

Assessing the contribution of Thailand's poultry agribusiness
towards
mitigating climate change



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การประเมินมาตรการสนับสนุนของธุรกิจอุตสาหกรรมเนื้อไก่ในประเทศไทย
ต่อการลดภาวะโลกร้อน



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This research provides an overview of the Thailand agreement on greenhouse gas emissions, specifically focusing on the meat industry, and examines the roles of the government, private companies, and civil society in Thailand. Research indicates that the meat industry has significant environmental impacts, including greenhouse gas emissions, deforestation, and biodiversity loss.

Livestock for meat consumption has been a major contributor to environmental issues such as climate change, water pollution, and deforestation. Livestock alone contributes a substantial percentage to global climate change. This issue has become a critical transboundary concern affecting not only one specific country or region.

In response to the environmental impacts and the global challenge of climate change, the Thai government signed and committed to the Paris Agreement in 2015, aiming to reduce greenhouse gas emissions. Thailand has set a target to decrease greenhouse gas emissions by 20% by 2030, and the Climate Change Master Plan (2015-2050) envisions achieving sustainable low-carbon growth and climate resilience by 2050. However, the country's environmental policy still lacks clarity and a specific focus on greenhouse gas emissions from the meat industry.

Currently, Thai meat industries do not include information about greenhouse gas emissions in their environmental reports, and they tend to overlook environmental issues related to their operations. Moreover, these industries possess significant influence over the media, controlling information about the environmental impact of the meat industry. As a result, civil society has taken a leading role in raising awareness about this issue, rather than relying on the government or industry itself.

In conclusion, my research findings suggest that the Thai government's lack of a robust environmental policy and management approach has contributed to weak regulation of greenhouse gas emissions in the meat industry. There is a need for more comprehensive and concerted efforts from all stakeholders to address this pressing environmental concern effectively.

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CHAPTER I: INTRODUCTION

1.1 Introduction

Meat production industries activities have a significant impact on the environment, including climate change and greenhouse effect and it is growing and rapidly changing (Osofsky, 2007). Global demand for meat production is fast rising, driven by the economic policy, increasing populations and urbanization (Osofsky, 2007) As an economic activity, meat production is one of the keys to drive economic growth, more income for the farmer and agriculture sector due to the internal and international consumption.

The agriculture playing a significant role in the country, even people's income more comes from industry and services, but agriculture is still a major employer. Thailand has played an important role in meat production industry especially poultry to export to the world. The development of the Thai poultry industry span within two decades. From rural backyard production of chickens catering to the domestic market prior to the 1980s, the sector has transformed itself into quite advanced industrial production under controlled evaporative (EVAP) housing systems, gaining a foothold in the highly competitive international market for chicken meat. (Pacific, 2002)

Table 1: Statistic of Poultry Meat, Products

Year	2018	2019	2020	%Δ 2021/2018
Poultry Meat and products productions (ton)	2,126,947	2,347,491	2,503,961	17.73
Poultry Meat and products consumptions (ton)	1,287,465	1,445,009	1,603,961	24.58

Source: Office of Agricultural Economic, Ministry of Agriculture and cooperatives

Poultry production and consumption in Thailand are growing significantly in the past few decades by many causes, and one is Thailand economic policy is promoting the meat production as one of the main export products over the continents. The table show that during 2018 – 2020 poultry meat production in Thailand has been

raising gradually 17.73 percent from 2,126,947 ton in 2018 to 2,503,961 ton in 2020. And the internal poultry consumption in Thailand was climbing up 24.58 percent during 2018-2020 from 1,287,465 ton in 2018 to 1,603,961 ton in 2020. Thailand also play an important role of 4th world top poultry meat and products exporter beside Brazil, USA and EU.

The growth and contributions of meat production industries have been succeeded to be the major industries of Thailand and the main drivers of demand growth. The main aspects of the technological advances in the poultry sector, the industrial organization to capture the returns to private investments in technology, and the policy actions in support of the private sector.

Livestock for meat consumption had been the significant factor of effect to environmental such as climate change, water pollution and deforestation (Knips, 2004)The climate change issue has been the most essential issue in environmental for over decades and became to a transboundary problem. According to that United Nations Framework Convention on Climate Change (UNFCCC) had launched The Paris Agreement 2015 to dealing with the greenhouse effect, weather temperature change, gas emissions and adapts to its effects and aiming to the reinforce the global response to the threat of climate change.

