(Te Strake, 2017)

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Taxing and Managing Meat: An Integrated Approach to Tackle Climate Change

ABSTRACT

The livestock industry have become one of the main responsible for the current global climate crisis, however it still contributes significantly to food security as it is the main supplier of global nutrition, especially in developing countries. For this reason our project aims to the creation of a Global Tax Meat Scheme that will allow countries from all over the world to have a profound transition of the industry to cleaner livestock management while achieving a change on consumer's behavior.

Our project has the potential to make a difference considering that it takes into consideration the different realities between developed and developing economies; also because it not only targets states, but producers and consumers, focusing on education to raise awareness and a new sense of responsibility. At the same time, through the redistribution of the tax revenue, our project will foster innovation, which will allow the strengthening of food security.

THE TEAM

Our team represents a broad range of nationalities, cultures and professional legal backgrounds, which allow us to have a broad and rich perspective about international development problems.

We are all undertaking graduate studies in International Law and Global Governance at Tilburg University which crossed three core areas: International Law and International Relations; Human Rights and Human Security; Global Sustainability and Environmental Law.

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Undergraduate Education: LLB Universidad Gabriela Mistral in Santiago de Chile.
Prior to enrolling in the Master, Lorena had been developing her career as Attorney in the private and public areas. She served as acting Judge in Local Police Tribunal in Robinson Crusoe Island, she also worked as assistant attorney for the 29th Civil Court of Santiago and provided assistance to the Supreme Court of Chile as reviser attorney in the Civil Court Monitoring Department. Lorena also worked as counselor for the Municipality of Juan Fernandez in Robinson Crusoe Island, and participated in the creation of a Sustainable Tourism Company, where she acquired knowledge related to biodiversity and environmental aspects. All these work experiences had allowed Lorena to develop a solid interest in Justice, Human Rights and Environmental issues which she has been further exploring thanks to her current studies at Tilburg University.

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Prior to the enrolling in the Master, Maria had been developing her career as attorney in the private areas. She worked as a legal assistant in the legal department of the hospital Fundación Valle del Lili. After this, she joined the legal team of BTL Legal Group, a legal firm in Colombia, as the Coordinator of the Social Security area. However, her main interest has always related to environmental issues and human rights, and is hoping to pursuit a career as a researcher in this area.

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Prior to enrolling in the Master, Melanie had been studying French private law, European law and International law. She has always been involved in environmental issues through activism and campaigning for environmental protection. For instance, she participated in the creation of a biological farm in Belgium in 2014. It is only been few months since she have had the opportunity to study these issues academically through the specialization of International Environmental Law.

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During her studies she engaged in the research of Public and Private International Law, being orator on the XXI Inter American Moot Court Competition and part of the research group on the Moot Court of Foreign Direct Investment. She wants to aim her work on the protection of human rights trough responsible business conduct measures.

INTRODUCTION

Climate Change, constitutes one of the biggest challenges of our generation. Action and cooperation from every country is needed, as well as from every sector and industry.

While several actions to mitigate Climate Change have been developed in the most traditionally acknowledged pollutant industries, such as transportation, severe environmental impacts of Livestock industry has managed to remain in the shadows. In fact, a survey developed by Chatham House along with the Glasgow University in 2014[1], revealed how misinformed are people regarding the real impact of the livestock industry and the important role it plays when it comes to Climate Change, demonstrating that livestock sector is not recognized by people as a contributor. As a matter of fact, one-quarter of them considered that 'meat and dairy production contributes either little or nothing to climate change'[2].

(Behrend, n.d.)

Contrary to popular belief, studies have demonstrated that the Livestock industry contributes significantly to Climate Change. Indeed, production of livestock products involve the development of several activities which in combination generate direct or indirect environmental impacts. These effects occur during the different stages of the production chain, such as, through animal

[1] Rob Bailey, Antony Froggatt and Laura Wellesley, *Livestock – Climate Change's Forgotten Sector Global Public Opinion on Meat and Dairy Consumption* (2014) <https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20141203LivestockClimateChangeForgottenSectorBaileyFroggattWellesleyFinal.pdf > accessed 16 April 2018

[2] Rob Bailey, Antony Froggatt and Laura Wellesley, *Livestock – Climate Change's Forgotten Sector Global Public Opinion on Meat and Dairy Consumption* (2014) <https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20141203LivestockClimateChangeForgottenSectorBaileyFroggattWellesleyFinal.pdf > accessed 16 April 2018

physiology (enteric fermentation, respiration and excretions), animal housing, feed crops, manure handling, processing of livestock products and sub products, transportation and land use for livestock production (deforestation, desertification)[3].

On the other hand, the importance of the industry must be recognized, as its impacts reach several arenas such as social equity, economic development and public health issues[4]. This sector occupies a strong place in the economies of both developed and developing countries, and continues to grow. This phenomenon obeys mostly to the increase of the world population which has bring in turn a huge rise in the consumption of meat[5]. In fact, Livestock is one of the main food sources in the world, representing a 17% of the calories and a 33% of the protein consumed globally[6]. In poor countries, livestock products consumption is related with the reduction of mortality and the improvement of cognitive development of children[7], which leads to believe, at first, that meat/dairy consumption is an assertive risk reduction strategy for vulnerable communities.

According to Philip[8]:
'The total meat production in developing countries tripled between 1980 and 2002, from 45 to 134 million tons (…) in countries that experienced rapid economic growth, particularly in East Asia (…). In developed countries, on the other hand, production and consumption of livestock products are now growing only slowly or stagnating, although at high levels. Even so, livestock production and merchandizing in industrialized countries account for 53 per cent of agricultural GDP'.

