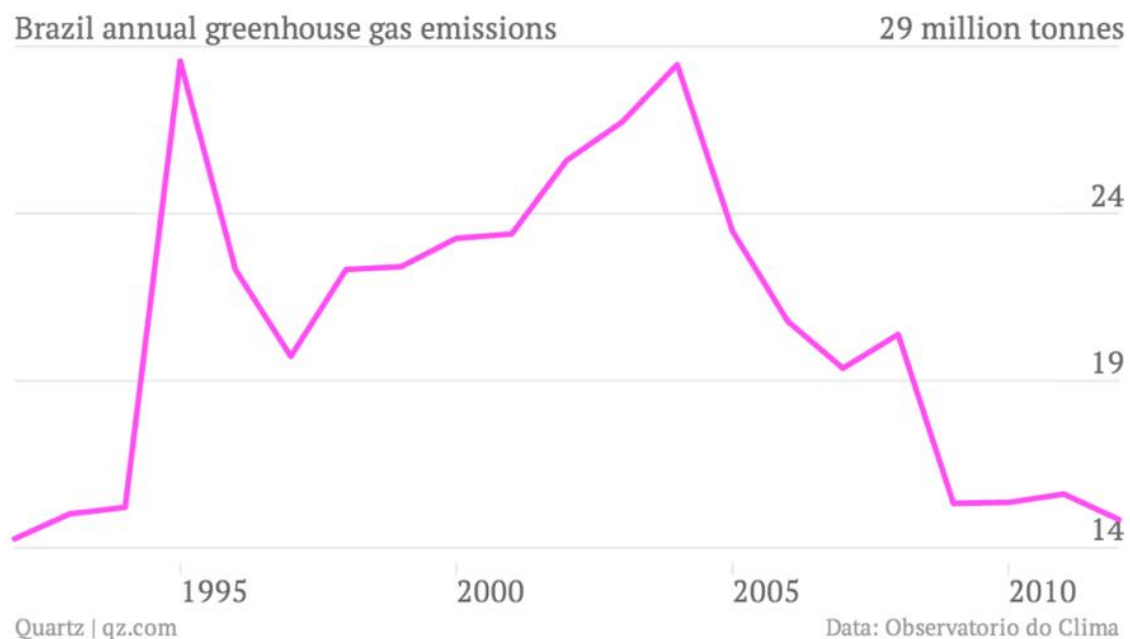


Figure 5. Brazil annual greenhouse gas emissions. Sources: Observatorio do Clima.