Thailand had submitted a new climate action plan to the UN Framework Convention on Climate Change (UNFCCC) in October.2015. “Thailand intends to reduce its greenhouse gas emissions by 20 percent from the projected business-as-usual (BAU) level by 2030. The level of contribution could increase up to 25 percent, subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support through a balanced and ambitious global agreement under the United Nations Framework Convention on Climate Change (UNFCCC).” (Office of Natural Resources and Environmental Policy and Planning, 2015)

In order to achieve the commitment according to The Paris agreement, Thailand government has to change the policy and making the process on the climate change issue then encourage and enforce the meat production manufacture to adopt the new policy to adjust in the industry. Furthermore, Thailand had launched Thailand

National Climate Change Master Plan (2015 – 2050) in 2014 with vision Thailand will achieve sustainable low carbon growth and climate change resilience by 2050. And to building climate resilient into national development policy by integrating directions and measures in all sectors at both national and sub-national levels to ensure country's adaptability to climate change.

Charoen Pokphan aka. CP had published the environmental report to the public, and the climate change solution had shown only to reduce the energy consumption not the greenhouse gas emission from the farm animal yet. On the other hand, CP states that it is committed to reducing its environmental footprint by the end of the decade, with its strategy centered on four areas: electricity use, greenhouse gas (GHG), water use, and landfill waste disposal.(Harvey, 2018)

Meanwhile, the second largest meat production manufacture in Thailand, Betagro, still far from reducing the greenhouse gas emission and has not done any public environmental report yet. Thai integrator–Betagro aims to expand its low-carbon system to livestock farms and processing plants after recently winning approval for its chicken feed to bear the Thailand Greenhouse Gas Management Organization (TGO) carbon footprint labels. (Berkhout, 2010)

Seem like, Thailand government and these companies are very active on the propose of Climate Change issue due to the commitment to the Paris agreement and UNFCCC; also the SDG goal. But are these process from the government and private sector side are genuinely enough to achieve climate change goal and reduce the greenhouse gas emission? This thesis will research more on these issue for more understanding and focus more on policies and practices of Thailand in meat industry on climate change toward Thailand government commitment to Paris agreement.

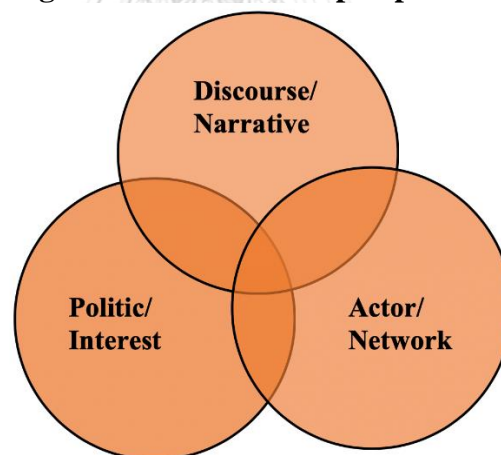
1.2 Conceptual Framework

This research will focus on the commitment and policy of Thailand on the livestock production industry according to the Paris agreement and addresses different aspects as the inter-relationship between the main sectors. The research will use the conceptual framework as “Policy process and policy change” and “The advocacy coalition framework.”

The heart of the policy process and policy change is exploring how actors create and shape policy narratives and interests while being simultaneously constrained by them at the same period.

There are three broads of the policy process to understanding policy- making; discourse/ narrative, politic/interest and actor/network. The first one focuses at the patterns and traditions associated with changing discourses, and how these shape and direct policy problems and course of action. Another discusses political economy and state and civil society relations, as well as multiple interest groups. The third gives primacy to the position and agency of individual actors (or desire to make a difference). (Knowledge Technology and Society Team, 2006) The term “network” is reflected through interconnection between civil society, governmental and private sector in terms of common interests and benefits which will be stated as policy coalitions. (Cairney, 2012)

Figure 1: 3 intersection perspectives



The intersection of the three intersecting perspectives leads us to understanding policy processes consequently comes as a result. Therefore, in order to understand why policies, take particular forms, it is crucial to understand not only the scientific framing of issues –the narratives that tell the stories of policy but also the way in which political positions are embedded in networks (of actors, funding, professional and other relationships, and particular institutions and organizations) and the dynamics of enabling or restricting power.