Even though there is a commitment and a mandate under the different treaties and agreements according to which, countries have to meet their greenhouse gas emission goals, livestock industry is not really targeted, so these objectives won't be met as the projections indicate that animal

[3] Melissa M. et al, *Climate change and livestock: Impacts, adaptation, and mitigation*, (2017) SD available at: https://www.sciencedirect.com/science/article/pii/S221209631730027X, accessed on April 2, 2018. Page 151
[4] Philip Thornton, *Livestock production: recent trends, future prospects* (2010) Philos Trans R Soc 2853.
[5] Tony Weis, *The Ecological Hoofprint : The Global Burden of Industrial Livestock* (2013). Zed Books, available at: https://ebookcentral.proquest.com/lib/uvtilburg-ebooks/detail.action?docID=1644030 accessed on August 11, 2018. Page 1
[6] Philip Thornton, Mario Herrero and Polly Ericksen, *Livestock and climate change* (2011) Livestock Exchange Issue Brief 3, 1,1
[7] Ibid
[8] Philip Thornton, *Livestock production: recent trends, future prospects* (2010) Philos Trans R Soc 2853, 2853

product consumption will continue to increase[9]. UNFCCC and Kyoto Protocol only formulate a fragmented set of rules'[10] and the Paris Agreement gives general recommendation that prioritize food security rather than targeting livestock industry. Still, for some scholars, it does not mean that Paris Agreement will not have an impact on agriculture since the 'Parties are required to engage in adaptation planning processes and building the resilience of socioeconomic systems, which obviously also include agriculture policies'[11] .

The risk that Climate Change represents for our planet, is the reason why in this paper we adopt a practical approach in order to provide a feasible global solution that at the same time can be as equitable as possible, taking into account the nature of the livestock industry, its positive and negative impacts and putting Climate Change phenomena as the center of the problem[12].

In this order of things, our proposal, as will be further explain, shall consist of the establishment of the "Global Meat Tax Scheme" which is comprised of several components. Firstly, it involves the application of taxes on meat, inspired upon food taxation experiences in Denmark; secondly each State, according to their own national reality and institutions will have to collect and distribute the tax revenues which will be utilized to invest in cleaner industry developments; thirdly, and in order to secure transactions, the application of Blockchain technology to the system becomes substantial and completes the equation necessary to implement a scheme that will ultimately reduce in a significant manner GHG emission produced by the Livestock sector, tackling Climate Change. For this to work, an international organization will be in charge of supervising and assessing the compliance of the states and the correct utilization of the funds.

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[9] European Parliament, *What if animal farming were not so bad for the environment* (2017) <http://www.europarl.europa.eu/RegData/etudes/ATAG/2017/598619/EPRS_ATA(2017)598619_EN.pdf> accessed on 05 May 2018

[10] Bob O'Sullivan and Charlotte Streck, *Forestry and Agriculture under the UNFCCC: A Jigsaw Waiting to be Assembled*? (The Oxford Handbook of International Climate Change Law, 2016)

[11] Jonathan Verschuuren, *The Paris Agreement on Climate Change: Agriculture and Food security* (2016) 4 EJRR accessed 16 April 2018

[12] M. Herrero et al, *Roles of livestock in developing countries* (2013) CUP <https://www.cambridge.org/core/journals/animal/article/roles-of-livestock-in-developing-countries/F349D13CBF84599AF44952632BC2E48C/core-reader>

I

THE PROBLEM

1. Issues of Livestock industry: Impact on Climate Change

1.1 GHG Emissions

According to the IPCC, the main cause of climate change is the increase of the "Greenhouse effect"[13]. Without this natural process the average temperature at the earth surface would be below the freezing point of water, which means that the earth's natural greenhouse effect is what makes life viable in our planet[14]. However, due to human activities the greenhouse gasses have increased significantly in the atmosphere, causing the retention of more heat from the sun, therefore causing global warming[15]. Also, since they are stable and can remain in the atmosphere for centuries, they have a lasting impact on the environment[16].

(Huffington Post UK, n.d.)

Livestock industry is commonly associated with negative environmental impacts, due to the large GHG emissions generated in the entire chain production of Livestock industry. This happens, through animal physiology (enteric fermentation, respiration and excretions), animal housing, feed crops, manure handling, processing of livestock products and sub products, transportation and land use for livestock production (deforestation, desertification).[17]

[13] (Ipcc.ch, 2018)
[14] Ibid.
[15] Ibid.
[16] Ibid
[17] M. Rojas-Downing et al, *Climate Change and livestock: Impacts, adaptation and mitigation.* (Climate Risk Management, 2017) 151.

Livestock industry alone is responsible for 14.5% of the annual worldwide Greenhouse Gas (GHG) emissions of Carbon Dioxide (CO_2), Methane (CH_4) and Nitrogen Dioxide (N_2O), exceeding the emissions produced by the entire global transportation sector[18]. Cattle, Buffalo and small ruminants are the main contaminators, largely due to the CH_4 emissions produced through enteric fermentation, that accounts for 30% of the global methane emissions[19]. In the case of pigs and chicken, the largest source of emissions comes from feed productions, which includes fertilizer production, machinery use and feed transportation[20].