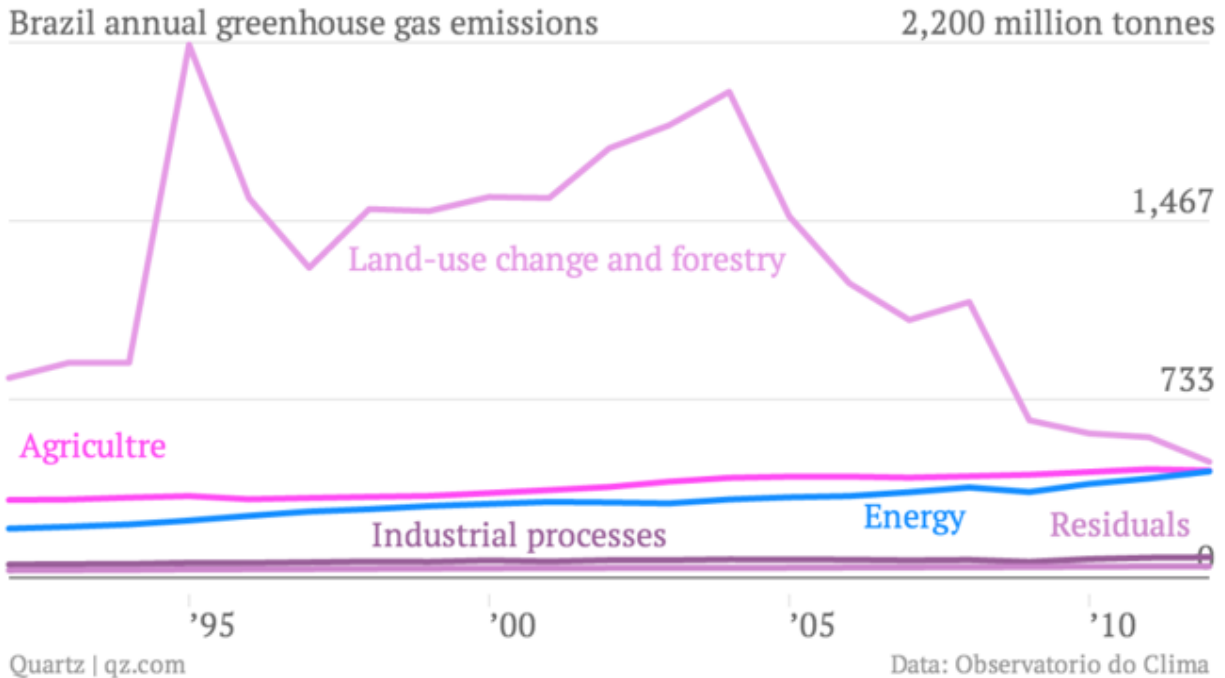


Figure 6. Causes responsible for the Brazil annual greenhouse gas emissions. Sources:

*Observatorio do Clima.*

### ***Disturbances to the indigenous tribes***

The local residents in the Brazilian Amazon, they rely on the forest resources to sustain life for thousands of years. They are using timber for house building, hunting animals for food, drinking water directly from the Amazon Basin, and using plants for medicine. After 1970s, many residents immigrated from their own place as artificial destruction, as they are used to the past lifestyle. As mentioned above, all implications of deforestation changes the indigenous people's life. Loss of trees, water pollution, high fire risk and environmental degradation perplexed them for quite long time. Especially for some indigenous communities, they prefer to live together in their own territory for self-sufficiency. They have their own food resources and lifestyle, however, it has been disturbed by loggers, rancher, farmer and businessmen. As rainforest has been destroyed,

they don't have enough room and have to relocate. They won't die without the rainforest, but it leads to psychological harm. They lose their culture, even belief, and last for many years. The indigenous people may not adapt the life in other places, there is no familiar faces, food and places, their knowledge about wildlife, nature and medicine may never be used again. "You have schools, we don't, but we know how to look after the forest", said by Davi Kopenawa Yanomami – Yanomami shaman and spokesman. In the past, as many local people didn't know well about the laws and their own rights, and developed countries abused and consumed the nature without concerning about the local people, they could do nothing to protect their homeland when selfish man grabbing the land from them (Randy Wilson, 2001).

#### **4. RESPONSES TO DEFORESTATION**

##### **Government Responses**

- ***Enforcement***

In 2009, there was a drastic debate between the Federal Public Prosecutor's Office in Pará State, most of the slaughterhouses committed to the Terms of Adjustment of Conduct (TAC) that they could only by the cattle with confirmation of the Pará State Rural Environmental Register (CAR) (Nathalie Walker, 2004). With the restrictions of government organizations, the cattle rancher, slaughterman and supermarket all slow down the deforestation indirectly.

In the report entitled "DETERring Deforestation in the Brazilian Amazon: Environmental Monitoring and Law Enforcement" by Juliano Assunção, Clarissa Gandour and Romero Rocha in 2013. It indicated that DETER – monitoring system, succeeding in helping law enforcer to monitor

actions, and remitting the pressure of deforestation (Ruby Barcklay and Vanessa Ramalho, 2013). The method will be popularized widely within the local people and industry in the future.

- ***Soybean Moratorium***

The production was growing faster than land cultivated, as many soy industry signed up with Greenpeace for “Soy Moratorium” to avoid fresh area deforestation (Fig. 7) (Greenpeace, 2006), the productivity of land was increasing effectively from 1990 to 2008. Soy Moratorium was set up on July 2006 and announced by Brazilian Vegetable Oil Industry Association (ABIOVE), which was aiming to stop the newly deforested area for soy in the Brazil Amazon and persuading more companies joining this alliance. The moratorium is a cracking turning point to show responsibility of exploitation without damage forest. Brazilian Vegetable Oil Industry Association (ABIOVE) and Brazilian Grain Exporters Association (ANEC), collaborated with their member companies promised not trade and support the soy in deforested areas within the Amazon Biome (ABIOVE, 2014). It has effectively fallen off the deforestation in the Amazon, only nearly 3% of deforestation caused directly by soy, and 41% of land succeeded in escaping from being removed by soybean industry (Greenpeace, 2007), since the “Soy Moratorium” was carried out.