In addition, understanding these three influences on policy empowers us to begin to answer the question: why are some of the proposals that circulate in research / policy networks picked up and acted on, whereas others are ignored and disappeared? And how can knowledge be transferred to the policy sphere from the research? (Knowledge Technology and Society Team, 2006)

1.2.1 Policy narratives

All have a beginning, a middle and an end to stories about policy change. They describe actions, or in some ways define the world, and so shape policy determination. These provide both an analysis and a set of interferences and measures. They describe an issue, explain how it happens, and show how it needs to be put right. They regularly gain soundness despite the fact that they normally simplify complex issues and processes. This simplification is attractive in that it sidesteps fuzziness and proposes an action program. That is what makes simplistic narratives appealing to politicians or executives. Several narratives tend to gain more authority, and thus have more impact on policy decisions but alternative policy narratives that present challenges and solutions in various ways. (Knowledge Technology and Society Team, 2006)

1.2.2 Actor and networks

The significant in spreading and preserving narratives through chains of persuasion and influence such as journals, conferences, education or informal introductions are networks, coalitions and alliances of actors (individuals or organizations) with a shared vision – similar belief structures, codes of conduct and established forms of behavior. (Knowledge Technology and Society Team, 2006)

In any given policy field, actor networks are not confined exclusively to state establishments; they link parts of the bureaucracy and government with the private sector, donors, and civil society actors such as presses, researchers, and non-governmental organizations (NGOs). Therefore, the existence of actor networks can involve a range of different stakeholders or actors in pluralist policy making.

The negotiation and bartering processes among competing interest groups are essential to policymaking. Policies are gaining and falling in prominence as a result of

the changing effectiveness of various actor networks in the debate. Networks can slowly change and reinforce narratives – as they bring together people who exchange ideas and strategies. Moreover, networks of actors occur across various scales and national frontiers. Global and local sites are linked by networks and connections.

The mentioned networks consist of the government sector, private sector, and NGOs, each having its own roles in driving and implementing greenhouse gas reduction measures. These networks are interconnected, starting with the government organizations responsible for formulating regulations and various measures that the private sector enforces in their industries. The social sector also observes and monitors the work of the government and private sectors to ensure that they align with the set objectives.

At the same time, the social sector also drives societal changes through various campaigns or advocacy efforts in their own way. The commonality among all three actors is their aim and goal to reduce greenhouse gas emissions in their respective forms and approaches.

1.2.3 Politics and interests

It seems obvious that the policy is politically inherent and contested. But that is denied by the conventional policy view, in which fact and value are separated. Politics shape policy processes in various significant ways: (Knowledge Technology and Society Team, 2006)

a) The political background is influenced by the needs of particular regime authorities. Competition often occurs between groups within society, based, for example, on their differing preferences in terms of resource distribution or social issues.

b) A range of interest groups which exert power and authority over policymaking influence the policy process. These influences affect every stage of the process, from setting the agenda to finding alternatives, weighing the choices, choosing the most desirable and enforcing them.

c) Policy is defined as objective, neutral, value-free, and is often referred to in legal or scientific language, emphasizing its rationality. In this way, using technical

language, which emphasizes rationality and objectivity, hides the political nature of the policy. But the technical is always political in some way.

d) Bureaucrats are not merely neutral policymakers; they have to negotiate their own personal and political agendas. Bureaucratic practices, such as battles for control of policy areas within ministries, are important.

1.3 Research questions

1.3.1 Main Question:

How have the politics of climate change in Thailand defined the poultry industry's contribution towards Thailand's commitment under the Paris Agreement? To what extent has the poultry industry changed its practices on-the-ground and why?

1.3.2 Sub Questions:

- 1) Which are the key policy networks on climate action by the poultry industry?
- 2) What are the main narratives of these networks? How have they influenced policy?
- 3) To what extent has the poultry industry changed its practices on-the-ground and why?