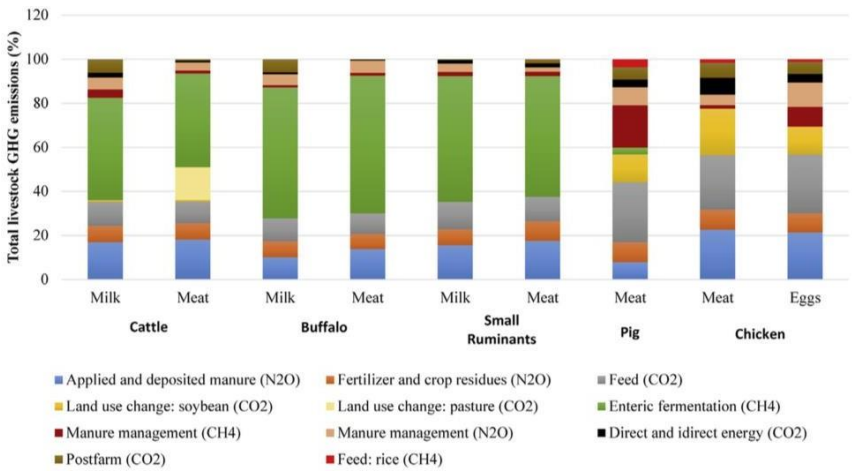
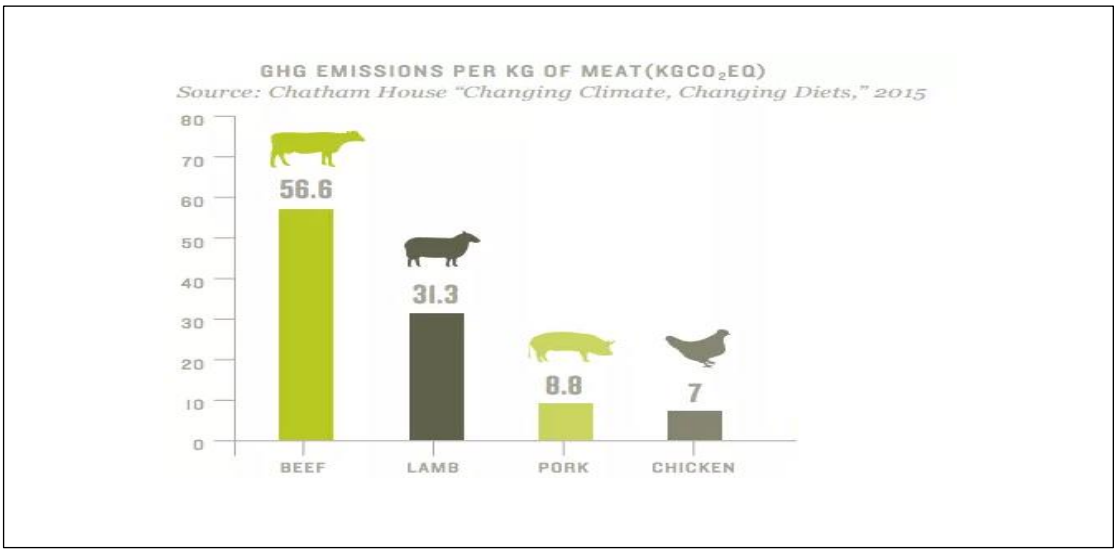


Figure 1. Total livestock GHG emission by specie and product (taken from Rojas-Downing, Pouyan, Harrigan, Woznicki, 2015).

[18] M. Rojas-Downing et al, *Climate Change and livestock: Impacts, adaptation and mitigation.* (Climate Risk Management, 2017) 152
[19] M. Rojas-Downing et al, *Climate Change and livestock: Impacts, adaptation and mitigation.* (Climate Risk Management, 2017) 155
[20] Ibid.

Likewise, the Chatham House established the GHG emission per kg of meat which can be observed in the following chart[21]:



1.2 Use of land and water

A second problem that we want to highlight is the amount of resources necessary for the effective operation of livestock industry, such as the use of large land areas as well as millions of gallons of water.

Deforestation is one of the most concerning consequences when it comes to livestock production. According to the FAO during the 1990s, the deforestation to grow crops and graze livestock for meat and dairy production[22] increased by 94.000 square kilometers a year, an area equivalent to the size of Portugal; forested areas in Central America decreased by almost 40% in the last 40 years; and Latin American countries started to convert forest land to pasture and croplands. Between 2004 and 2005 alone, soybean crops for animal feed replaced 1.2 million hectares of rainforest'[23].This have a large impact in the climate crisis, considering that the clearing and burning of the trees releases billions of tones of CO_2 and other GHG into the atmosphere[24], causing

[21] Chatham House, *Changing Climate, Changing* Diets 2015
[22] (Cattle Ranching and Deforestation, 2005)
[23] M. Rojas-Downing et al, *Climate Change and livestock: Impacts, adaptation and mitigation.* (Climate Risk Management, 2017) 155
[24] (Cattle Ranching and Deforestation, 2005)

one quarter of all anthropocentric carbon emissions[25] and, since grass absorbs less CO_2 than trees, the remaining forested areas cannot absorb the same amount of CO_2 anymore, which consequently increases the presence of this gas in our atmosphere[26].

With regard to water use, the water footprint can vary depending on the local weather, production systems and animal productivity[27]. According to Mekonnen and Hoekstra, who calculated an average for seven countries (Australia, Brazil, China, India, the Netherlands, Russia and the United States) based on three production systems (grazing, mixed and industrial), the ´water footprint in beef production is 14.414 L/kg; in pork production is 4.907 L/kg; in chicken production is 3.545 L/kg; in eggs production is 2.592 L/kg; and in milk is 863 L/kg´[28].