With lots of support from non-government organizations (NGOs), including WWF, Greenpeace, The Nature Conservancy, Conservation International, and IPAM (Cargill, 2014), consociation between each other promises farmers who under the agreement would receive financing and technological support. The Soy Moratorium is expected to be revised in 2014 for getting consensus and further information on new Brazil’s Forest Code to get long-term sustainable development in soy.

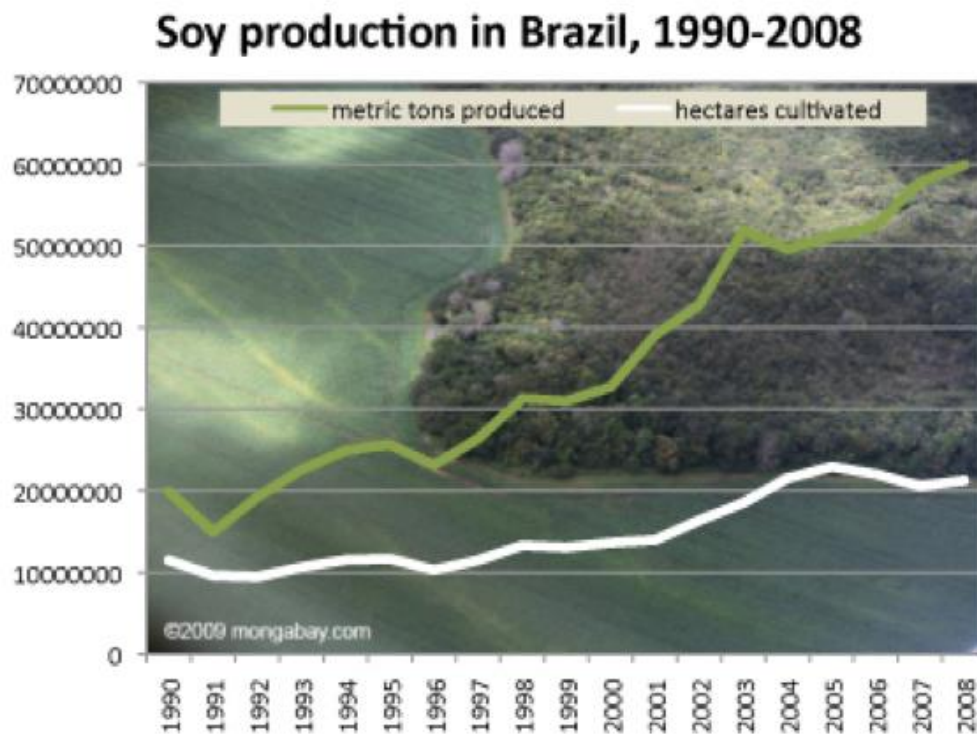


Figure 7. Soy production in Brazil, 1990-2008. Source: Mongabay.

## International Support

- **Greenpeace**

News on deforestation in the Brazilian Amazon has recorded continuous declining of destruction rate, while, in last year 2013, new data announced by the Brazilian government on November 14<sup>th</sup>, 2013, demonstrates the slightly increasing of 28%. A little change happened in this area would cause massive attention around the world. In the report “Slaughtering the Amazon” publicized by Greenpeace International on June 1<sup>st</sup>, 2009, pointing out the sector of cattle ranching is biggest driver of deforestation and proposed zero deforestation by 2020. In order to get close to their plan, they encourage industry change practice code and persuade consumer to use the non-forest products, try to find substitute for goods. Greenpeace also made efforts to cooperating

with the local tribes and spreading education in remote area, their voice is more powerful than anyone else, helping them defend their homeland in order to slow down the deforestation rate. They are also promoting the “Soy Moratorium” and “Zero Deforestation” in the Brazil, the movement is involved with support of different companies, such as Adidas, Nike and Timberland, who owning lots of manufacturing factories, even achieve an agreement, only when their products were proved that not related with Amazon deforestation, otherwise, they won’t produce anymore in there. Walmart and Carrefour are also joining the groups of zero deforestation. That’s an excellent model for other companies occupying the resources in Amazon (Greenpeace, 2009).