1.4 Method

1.4.1 Data Collection

Beside all the research and literature review more essential information were added by in-dept interviews with keys actor such as government authority, private sector, civil society, media, and expert who are keen and related in this field. Also, including related online document and news both of Thai and English reference sources were gathered. The preparation of primary data collection start with Paris Agreement and Submission by Thailand Intended Nationally Determined Contribution and Relevant Information by The Office of Natural Resources and Environmental Policy and Planning (ONEP) who is the main representative of nation to deal and adapt with international agreement by launching the nation policy in climate change and greenhouse gas emission issue, then the researcher mange to do in dept interviews with variety key actors, mostly via video call, telephone, e-mail

according to Covid – 19 pandemic situation only a few interviews had done by one-on-one interviews.

The main purposes of this research are to see how the government authority has done and adapt the reducing climate change commitment to the nation policy, then to see how the government forced private sector, who is the main player in greenhouse gas emission to follow this policy. Beside from that, the researcher also focuses on other key actor as such civil society, media and expert who are work on related issue of greenhouse gas emission and climate change.

1.4.2 Data analysis, collection matrix and tools

Table 2: Data analysis, collection matrix and tools

Research Questions	Data Needs	Sources of Data	Research Tools	Analysis Method
1) Which are the key policy networks on climate action by the poultry industry?	<ul style="list-style-type: none"> Thailand politics/interest of climate change policy Thailand policy goal and narrative of reducing greenhouse gas emissions on poultry industry along the supply chain Thailand regulation towards the poultry industry to reduce greenhouse gas emissions 	<ul style="list-style-type: none"> Office of Natural Resources and Environmental Policy and Planning Thailand Climate Change Master Plan (2015-2050) The News on newspaper and the media online 	<ul style="list-style-type: none"> Desk study Secondary Analysis In- depth Interviews Office of Natural Resources and Environmental Policy and Planning, 9 June 2020 Department of Environmental Quality Promotion (DEQP), 20 November 2019 	<ul style="list-style-type: none"> Document Analysis Content Analysis
3) To what extent has the poultry	<ul style="list-style-type: none"> Poultry industry politics/interest 	<ul style="list-style-type: none"> Poultry industry leader company 	<ul style="list-style-type: none"> Desk study Secondary Analysis 	<ul style="list-style-type: none"> Document Analysis Content

Research Questions	Data Needs	Sources of Data	Research Tools	Analysis Method
<p>industry changed its practices on-the-ground and why?</p>	<p>of climate change policy</p> <ul style="list-style-type: none"> • Poultry industry goal and narrative of reducing greenhouse gas emissions along the supply chain. • Poultry industry new policy on reducing greenhouse gas emission along the supply chain • Poultry industry's perspectives towards the current government initiatives and the role of civil society 	<ul style="list-style-type: none"> • Poultry industry climate change annual report • The News on newspaper and the media online 	<ul style="list-style-type: none"> • In- depth Interviews - Betagro group, 10 June 2020 	<p>Analysis</p>
<p>3) To what extent has the poultry industry changed its practices on-the-ground and why?</p>	<ul style="list-style-type: none"> • Civil society's politic/interest of reducing greenhouse gas emission of poultry industry • Civil society's policy goal and narrative of reducing greenhouse gas emission of poultry industry 	<ul style="list-style-type: none"> • NGO, green new agency • The News on newspaper and the media online • The research about the effect of greenhouse gas emission to the society 	<ul style="list-style-type: none"> • Desk study • Secondary Analysis • In-depth interviews - Bio Thai, 15 May 2020 - Green Peace, 4 August 2020 	<ul style="list-style-type: none"> • Document Analysis • Content Analysis

Research Questions	Data Needs	Sources of Data	Research Tools	Analysis Method
	<p>along the supply chain</p> <ul style="list-style-type: none"> • The expectation of civil society to poultry industry company changed regarding reducing greenhouse gas emissions along the supply chain. • Role of civil society in this greenhouse gas emission issue 			

1.4.3 Content Analysis, Document Analyst

Primarily, a content analysis was pertinent documents was carried out Thailand greenhouse gas emission nation plan and report to show that how Thailand deal and plan with this matter especially in poultry industry. And how Thailand policy has been enforcing this issue to private companies who are producers. The documents were analyzed through concept policy process and policy change and the advocacy coalition framework.