In addition, the existence of other sources associated to livestock chain of production such as marine and land-based industries, which are grown in order to feed livestock, has been estimated to reach up to half the entire annual catch of marine organisms.[29]

1.3 Food security

Livestock industry contributes significantly to food security as it is the main supplier of global calories, proteins, and essential micronutrients[30]. The animal production is a good alternative in some developing countries that have difficulties growing crops, and find in livestock production the solution to ensure the nutrition of their population[31]. However relying almost exclusively in livestock products entails risks for human health and food security itself.

[25] Ibid.
[26] Ibid
[27] Michel Doreau et al., *Water use by livestock: A global perspective for a regional issue?* (Animal Frontiers, Volume 2, Issue 2, 1, 2012) 9
[28] M.M. Mekonnen., A. Y. Hoekstra, *The green, blue and grey water footprint of farm animals and animal product*s (UNESCO, Vol. 1: Main Report, 2010).
[29] Robert Goodland, *Livestock and Climate Change* (World Watch, 2009) <http://www.worldwatch.org/files/pdf/Livestock%20and%20Climate%20Change.pdf> accessed 21 April 2018
[30] Philip Thornton, Mario Herrero and Polly Ericksen, *Livestock and climate change* (2011) Livestock Exchange Issue Brief 3
[31] Ibid.

The consumption of meat in developed countries is **five times higher** than in the developing countries[32]. And with a diet high in red meats and processed meats, people have a higher risk to develop colorectal cancer, pancreatic cancer and prostate cancer[33]. According to the World Health Organization (WHO)[34], red meat (beef, veal, pork, lamb, mutton, horse and goat) has been classified as Group 2A, 'probably carcinogenic to humans'; and processed meat ('hot dogs', ham, sausages, corned beef, beef jerky, canned meat and meat-based preparations and sauces) as Group 1, 'carcinogenic to humans'[35]. In fact, studies have shown that diets high in red meat could be responsible for 50.000 cancer deaths per year worldwide[36]. Therefore, in order to reduce the risk of colorectal cancer, the WHO stresses the importance of the reduction on consumption of processed meat[37]. Thus, the leading role that meat products have in food security is questionable.

Regarding to food security and the climate crisis, the increase in the global temperature will have a direct impact on livestock animals, risking their lives and therefore global food security. The IPCC fifth assessment report identified that by 2100 the global average surface temperature may have an increase between 0.3C and 4.8C, which will have a direct impact on the body temperature of animals, creating heat stress and developing a condition known as "acclimation", which causes poor appetite, resulting in the weight loss of the animals, the increase of water consumption, reduction on milk production, and alteration on the reproductive functions and in the productive efficiency[38]. Likewise, a rise in the temperature will enable the acceleration in the growth of pathogens and parasites[39] that may generate shifts in disease spreading, outbreaks of severe disease or even introduce new diseases[40], increasing the risk of morbidity and death of livestock.

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[32] Ibid.
[33] Ibid.
[34] World Health Organization, *Q&A on the carcinogenicity of the consumption of red meat and processed meat* (2015) <http://www.who.int/features/qa/cancer-red-meat/en/> accessed 22 April 2018
[35] Same group as tobacco smoking and asbestos
[36] Ibid.
[37] Ibid. Cf: "The IARC Working Group considered more than 800 different studies on cancer in humans (some studies provided data on both types of meat; in total more than 700 epidemiological studies provided data on red meat and more than 400 epidemiological studies provided data on processed meat)"
[38] Alessandro, Nardone et al., *Effect of climate changes on animal production and sustainability of livestock system* (2010) LIVEST SCI. 57, 69 <10.1016/j.livsci.2010.02.011> Accessed 15 April 2018.
[39] C.D. Harvell et al., *Climate warming and disease risks for terrestrial and marine biota* (2002) Science 296 <https://people.ucsc.edu/~cwilmers/ENVS220/Harvell%20et%20al%202002%20Science.pdf> Accessed on 23 April 2018
[40] P.K. Thornton et al., *The impacts of climate change on livestock and livestock systems in developing countries: A review of what we know and what we need to know* (2009) ILRI <https://www.sciencedirect.com/science/article/pii/S0308521X09000584> Accessed on 25 April 2018

For these reasons, if most States rely on livestock production to guarantee the food security in their countries and this production is affected by climate change, then consequently the world would face a food crisis.

2. Issues of Livestock Industry: Importance in developing countries

While it has been explained how livestock industry impacts the environment, it is very important to consider that this industry in developing countries plays a crucial role at many different levels, as follows:

2.1. Livestock role in nutrition

In developing countries part of the population may suffer from what is known as 'hidden hunger' a "nutritional status resulting from lack of good-value proteins, vitamins and minerals"[41]. This situation must be considered as it may result in serious consequences, such as individuals with lower levels of energy, that result on less capacity to work, impacting their income; individuals with cognitive development issues, which can impact later in life of people affected in different arenas; and people more prone to disease, one of the most known causes to fall into poverty[42].

For climatic reasons or availability of soil nutrients, these countries may have difficulties growing good quality crops or sometimes crops at all[43], reason why the nutrients that they need to survive cannot come from grain intake, reason why livestock industry has a main role on nutrition in these countries, as it is currently the main supplier of calories, proteins, and essential micronutrients[44].