- ***Charity***

Save the Amazon Rainforest Organization (STARO) is a charitable group established in London by Jessica Hartfield and Dieter Bratschi, aiming to help the community sustain rainforest and promote conservation and protection in the Brazilian Amazon.

Sky Rainforest Rescue is trying to save trees in the Amazon rainforest, and it’s originated from Sky and WWF in 2009. Now, they had an agreement with more than 1,000 small-scale farming families that the destructive methods are not allowable any more. Furthermore, they help rubber worker utilize new technology to prevent from damage of trees by sustainable methods (Sky Rainforest Rescue, 2014). Advertisements on public website broadcast and call for donations.

The Amazon Charitable Trust (ACT), collaborating with Xixuaú Community to popularize the knowledge and sustainability with support of Coope Xixuau, INPA and the State Government of Roraima other three groups. They are concentrating on offering support for local communities and aiming to set up a science centre to support their scientific research.

- ***World Wildlife Fund***

WWF is working on Reducing emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks (REDD +) with United Framework Convention on Climate change. As deforestation in the Brazilian Amazon rainforest has caused large emission of greenhouse gas, WWF is hammering at addressing attention from nations and guarding for homeland.

### **What should we do in the future?**

- ***Consumer Choices***

Nearly all deforestation activities happened in the Brazilian Amazon is beneficial temptation, cattle ranching and soybean industry is for trading or foods or energy. So, substitute of these is quite crucial in maintaining the balance between environment and human. Additionally, numerous of resources are waste without sufficient knowledge and technology, thoughts and minds decided our behaviors, so public education is a way to improve the efficiency of resources utilization. Promoting sustainable bioenergy instead of wood and charcoal, as it's a renewable energy came from trees can't be used as lumber but should be cut down, thinning or pruning practices or died trees after disturbances in forest area. For individuals try to avoid waste and use recycled stuff, and export or importing countries only permit legal products in the market, cooperated with government, institutions and cattle slaughter to produce deforestation-free products.

- ***Involvement in society and campaigns***

Afforestation and habitat conservation is a key to rescue the lost forest and biodiversity. At first, Seeking more funds and support from the society, then planting trees in sustainable ways to restore the ability of carbon sequestration, living up "the lungs of the earth" reputation. Afterwards, persuading the indigenous people and local industry to be involved in this actions, one movement



is more worthy than thousands of words, at the same time, communicating with them as they are more familiar with how to manage the forest to reach its best status. Many excellent campaigns, such as Greenpeace and WWF, volunteers would provide equipment and knowledge to help the forest recovery from its current status, and they would try their best to save the inestimable forest without payment.

- ***Government enforcement***

Lastly, only with strong and strict policy, restrictions or laws, the final objective could achieve. Cancelling the tax incentives and reducing the accessibility of land which benefits cattle rancher or farmers. More efforts and attention should be paid on improving the productivity of land and indoctrinating “zero deforestation” in mind. It’s tough to make choice between profit and environment, while we have to consider and care about off-springs and future environmental conditions. The investment on education and insistence of strict policy is crucial, though it doesn’t work instantly, it will outstand in the long run.

## **5. Conclusion**

The study reveals the role of cattle and soybean in the process of the deforestation in the Brazilian Amazon, as well as the solutions and recommendation in the future. Soy production industry has large economic, ecological and social impacts (Bickel & Dros, 2003), same for cattle ranching in the Brazilian Amazon. All interest is based on someone’s scarification, it provides job opportunities, advanced technology, cultural exchange, infrastructure service and improving caste in world market, however, it destroyed and broke down the relationship between nature and human. Millions of years ago, god created nature firstly, then human.