The official documents were retrieved from the Office of Natural Resources and Environmental Policy and Planning (ONEP) and Thailand Greenhouse Gas Management Organization (TGO) which some of them are available in online both of Thai and English. Also, the other documents like annual report, research, news from private sector and NGO are available on online website to show how transparent of organizations. These primary data are key to analysis but in order to get more in-depth information, interview with experts also significant.

1.4.4 Interview

In-depth interview was collected from all of sectors, government, private sector and NGO total are 10 interviews. Three of interviewees were conducted from government sections; The Office of Natural Resources and Environmental Policy and Planning (ONEP), Department of Environmental Quality Promotion Ministry of Natural Resources and Environment and Thailand Greenhouse Gas Management Organization (TGO). One of interviewees was presented private sector, Betagro, who the only one consent to do the interview. Three of interviewees from NGO were conducted; Green Peace Thailand, Bio Thai and Thailand Environment Institute Foundation. In addition, two of academy expert interviewees were selected from Faculty of Environment, Faculty of Economics Kasetsart University. And One of interviewees from media journalist expert; Green News.

Table 3: Interview

	Name	Position	Date of Interview
Government Sector			
1	Mrs. Chongrak Thinagul	Director, Department of Environmental Quality Promotion - Ministry of Natural Resources and Environment	20 Nov 19
2	Dr. Kittisak Prukkanon	The Office of Natural Resources and Environmental Policy and Planning (ONEP)	9 June 20
Private Sector			
4	Ms. Maesa Sriamporn Manager- Sustainable Development	Manager- Sustainable Development, Betagro	10 Jun 20
NGO			
5	Ms. Rattanasiri Kittikongnapang	Food + Ecological Agriculture Campaigner, Green Peace Thailand	4 Aug 20
6	Deputy Director	Bio Thai	15 May 20
Academic Expert			
8	Mr. Decharut Sukkumnoed	Faculty of Economics, Kasetsart University	15 May 20
9	Dr. Patthra Pengthamkeerati	Faculty of Environment, Kasetsart University	
Journalist			
10	Mr. Pratch Rujivanarom	Editor, Green News	30 June 21

1.5 Research limitation

The research had some difficulty to access the data and information due to the sensitive of this issue. Some of government authorities limited the accessibility of policy's processing and data not available on greenhouse gas emission of poultry industry in Thailand. The private sector also had limited the accessibility of the data on greenhouse gas emission because of the company image and business reasons.

Additionally, because of COVID-19 pandemic had been impacted to field interview and quality collected data.

1.6 Research Significant

The importance of this research paper is to illustrate Thailand's stance on the response and action to the Paris Agreement on global warming issue that how does the commitment apply to global warming or climate change-related policies that are urgently needed to be addressed in a timely manner. This research focuses on the poultry industry in Thailand, pay an important role as one of the biggest producers and exporters. Most people would understand that the meat industry is not or less contributing to greenhouse gas emission. Especially the poultry industry, and there is no research that has focused on the industry's impact on global warming and greenhouse gas emissions yet.

In addition, this research is also a demonstration of the work and implementation of policies of Thailand government in policies related to global warming and greenhouse gas emission and the policies enforcement to other sectors such as the private sector, including evaluating the work of the government and private sectors, through the eyes of NGOs, media and academic experts on the matter and what direction it should be; and it need to improve or not.

1.7 Research Ethic

This thesis focuses on the topic of Assessing the contribution of Thailand's poultry agribusiness towards mitigating climate change. I recognize that it is important to conduct research with ethics including respect for human rights by

obtaining consent before conducting research and collecting data. Furthermore, this research is based on facts and academic principles without bias, not for personal benefit, considering the academic and social benefits as fundamental.

This research may contain some facts which may affect the image of the company and the interviewee, I am always aware of this issue during doing research and collecting data. Thus, I had made a good effort not to mention others in case the information would affect them, their name and identity of the data provider will be anonymous.