[41] Susan MacMillan, 'Could animals help solve the worlds calorie as well as hidden hunger' (2017) < https://clippings.ilri.org/2017/10/16/could-animals-help-solve-the-worlds-calorie-as-well-as-hidden-hunger-ilris-delia-grace-on-world-food-day/ >
[42] Ibid.
[43] Ibid.
[44] Philip Thornton, Mario Herrero and Polly Ericksen, *Livestock and climate change* (2011) Livestock Exchange Issue Brief 3

2.2.Livestock role in households of developing countries: source of income and employment

Currently, as the quality of life grows in developing countries, livestock has become one of the fastest growing agricultural industries[45] that plays a special role as an income source for households, as it employs about 1.3 billion people around the globe and supports the livelihoods of 600 million small farmers in developing countries[46].

(Pollack, n.d.)

Livestock products are highly valued in the market in comparison to other agriculture products. For instance, the 'global price of a tonne of red meat is more than 10 times higher than the price of soy bean, whereas that of milk is 70% higher'[47].

[45] Ibid.
[46]Phillip Thornton, *Livestock production: recent trends, future prospects* (2010) J R SOC 2853
[47] M. Herrero et al, *Roles of livestock in developing* countries (2013) CUP <https://www.cambridge.org/core/journals/animal/article/roles-of-livestock-in-developing-countries/F349D13CBF84599AF44952632BC2E48C/core-reader>

Also, at an international level, meat trade has increased as new agreements are being concluded in certain countries, such as Brazil and Thailand[48]. National trade of livestock products have a considerable impact on the economy, considering that, in order to be able to satisfy the increasing need to provide for larger populations[49], livestock companies create new employments as the supply chain grows. For instance, in Asian and African continent dairy and meat products support household's income, as they are commonly traded in the informal sector, such as street food markets. This is indeed a large source of income and employment for poor people who are generally involved in these dynamics, especially poor women who participate in the food manipulation and meal preparation process.[50]

2.3. Livestock role as animal assets in vulnerable rural households:

In developing countries where access to banks and other insurance and financial institutions is quite limited or simply not possible, livestock is utilized as a money saver, helping people to manage their investment possibilities and risks, and providing the possibility to have a different income acquisition scheme not related to farming. [51]

Also, in many countries, animals are a part of the logistics stage, as they provide traction to work the fields, as well as serving as a mean of transportation.[52]

Considering this situation, developing countries should have a different treatment than developing countries, since their economy and life greatly rely on the presence of livestock products, for nutrition, and on the animals' as assets in their economy and in the logistics of farming operation and transportation. Also, in order to ensure the food security and economic development of such countries, there should be proper investment to increase efficiency of livestock systems, as for environmental reasons, the intensification of the industry is not the main goal[53.]

[48] Ibid.
[49] Ibid.
[50] Ibid.
[51] Ibid.
[52] Ibid.
[53] Ibid.

II
THE SOLUTION

While the utilization of taxes to raise the prices of unhealthy food in order to encourage healthy eating habits, is an approach that has been only modestly applied by some countries, such as France taxing sugary soft drinks, Hungary taxing ready to eat snacks with certain nutritional components and Finland applying taxes on sweets[54], we believe that taxing it's a strategy that should be explored for achieving the purpose of reducing livestock industry emissions, thus significantly contributing to solve Climate Change while also and as a consequence, inducing modification of eating habits for healthier and conscious ones.

1. Inspiring Initiatives

The case in Denmark

So far, Denmark has been pioneering the application of taxes in food. Danish authorities have been clear about the fact that they care about the health of their citizens and also, the health of the environment. In this way, they have utilized taxes to control the intake of several food categories such as sugars, soft drinks and other sweets[55]. In 2011, Danish authorities introduced a tax to saturated fats and also[56], since 2016 the establishment of a tax on meat products has been under discussion in order to protect the environment from Climate Change. Accordingly, and with the purpose of finding ways into a possible and feasible solution, this paper will explore these remarkable initiatives that will serve as an inspiration for our proposal.

The saturated fat tax was repealed in 2012 due to lacking of strong foundations and political pressures, however what makes it important and unique in comparison to others is the fact that it established a threshold of saturated fat quantity in food (weight), meaning that the tax was to be paid if the food item exceeded the saturated fat limit. Since the tax was applied over a nutrient and not over a food category, it had the potential to be applied to many food items such as dairy

[54] Jørgen Dejgård Jensen and Sinne Smed, *The Danish Tax On Saturated Fat – Short Run Effects On Consumption, Substitution Patterns And Consumer Prices Of Fats* (2013) 42 Food Policy.
[55] Ibid
[56] Ibid

products, meats and pastry products, which are heavily manufactured with a saturated fat component[57].

While the discussion regarding the market effects and political reasons that led to the repeal of this tax escape the aim of this paper, what is truly important is that it succeeded in generating the desired change in the consumer behavior, and consequently achieved the goal of deterring consumption. In this sense, studies conducted have demonstrated that this tax managed to reduce consumption of highly saturated fat products by 10 to 15% [58]compared to consumption levels prior to the establishment of the tax. Also it is suggested, from an economical point of view, that these levels should have increased as the creation of new eating patterns take time to develop, therefore long term effects would have been expected to be observed[59]. Another research[60] that supports these same results, lead us to the conclusion that the saturated fat initiative was not a failure, but that it could be improved and strengthened based on our current Climate Change Crisis.