Brazilian government and non-government organizations' efforts could make a huge change by establishing policy and laws, as well as cooperated with industry to achieve agreement on sustainable development on regulating and monitoring forest practices. The responses by government, organizations or individuals can get further progress by latest and useful methodology, which is really a good example for future actions. Consumers' wise choice is another important contributing factor to rescue the Brazil Amazon. Saving deforestation in Amazon is a huge project related with the social, economic and environmental problems, the situation has taken a turn for the better, which made us more confident. Reinforcing the efforts on each aspect and devoting more in sustainable development is priority.

## **6. Acknowledgement**

Sincere gratitude is hereby extended to Janette Bulkan, who offers me lots of knowledge and suggestions to complete this essay. I also appreciate everyone who helped and encouraged me in my whole university life.

## 7. Reference

ABIOVE, 2014. *Soy Moratorium*. Retrieved from:

<http://www.abiove.org.br/site/index.php?page=soy-moratorium&area=MTetMy0x>

On July 2006, ABIOVE (Brazilian Vegetable Oil Industry Association) and ANEC (Brazilian Grain Exporters Association), and their respective member companies, pledged not to trade and finance soy originated after that date in deforested areas within the Amazon Biome.

Bickel U. and Dros J. M. (2003) *The Impacts of Soybean Cultivation on Brazilian Ecosystems* (Bonn: AIDEnvironment-WWF). (Part 5, Para 1) Retrieved from:

<http://assets.panda.org/downloads/impactsofsoybean.pdf>

Ulrike Bickel and Jan Maarten Dros conducted three case study of soybean expansion in Amazon, respectively in Southern PIAUÍ, Mato Grosso, HUMAITÁ and the state of Amazonas. And it revealed the relationship between expansion and market demanding, as well as social, ecological and cultural situation. Finally it mentioned the implication of soybean expansion. Though it provided enormous profits for local and companies. These are huge loss to human and environmental we can't ignore, such as deforestation and biodiversity loss.

Blue Planet Biomes (2003). *Amazon Rainforest*. Para 1-3. Retrieved from:

<http://www.blueplanetbiomes.org/amazon.htm>

Blue Planet Biomes is a worldwide organization focus on biocenosis. And it indicated that the wildlife, plant and aquatic ecosystem in Amazon rainforest relied on the canopy. As well as analysis each layer of forest can provide different shelter and functions for ecosystem in order to keep balance within different communities.

Brent Stirton. (2013). *Unsustainable cattle ranching*. WWF Global. Para 1-3. Retrieved from:

[http://wwf.panda.org/what\\_we\\_do/where\\_we\\_work/amazon/problems/unsustainable\\_cattle\\_ranching/](http://wwf.panda.org/what_we_do/where_we_work/amazon/problems/unsustainable_cattle_ranching/)

Brent Stirton demonstrated three main factors of deforestation: cattle, soy and fire. Actually there are links between them, in drying season, the raging fire always puzzle the Amazon rainforest, because of extensive agricultural management.

Bustamante, M. M. C., Nobre, C.A., Smeraldi, R., Aguiar, A.P.D., Barioni, L.G., Ferreira, L.G., Longo, K., May, P., Pinto, A.S. and Ometto, J.P.H.B. 2012. *Estimating greenhouse gas emissions from cattle raising in Brazil*. *Climatic Change*, DOI: 10.1007/s10584-012-0443-3.

The study estimated the greenhouse gas emissions associated with cattle raising in Brazil, focusing on the period from 2003 to 2008.

Butler Rhett (2006). *Deforestation in the Amazon*. Retrieved from Mongabay.com. Web site:  
<http://www.mongabay.com/brazil.html>

Rhett Butler analyzed the reason for why the Brazilian Amazon is being destroyed. And he concluded several factors, such as clearing for cattle pasture, colonization and subsequent subsistence agriculture, infrastructure improvements, commercial agriculture and logging.

Cargill Company, 2014. *Responsible soy production*. Retrieved from:  
<http://www.cargill.com/corporate-responsibility/pov/soy-production/responsible-soy-production-amazon/index.jsp>

It indicates some detail about how Cargill and farmers cooperated with non-government organizations and shows successful achievement by the Soy Moratorium.