CHAPTER II: LITERATURE REVIEW

1. Literature Review

This research will review the literature overall the knowledge about the history of meat industry in Thailand, Thailand government policy in this sector and what Thailand had commitment to The Paris agreement in 2015. Also, the response from meat industry and the perspective or the hypothesis from the civic society. In section 2.1 History of meat manufacture in Thailand, in section 2.2 Thailand government policy in meat industry, in section 2.3 Environment and Social Impact of meat production (poultry), in section 2.4 Thailand role in the Paris Agreement, in section 2.5 Meat industry company role in the agreement, in section 2.6 Civil society and media analysis or discourse to meat production and Climate Change, in section 2.7 Poultry Industry Greenhouse Gas and Carbon footprint , in section 2.8 The poultry system in Thailand And in section 2.9 Commodity chain

2.1 History of meat manufacture in Thailand

Thailand is an agricultural-based country according to the country located in the tropical wet monsoon where cultivation and livestock play a major role in the livelihood of Thai people occupying about 47 percent of the country's land (Prathumchai, Polprasert, & Englande, 2018). In addition, a substantial transformation has taken place in the agricultural sector in Thailand. Agriculture has shifted away from rice, cassava and maize to highly valued products and non - traditional crops.(Pacific, 2002)

The Development of meat manufacture in Thailand got influence from Western countries. Eggs industry development began at Kasetsart University in 1950. However, rapid development only started in the mid-1970s when Western countries introduced commercial layer hybrids (Pacific, 2002) Indigenous livestock had previously played an important role in local community smallholder farms. Animal products and by - products were produced only to satisfy the needs of the household. But livestock production is currently shifting from backyard to industrial

husbandry.(Prathumchai et al., 2018) Meanwhile, new technology is imported from Western Countries to improve the implementation of production for economically important trades.

From the perspective of agribusiness, Thailand is one of the most suitable places for poultry production and industry due to its favorable natural environment such as sunshine, temperature, good soil fertility combined with cheap soil, low labor costs and year - round availability of cheap feed. Moreover, the poultry industry was often referred to as Thailand's livestock sector's star. The Thai poultry industry's development within just two decades. The poultry sector has become quite advanced industrial production under controlled evaporative (EVAP) housing systems, gaining a foothold in the highly competitive international chicken meat market, from rural backyard production of chickens catering to the domestic market during the period 1980s. (Costales, 2004)

The meat production industry accounted for about 2.4 percent of the nominal GDP of Thailand in 2013 (Sullivan, 2014). In Thailand, pork and poultry are the two most broadly consumed meat products. Poultry includes all domesticated birds, including chicken, turkey, geese and duck. Thailand has a poultry industry that is industrialized and commercialized. Chicken is the most important meat protein source in Thai diet according to the marketing of the meat company, trying to promote the good protein without fat and low cholesterol. (Sullivan, 2014)

In response to expected growth in export and domestic demand, Thai chicken meat production is expected to increase. Expansion is also encouraged by robust prices for live broilers and chicken meat for export as well as lower production costs in 2017.(Preechajarn, 2017)

Thailand domestic chicken sector had been dominated by seven operators: Charoen Pokphand Foods, Betagro, Sahafarms, Cargill, Thaifoods, GFPT, and Laemthong Industries. All of these have invested in operations through the length of the production chain, from animal feed to farming (both running their own farms and running contract farming with independent farmers) to processing. This allows these

players to control costs, exploit economies of scale, and process inputs into value-added export products. (Chuasuwana, 2018)

Chicken meat exports from Thailand are estimated to grow sharply when Japan buys more from Thai suppliers after spoiled meat scandal in Brazil, and strong demand from the non - EU market, particularly from South Korea, Hong Kong, Malaysia, and Canada.

2.2 Thailand government policy in meat industry

The Details of government support for the livestock sector are hard to obtain. An inclusive study was conducted by a team sponsored by the Asian Development Bank in 1989, but tiny analysis and discussion of livestock policies seems to have taken place since then. (Pacific, 2002) In addition, the First National Economic and Social Development Plan (1961-1966) the state aim to support for infrastructure development while leaving the agriculture which farmers received support from the agro-processing sector from the Board of Industrial Promotion and the Bank of Agriculture and Agricultural Cooperatives (BAAC) (Pacific, 2002)

The 9th National Plan for Economic and Social Development (2002-2006) suggests that a development strategy for the livestock sector has not yet been developed. Rather, the sector appears to be addressed through the general participation-oriented development policy and an economy of self-sufficiency that incorporates conservation of natural resources.