Another very important initiative to address is the tax on meat. The Denmark Ethics Council have called for a higher tax on red meat [61], in attendance with the no harm principle and the intergenerational equity principle. The document released on 2016 stated that taxes should be higher on products that are most damaging for the environment.[62]. A study based on this document was carried in order to analyze the possible results on the implementation of this *Pigouvian Tax* on beef, pork and chicken, aiming to simulate the results on reducing the emissions of GHG, nitrogen, ammonia and phosphorus from the livestock sector by up to 12%[63].The tax was proposed to encourage people to have a more sustainable consumption of food, thus reducing GHG

[57] Ibid
[58] Ibid
[59] Ibid
[60] S Vallgårda, L Holm and J D Jensen, *The Danish Tax On Saturated Fat: Why It Did Not Survive* (2014) 69 European Journal of Clinical Nutrition.
[61] The Danish Council on Ethics, *The Ethical Consumer, Climate damaging food* (2016) Prod <http://www.etiskraad.dk/~/media/Etisk-Raad/en/Publications/Climate-damaging-foods-2016.pdf, accessed in july 2018
[62] The Danish Council on Ethics, *The Ethical Consumer, Climate damaging food* (2016) Prod <http://www.etiskraad.dk/~/media/Etisk-Raad/en/Publications/Climate-damaging-foods-2016.pdf, accessed in july 2018
[63] Sarah Sall, Ing-Marie Gren, *Effects of an environmental tax on meat and dairy consumption in Sweden* (2015) Food Policy 41

Emissions from agricultural sector in Denmark[64]. This study succeeded to prove that a possible tax on meat would reduce GHG emissions between 10.4% and 19.4% for an average household[65].

Also, it is preferable to tax the consumers rather than the producers[66] based on the individual producers` specific emission levels rather than on the average emission level of the country[67]. If the consumers are taxed, the products will be taxed equally regardless of where they are produced.

It is important to observe that if this policy is placed exclusively in a territorial approach, it may result in the relocation of production rather than in the actual decrease of consumption[68], similarly to the "carbon leakage" phenomenon[69]. This could even lead to competitive disadvantage to local producers with regards to imports[70], considering that farmers and the local food industry may try to offset reduced domestic demand by increasing exports to other countries. For this reason, an international effort may be necessary to successfully implement a tax on meat, and avoid the distortion on competition[71].

2. Ways Forward

Taking into account the Danish approach to taxes on food, we believe that the establishment of a meat tax is certainly a good starting point and a key ingredient to solve livestock industry emissions problem. However, we also acknowledge that it is not enough. In this sense, and in order to support a sustainable tax model that could be applicable worldwide, we propose the establishment of a revenue-neutral Tax scheme. This scheme will ensure that tax revenues are given back to specific

[64] Dario, Caro et al, *Toward a more consistent combined approach of reduction targets and climate policy regulations: The illustrative case of a meat tax in Denmark* (2017) Food Policy 78
[65] Louise Edjabou, S. Smed, *The effect of using consumption taxes on foods to promote climate friendly diets and the case of Denmark* (2013) Food Policy 39, 84-96.
[66] S. Wirsenius, F. Hedenus, K. Mohlin, *Greenhouse gas taxes on animal food products: rationale tax scheme and climate mitigation effects* (2011) Clim. Change 108, 159–184.
[67] Louise Edjabou, S. Smed, *The effect of using consumption taxes on foods to promote climate friendly diets and the case of Denmar*k (2013) Food Policy 85
[68] S. Davis, K.Caldeira, *Consumption-based accounting of CO2 emissions* (2010) PRoc.Natl. Acad. Sci. U.S.A. 12, 5687–5692
[69] Louise Edjabou, S. Smed, *The effect of using consumption taxes on foods to promote climate friendly diets and the case of Denmark* (2013) Food Policy
[70] L.M. Abadie et al, *Using food taxes and subsidies to achieve emission reduction targets in Norway* (2015) J. Clean. Prod <http://dx.doi.org/10.1016/j.jclepro.2015.09.054> accessed in 5 April 2018
[71] Sarah Sall, Ing-Marie Gren, *Effects of an environmental tax on meat and dairy consumption in Sweden* (2015) Food Policy 42

actors, through the empowerment of national entities and international organizations, which shall be capable of collecting part of these taxes, with the purpose of incentive the development of eco-efficient technologies to support technological improvements of the livestock industry management, or to invest in healthier food options, alike fruits and vegetables[72]. The security of these transactions will be ensured through Blockchain technology system.

In addition, we acknowledge the importance of explaining consumers why the taxation is occurring. This could be done by a "carbon footprint label" stamped on the meat, showing the percentage of GHG released to the atmosphere on the production of such product.

3. In the Deep: The Global Meat Tax Scheme

As has been exposed, for the establishment of a feasible and successful global meat tax scheme, certain elements should be added into the equation. In this section, this paper will explain how would the tax work along with the entities involved and the utilization of Blockchain technology.

As a starting point, for this particular tax scheme to work, it must be established that the Tax on meat shall be only applied in developed countries, levied on the consumers in order to directly induce changes in meat consumption, and it must be collected by national entities. As was previously explained in chapter I of this paper, developing countries need meat consumption for health and socioeconomic reasons, therefore, solidarity and understanding of this situation is key to correctly apply the tax and make the scheme work.

(PETA, n.d.)

Secondly, governments shall cooperate with international organizations in order to make sure that tax revenue is utilized solely with the purpose of promoting transition of intensive meat production

[72] Kelechi E Nnoaham et al, *Modelling income group differences in the health and economic impacts of targeted food taxes and subsidies* (2009) OJLS

industries into eco-friendly ones with alternative production in developed countries, and promoting transition into cleaner farms in developing countries .

3.1 Operating the system: Governments role

In order to create a successful meat tax scheme, important tasks should be assumed by those governments where the tax will be applied, as well as by international organizations.