Daniel C. Nepstad, Claudia M. Stickler, and Oriana T. Almeida. 2006. *Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation*. Retrieved from:  
[http://www.whrc.org/policy/pdf/Brazil/Nepstad\\_et\\_al\\_2006\\_Cons%20Bio1.pdf](http://www.whrc.org/policy/pdf/Brazil/Nepstad_et_al_2006_Cons%20Bio1.pdf)

Keywords: conservation policy, deforestation, green certification, hoof-and-mouth disease, soy, beef markets, tropical conservation

Geist, Helmut J. and Eric F. Lambin (2002). *Proximate Causes and Underlying Driving Forces of Tropical Deforestation*, p1, BioScience 52(2):143-150. 2002 doi:  
[http://dx.doi.org/10.1641/0006-3568\(2002\)052\[0143:PCAUDF\]2.0.CO;2](http://dx.doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2)

Geist, Helmut J. and Eric F. Lambin did lots of studies to identify possible causes and determined that the deforestation is caused by combination of various factors. They were focusing on agriculture management and showed the case-based evidence to remain us there is demand for specific policy.

George Flakerud, 2003. *Brazil's Soybean Production and Impact*. North Dakota State University, Fargo, North Dakota 58105. NDSU EXTENSION SERVICE. Retrieved from: <http://www.ag.ndsu.edu/pubs/plantsci/rowcrops/eb79.pdf>

The author clearly stated the reasons for soybean rapid development and its implications. He analysed several aspects from geography, infrastructure, production, farms and soybean use.

Greenpeace (2009), *Cattle ranching expansion in the Brazilian Amazon*. Retrieved from:  
<http://www.greenpeace.org/usa/en/media-center/reports/cattle-ranching-expansion-in-t/>

It's a document published by Greenpeace for researching the cattle ranching expansion in the Brazilian Amazon between 1996 and 2006.

Greenpeace, 2009. *Global cattle giants unite to ban Amazon*. Retrieved from:  
<http://www.greenpeace.org/international/en/news/features/global-cattle-giants-unite051009>

After “Slaughtering the Amazon” has been published in 2009, Greenpeace has received lots of support from different professions, like Nike, Adidas and Walmart. It did help to achieve “zero deforestation” ideas.

Hall, A.L. (1989) *Developing Amazonia*, Manchester: Manchester University Press.  
Retrieved from: <http://sciencecases.lib.buffalo.edu/cs/files/amazon.pdf>

With increasing concern about deforestation in the Amazon, Hall collected some data about deforestation in history. I took the transportation history for reference.

Jan Maarten Dros, 2004. *Managing the Soy Boom: Two scenarios of soy production expansion in South America*. AIDEnvironment, Amsterdam. Commissioned by WWF.  
Para 1-3.

This article wrote about the overview of impacts of soy cultivation with focus on conversion of forest and savannah ecosystems.

Jessie Szalay, 2013. *Deforestation: Facts, Causes & Effects*. Para 11. Retrieved from:  
<http://www.livescience.com/27692-deforestation.html>

It includes statistics about the tropical forest, such as “forest loss contributes between 12% -17% of annual global greenhouse gas emissions”. Not too much information used in my essay.

John Vidal, 2004. *Demand for beef speeds destruction of Amazon forest*. Retrieved from:  
<http://www.theguardian.com/environment/2004/apr/02/conservationandendangeredspecies.internationalnews>

Europe's demand for beef made last year one of the worst ever for Amazonian deforestation, according to an international research report which quotes Brazilian government figures due to be released soon.

Jonas Karstensen, Glen P Peters and Robbie M Andrew. *Attribution of CO2 emissions from Brazilian deforestation to consumers between 1990 and 2010*. *Environ. Res. Lett.* 8 024005  
doi:10.1088/1748-9326/8/2/024005

Around the world, much efforts are made on reducing the deforestation. Many studies have found that production of cattle and soybean contributes to CO2 emissions in the Brazil Amazon.