The Master Plan for Thai Livestock in the Next Decade (2013 - 2022) which linked to the 11th National Plan for Economic and Social Development (2012-2016) has strategy to focus on developing, improving, and driving. "Livestock of Thailand" as a key, by using the process of participation of people and groups of stakeholders and integrated with sustainable development practices and state law enforcement processes. This strategy also adheres to the government policy framework, especially in the field of livestock. Moreover, the vision of the plan is "Sustainability of Thai

Livestock to be main role in the global market” and the main goal is making well-being society, improving the quality of life of livestock farmers in order to have career stability with a standardized production and environmentally friendly. Additionally, to have a strong commercial market with international standards to export to world market.(livestock, 2018)

The "standard farm" regulation for swine, poultry and cattle farms was established by the Department of Livestock Development (DLD) in 1999. These farm standards are based on guidelines for "Good Agricultural Practice" (GAP) to maintain high quality livestock product from producer to consumer.

The comparatively little information existing on the support in Thailand's livestock manufacture in the past is not surprising. Nowadays, the information is easier to access but still not explicitly. Since Thailand government commitment to the Paris Agreement toward

reducing the greenhouse gas emission, Thailand government policy had been forcing to meat industry to change their practices and their own policy.

However, Thailand economic policy is supporting the meat industry for both of internal and international consumption for driving the economic growth and to support the farmer also the main company. Moreover, the farmers are expected to have more income from meat industry business to have the better live hood.

2.3 Environment and Social Impact of meat production (poultry)

Meat manufacture including poultry is a key driver of climate change up to 30 percent driven greenhouse gas emissions (GHG). The meat production and the crops to feed farm animals accounts for closely third of global deforestation and related carbon dioxide emissions (Laura Wellesley, 2015). In addition, The natural resources such as water, air and soil are needed for the meat manufacture which is increasing rapidly and this sector cause to environmental impact. (Djekic, 2015)

Moreover, chicken production is geographically widespread, with particularly high meat production in The East and Southeast Asia region dominates egg

production, accounting for 42 percent (by mass) of eggs from layers and 35 percent of backyard eggs.(Food & Agriculture Organization of the United, 2013) At a global level, broilers and layers account for the bulk of protein production and associated emissions. Backyard production accounts for 8 to 9 percent of production and emissions.(Food & Agriculture Organization of the United, 2013)

A main motivation for this environment impact is that the environmental issue linked to meat production has not commonly received an adequate institutional response both of developed and developing countries. Meat production sector growing in some particular places and stagnation with poverty in other places. (Osofsky, 2007)

As the animal environment is increasingly modified and standardized, the emission impacts of the environment are changing rapidly. In both developed and developing countries, public policies are barely keeping pace with rapid transformations in the sector's technology of production and structural shifts. Environmental laws and programs are typically only implemented after substantial damage has already occurred. The focus continues to be on protection and restoration rather than on prevention and mitigation approaches that are more cost - effective. (Osofsky, 2007)



2.4 Thailand role in the Paris Agreement

Thailand government had committed to the Paris Agreement in 2015 to reduce the greenhouse gas emission and plans to reduce greenhouse gas emissions by 20% from the projected level of business-as-usual (BAU) by 2030. Aim to adequate and enhanced access to technology development and transfer, financial resources and capacity building support through a balanced and ambitious global agreement under The United Nations Framework

Convention on Climate Change (UNFCCC), the contribution level could increase to 25 percent (Office of Natural Resources and Environmental Policy and Planning, 2015).

The Thailand's Intended Nationally Determined Contribution (INDC) of was developed by participatory process. Consultations with stakeholders were conducted by setting up an inter-ministerial working group and steering committee consisting of representatives from relevant sector agencies, academia, and the private sector. Furthermore, during the technical analysis phase, three national consultations were held. Thailand's INDC has been formulated for Cabinet approval on the basis of the Climate Change Master Plan already approved or in the pipeline. (Office of Natural Resources and Environmental Policy and Planning, 2015)

Thailand Climate Change Master Plan B.E.2558–2593 (2015-2050) with the vision that Thailand will achieve sustainable low carbon growth and climate change resilience by 2050. And missions to Building climate resilient into national development policy by integrating directions and measures in all sectors at both national and sub-national levels to ensure country's adaptability to climate change.