While the collection of the taxes should indeed occur at a national level, revenues shall be destined to achieve two purposes.

The first one is to promote the transition of the production, meaning less meat production, with clear pre-established production reduction targets and increase the production of healthy food alternatives. For this to occur, governments must utilize a part of the revenues collected, which shall be then distributed between producers to fully finance or subsidize these improvements. We believe this is a very positive approach to impulse transition of the meat industry because it allows for innovation to occur, as new ideas and developments can be created. It is very important that governments support the tax scheme by creating new policies and establishing proper institutions.

Distribution of the revenue between producers should occur through the establishment of a "Project Award" mechanism, which means that producers would have to present to the national entity on charge, a project of production improvement, which aim would have to be, the reduction of GHG livestock emissions through the modification of their current production methods and particularly, production of meat substitutes and alternatives, for example, of vegetable derived crops that are high in protein (algae, legumes, seaweeds, etc.), greener production of cereals (for example, sustainable agriculture through crop rotation and polyculture fields) and sustainable meat production (for example agroforestry, pasturelands with more plant biodiversity, such as wild seeds, to ensure greater CO_2 absorption, less cows, etc.),[73]

Consequently, the institutions created at the national level which will be in charge of collecting and awarding the revenue shall have instructive and compliance duties. On the instructive ground,

[73] Frans W.H. Kampers and Louise O. Fresco, *Food Transitions 2030* (2017) <http://library.wur.nl/WebQuery/wurpubs/fulltext/423601> accessed on 30 April 2018

they shall conduct research and help the producers to find the best way to adopt mitigation measures on their farms and therefore comply with the targets of the reduction of GHG emissions. On the compliance area, an analysis of the efficiency of the projects submitted, trough *due diligence* methods, will be done in order to correctly provide the funds to the specific producer and after the estimated end of the project, the *audit* team will analyze if the targets were met and an annual summary of activities will be provided.

3.2 Developing countries participation under the Meat Tax Scheme

Our proposal contemplates the idea of a project based system to distribute the collected taxes as has been recently exposed. While our proposal sustains the idea that taxes on meat shall not be applied in developing countries, they are indeed, included into the scheme as they also have the mission to improve their production methods and transform them into cleaner systems.

For this to work, a portion of the revenues obtained and collected by national entities where the tax is applied, shall be entrusted to an international organization that would be in charge of assessing the correct utilization of the funds in developing countries. In this sense, we believe that FAO has the knowledge and technical expertise to assume the task.

FAO should be able to provide help directly or through certified local NGO's to the producers, in order to educate them on how to improve their production into cleaner techniques and to assist them in the development of the projects. Once FAO has approved the project, the funds shall be ready to be invested. The producer is expected to provide a summary of the implementation of the project to FAO or other designated agency.

3.3 Use of Blockchain Technology to ensure transaction data

In order for the meat tax scheme to work, monetary transactions will be continuously arranged between governments, agencies, and individuals. To make sure that tax revenue funds are safe and utilized solely for the intended purposes, we suggest the utilization of blockchain technology which is:

"A type of database that takes a number of records and puts them in a block (rather like collating them on to a single sheet of paper). Each block is then "chained" to the next block, in a linear, chronological order, using a cryptographic signature. This process allows blockchains to be used as ledgers, which can be shared and corroborated by anyone with the appropriate permissions. These distributed ledgers can be spread across multiple sites, countries or institutions"[74].

A private blockchain network would be developed in every State where the tax will be applied. It would be conformed by all the supermarkets that sell meat, the national entity in charge of the collection of the tax and other agencies involved, such as FAO. The private network would use user's identities to confirm their membership and access privileges, and each one would have their own private key in the system, that would be linked to the transactions they make and act as a personal digital signature[75].

By doing this, governments and agencies would always be aware of which member is doing the transaction and it would give it the possibility to track the balances at its source[76].

For a transaction to be successfully added, selected users must verify it, in order to check that the information is truthful, and maintain the transaction record. Once a transaction is made, it can't be altered. If so, the signature will become invalid and it would set an alarm to the entities involved.

This blockchain platform would have an infrastructure that 'will prevent anyone – even root users and administrators- from accessing sensitive information; deny illicit attempts to change data or applications within the network; carefully guard encryption keys using the highest-grade security standards so they can be misappropriated'[77]. By doing this, external an internal attacks can be prevented.

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[74] Ernest and Young, *Chain reaction: how blockchain technology could revolutionize the finance function* (2016) <http://www.ey.com/Publication/vwLUAssets/EY-chain-reaction/$FILE/EY-chain-reaction-how-blockchain-technology-could-revolutionize-the-finance-function.pdf> accessed 7 May 2018.
[75] Curtis Miles, *Blockchain security: What keeps your transaction data safe*? (IBM Blockchain blog, 12 December 2017) <https://www.ibm.com/blogs/blockchain/2017/12/blockchain-security-what-keeps-your-transaction-data-safe/ > accessed 7 May 2018.
[76] Ernest and Young, *Chain reaction: how blockchain technology could revolutionize the finance function* (2016) <http://www.ey.com/Publication/vwLUAssets/EY-chain-reaction/$FILE/EY-chain-reaction-how-blockchain-technology-could-revolutionize-the-finance-function.pdf> accessed 7 May 2018.
[77] Curtis Miles, *Blockchain security: What keeps your transaction data safe*? (IBM Blockchain blog, 12 December 2017) <https://www.ibm.com/blogs/blockchain/2017/12/blockchain-security-what-keeps-your-transaction-data-safe/ > accessed 7 May 2018.