Lester R. Brown. 2009. *Growing Demand for Soybeans Threatens Amazon Rainforest*. Retrieved from: [http://www.earth-policy.org/plan\\_b\\_updates/2009/update86](http://www.earth-policy.org/plan_b_updates/2009/update86)

Some 3,000 years ago, farmers in eastern China domesticated the soybean. In 1765, the first

soybeans were planted in North America. Today the soybean occupies more U.S. cropland than wheat. And in Brazil, where it spread even more rapidly, the soybean is invading the Amazon rainforest.

Livestock Information, *Sector Analysis and Policy Branch Animal Production and Health Division* (2013), *Cattle ranching and Deforestation*. Retrieved from <ftp://ftp.fao.org/docrep/fao/010/a0262e/a0262e00.pdf>

Forests have been cleared for many decades, it accumulated as an area size of India. Extensive deforestation causes environmental problems that we can't figure out specific amount. For instance, the loss of carbon sequestration and loss of canopy caused thousands of wildlife death.

Setting up accurate and specific policy is imperative, and compelling industry and company to take responsibility for deforestation and degradation in Amazon rainforest.

Medicine Hunter, 2014. *Amazon Rainforest Facts*. Retrieved from: <http://www.medicinehunter.com/amazon-rainforest-facts>

It contains some facts and data in rainforest, such as how much oxygen produce? How much fresh water it contains? And medicine men and women are relying in the Amazon area.

Merle D. Faminow, Merle D. (1998). *Cattle, Deforestation, and Development in the Amazon: An Economic, Agronomic, and Environmental Perspective*, p332-334. doi: 10.1002/1099-145X(200007/08)11:4<394::AID-LDR391>3.0.CO;2-8

Anderson examines the late colonial and early national periods of Brazilian history (1758 to 1911), combined with methodology, she concluded "Promoters in the nineteenth century repeated the mistakes of the colonial officials before them," she writes, and "developers today have ignored the errors of all previous generations". She showed the lessons from history to remained the followers. However, Merle Faminow thought the situation is not too serious, he use lots of figures and maps to demonstrated technological agriculture can fixed the problem of low productivity area.

Morales, K., & Vinicius, T. 2005. *Amazon rainforest: biodiversity and biopiracy*. *STUDENT BMJ*, 13, pp 386-7.

The Amazon rainforest is home to a flora with an enormous and vastly unexplored pharmacological potential. Klaus Morales and Tulio Vinicius investigate why biopiracy is becoming a threat to Brazilian biodiversity.

Nathalie Walker, Barbara Bramble and Sabrina Patel. (2010). *From Major Driver of Deforestation and Greenhouse Gas Emissions to Forest Guardians? New Developments in Brazil's Amazon Cattle Industry*. Retrieved from:

<https://www.nwf.org/~media/PDFs/Global-Warming/Policy-Solutions/NWFAmazonCattleUpdate.ashx>

Nathalie walker, Barbara Bramble and Sabrina Patel revealed that deforestation is obligated to over half of Brazil's annual greenhouse gas emission. And half of total deforestation in the world happened in Brazil. They concluded that successful efforts have been made for deforestation by declining the cattle expansion.

Philip M. Fearnside, 2000. *Soybean cultivation as a threat to the environment in Brazil*. Environmental Conservation, 28, pp 23-38 doi:10.1017/S0376892901000030

Soybean industry is a recent powerful threat to the Amazon Rainforest, and author tried to "develop effective strategies to contain and minimize the environmental impact of soybean cultivation requires understanding of both the forces that drive the soybean advance and the many ways that soybeans and their associated infrastructure catalyse destructive processes."

Randy Wilson, 2001. *The Effects of Rainforest Destruction on Indigenous Peoples Final*. Retrieved from: <http://jrscience.wcp.muohio.edu/fieldcourses01/PapersCostaRicaArticles/TheEffectsofRainforestDes.html>

Indigenous people are relying on the rainforest and it should be protected, like it said in article: "not just to compensate for the developed countries having destroyed all of their natural ecosystems, but because we have no right to destroy this also."

Ruby Barcklay and Vanessa Ramalho, 2013. *Brazilian Monitoring and Law Enforcement Prevented over 59,500 sq. km of Amazon Deforestation*. Retrieved from: <http://climatepolicyinitiative.org/press-release/brazilian-monitoring-and-law-enforcement-prevented-over-59500-sq-km-of-amazon-deforestation/>

According to a new study by Climate Policy Initiative, DETERring Deforestation in the Brazilian Amazon, it aimed to reduce the deforestation rate by satellite-based monitoring system, Which called DETER, and succeeded in slowing deforestation.

Schnepf, Randall D.; Erik Dohlman, and Christine Bolling, 2001. *Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops*. Market and Trade 14 Economics Division, Economic Research Service, U.S. Department of Agriculture, Agriculture and Trade Report, WRS-01-03.

I just focused on the trade barriers in author's article, and it's clear to see many trade barriers has been reduced as global market started.

Sky Rainforest Rescue, 2014. *Success so far*. Retrieved from:  
<https://rainforestrescue.sky.com/our-campaign/successes-so-far>

Sky Rainforest Rescue worked with WWF, and has made many achievements in controlling small-scale farming and reducing forest fires risk.

The Nature Conservancy (2014). *Brazil- Brazilian Amazon*. Retrieved from:  
<http://www.nature.org/ourinitiatives/regions/southamerica/brazil/placesweprotect/amazon.xml>

This is an organization for protecting nature, preserving life. They are contributing to conservation in indigenous lands, in private lands, as well as forests and climate.

World Preservation Foundation (2010). *Deforestation Statistics*. Retrieved from:  
<http://www.worldpreservationfoundation.org/blog/news/deforestation-statistics/#.UuCHLv2tv-k>

This article collected data from the United Nations Framework Convention on Climate Change (UNFCCC) to reveal the real deforestation rate to help us better understand the how it can trigger a series domino effects on the lifeforms of the planet.

World Wildlife Fund. *Amazon/Places/WWF*. (Para 1-3). Retrieved from:  
<http://worldwildlife.org/places/amazon>

World Wildlife Fund is a leading organization for wildlife conservation and endangered species, and they focus on Amazon Basin as there are millions of species, and it's largest refuge for these animals, especially for protecting animals.

World Wildlife Fund. *Climate Change Impacts in the Amazon: Review of scientific literature*. Retrieved from: <http://www.wilsoncenter.org/sites/default/files/WWFamazon.pdf>

The Amazon includes thousands of the world's biodiversity, sustains local people through agriculture and silviculture, and offers commodity for all people around the world.

World Wildlife Fund. *How does Biodiversity loss affect me and everyone else?* Retrieved from:  
[http://wwf.panda.org/about\\_our\\_earth/biodiversity/biodiversity\\_and\\_you/](http://wwf.panda.org/about_our_earth/biodiversity/biodiversity_and_you/)

We are relying on the biodiversity provided by the ecosystem and it indicated how much value it worth if we change it into money, it's more directly to show us the consequence.

William F. Laurance, Jeffrey Sayer, and Kenneth G. Cassman (2014). *Agricultural expansion and its impacts on tropical nature*. Trends in Ecology & Evolution February 2014 Vol. 29 NO. 2, pp. 65-126 ISSN 0169-5347.



The authors predict --- “major expansion and intensification of tropical agriculture, especially in Sub- Saharan Africa and South America; continuing rapid loss and alteration of tropical old-growth forests, wood- lands, and semi-arid environments; a pivotal role for new roadways in determining the spatial extent of agriculture; and intensified conflicts between food production and nature conservation”. And the connection between global population with healthy ecosystems.

World Ecology Report, 2012. *Food For Thought – Soybean Endangers Brazil Amazon Rainforest*. Post by Admin in WER ENGLISH 2011 VOL XXIII NO 4. Retrieved from: <http://worldinfo.org/2012/01/food-for-thought-soybean-endangers-brazil-amazon-rainforest/>

The author pointed out the achievements the government and some organization made to decrease the impacts of deforestation, but the challenges still remain.

Xia Wu, 2013. *Amazon Rainforest. Sustainable Development Research*. Retrieved from: <http://www.jxteacher.com/360222008002240008/column45863/a9f87f4c-fe04-4625-9d82-a657f59e9565.html>

It’s a Chinese teaching report on sustainable development on the Amazon rainforest. It analysed the current state of deforestation.