Also, to bring this idea into a feasible solution, the best approach would be to conclude an agreement between the particular government and the producer in order to secure that the cryptocurrency will have an agreed 'value' in dollars or euros after the money is not encrypted anymore.

3.4 The labeling process and social education

We acknowledge that imposing a tax on meat is likely going to create some debates. Indeed, meat is linked to healthy standards in most countries, therefore to reduce its consumption, 'a profound societal transition' needs to be organized.[78] According to Spiller and Nitzko, there are three different ways that should be used simultaneously, in order to influence consumer decisions: 'consumer education, financial incentive and regulatory mechanisms'.[79] In the case of our project, the most efficient course of action would be to combine a financial incentive mechanism, the tax on meat, and a consumer education mechanism, the footprint label.

Increasing consumer awareness is one of the first steps to stimulate the reduction of the global consumption of livestock products. On the study carried by Hanna Hartikainen et al on the Finnish consumer perceptions on labeling products[80], it was observed that the consumers are quite interested in carbon labeled food initiatives.

A significant number of carbon labeling schemes are already in place all over the globe. However, most of them are using the **'cradle to gate system boundary**' meaning that they excluded the greenhouse gas emission and removals in 'the use and end-of-life stages'.[81] Only the '**cradle to grave system boundary'** would include the complete life cycle of GHG emissions, five cycle, and give a reliable assessment of its environmental impacts, to base the label on.[82] The customer

[78] Chrysostomos Apostolidis and Fraser McLeay, *Should we stop meating like this? Reducing meat consumption through substitution, Food Policy* (Vol 65, 2016) 75
[79] Ibid
[80] It was carried with 1010 people on an online survey that compromised 30 questions. The consumers could choose their favourite carbon label among six available and the majority chose the scale one as pictured above. *Cf.* H. Hartikainen et al, *The Finish consumer perceptions of carbon footprint*s (2013) Journal of Cleaner Production 290 <https://doi.org/10.1016/j.jclepro.2013.09.018>
[81] Peng Wu, Bo Xia, and Xianbo Zhao, *The importance of use and end-of-life phases to the life cycle greenhouse gas emissions of concrete – A review*, Renewable and Sustainable Energy Reviews (Vol 37, 2014)
[82] Ibid

needs to have a full picture of the emissions produce by his consumption of meat to take an informed decision.

In this sense the International Organization for Standardization – ISO – provided in 2013 principles, requirements, and guidelines for the quantification and communication of the carbon footprint of a product.[83] ISO favours the use of the cradle to grave and reduce the use of cradle to gate to the materials that do not contribute significantly to the life cycle GHG emissions.[84]

Considering the aforementioned, as a part of our proposal we suggest to adopt the cradle to grave system boundary, a global footprint label that include all GHG emissions and all its life cycle. In the case of livestock, it will mean to include the emission of breading of the livestock (food, water, enteric fermentation, the land use), the transportation to the slaughter house, the slaughter house itself, the transportation to the shops and the shop itself when assessing the GHG emissions.

There is already a carbon footprint label available on the market, developed by the "Carbon Trust initiative" that apparently only considers CO_2 emissions, but actually shows the GHG emitted during the five stages of the life of the product. It can be observed as follows[85]:

[83] International Organization for Standardization, ISO 14040, *Environmental management – life cycle assessment – principles and framework*, 2006.
[84] Peng Wu, Bo Xia, and Xianbo Zhao, *The importance of use and end-of-life phases to the life cycle greenhouse gas emissions of concrete – A review*, Renewable and Sustainable Energy Reviews (Vol 37, 2014)
[85] Carbon Trust, *Certification* (2018) <https://www.carbontrust.com/client-services/certification/certification/ > accessed on 10 May 2018

III
CONCLUSION

Throughout this paper, we have explained how the livestock industry have become one of the main responsible for the current climate crisis, to the point that it has a greater impact in the environment than the entire transportation sector.

However, the livestock industry remains a very important sector for both developed (economic reasons) and developing countries (socioeconomic and public health reasons), as it is still the main supplier of global calories, proteins, and essential micronutrients.

There is a need for a solution that takes into consideration these opposing realities and reconciles them, in order to find a middle ground. For this reason we have created a project that focuses on the creation of a powerful economical instrument, a Global Tax Meat Scheme, which works through the application of taxes on meat and the redistribution of the tax revenue to the producers and to the developing economies, with the goal that they will invest on cleaner livestock management or in meat substitutes.

Our project has the potential to be an effective strategy for different reasons, as follows: first, by giving governments' flexibility and freedom to create their own institution to make the mechanism work, we are allowing them to take into consideration their individual national particularities for the application of the tax; second, through taxing the consumer and using labelling to ensure their education, we will raise awareness about their eating habits, making them understand the impact that the livestock products have on the environment, and consequently developing a new sense of responsibility and awareness in this time of crisis; third, our project will foster innovation because, since it creates a shift on consumers behavior, producers will be pushed to imagine and create new cleaner ways of livestock producing and/or to develop new food alternatives in order to be more competitive, which at the same time will have a positive impact on the food security; fourth, through the application of blockchain technology we will enhance the security of the scheme, guaranteeing the transparency of all transactions being made, and as a consequence promoting trust among governmental entities and individuals.

Finally, we believe that this project is a starting point for a profound transition of the society, which will allow future generations to have a different understanding and relationship with livestock products, for the sake of their health and the environment.

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