2.5 Meat industry company role in the agreement

Among of the biggest meat industries in Thailand, there is not any report or announcement to response the Thailand government agreement to the Paris agreement. Charoen Pokphan had published the sustainability annual public report but only mention the Climate Change issue for the energy power (Group, 2017). Meanwhile, Betagro had not published and issued anything for public yet, only green livestock farming project that close to the caring of environmental one.(Betagro, 2019)

However, the media online had published the CP and Betagro commitment from the board to involve with the Climate change and greenhouse gas emission issue as below.

CPF is committed to reducing its operating effect on the environment by the end of the decade, concentrating its strategy on four areas: energy consumption, greenhouse gas (GHG), water consumption and landfill waste disposal. Beside that before the end of 2020, the corporation plans to reduce energy and water usage by 5.77bn mega joules and 69 m cubic meters severally. And it object to reduce GHG

emissions by 490,000 tons of carbon dioxide and 12,000 tons of landfill waste disposal (Harvey, 2018).

Betagro stimulated by the approval of low-carbon chicken feed Thai integrator Betagro aims to expand its low-carbon policy to livestock farms and processing plants after the recent approval of the Thailand Greenhouse Gas Management Organization (TGO) to bring carbon footprint labels for their chicken feeds. The chicken feed plant at the company in Lop Buri was the first plant to join carbon footprint initiative, supported by the National Metal and Materials Development Centre in May 2009. Three products from the Lop Buri plant met TGO standard, with a carbon footprint of between 330 - 360 g for each kg of chicken feed. (Berkhout, 2010).

2.6 Civil society and media analysis or discourse to meat production and Climate Change

There are several International Organization mentions and discourse to meat production and Climate Change and link environmental impact to agriculture and livestock on their report. Such as the production of meat and dairy products had been increasing which sabotage the ecological basis of food security by leading to land degradation, water pollution, loss of biodiversity and climate change.(UNEP, 2012) Cattle and other ruminants are responsible for the bulk of the combined emissions of methane and nitrous oxide emitted by livestock, making them responsible for approximately 6% of all human greenhouse gas emissions. (Searchinger, 2013)

Meanwhile, Green Peace Thailand is an international non-government operation for environmental which head quarter in Southeast Asia is in Bangkok address that livestock industry is one of the main factors to climate change, but it was not mentioned and paid attention from public. Having say that, livestock industries are impact to climate change 14% which more than combination of all transportations in this planet. Plus, if world decrease 50% of consuming meat and dairy production, in 2050, greenhouse gas emission from agriculture sector will drop 64%. (Thailand, 2019) Also, Green peace had launched “Less Meat More Veggies project” and work with the primary school in Thailand. (Thailand, 2018)

Moreover, Green news agency address that during 1990 – 2013, swine consumption had increased 23% and poultry consumption also had increased 96% when swine and poultry industry were taken 70% of all worldwide meat industries which more than cattle and red meat industry. Green news also predicts that in 2022, poultry consumption will be the most consume and replace swine consumption who was the number one before. Even though, greenhouse gas emission per weight poultry might less impact to climate change than cattle meat but on “worldwide carbon footprint of poultry” got the largest number due to massive production and consumption all around the world. So we need to concern about having less meat to decrease greenhouse gas emission and to protect ecology for our next generation. (news, 2018)

On the other hand, during dry season around March – April , Chiang Mai had been in the worst city of haze pollution in the World because of the deforestation for growing the maize to feed the farm animal which had been happened every single year.(Pardthaisong, Sin-ampol, Suwanprasisit, & Charoenpanyanet, 2018) But the media and the social seldom speak out the truth behind which made the farmer was a victim without any proved.

The non-profit organizer and other civil society are the one who always raising the climate change issue while government ignore that. The main role of civil society in climate change is to raising awareness of climate change to spread in the public for example, Green Peace Thailand had lunched the project name “Less Meat More Veggies” or eating vegetable and publish content about Meat industry and climate change. The online media also publish the content how meat consumption effect to climate change such as Green news, Voice TV, VOA Thai etc. or even Thailand Greenhouse Gas Management Organization (Public Organization) also publish meat industry and climate change online.

2.7 Poultry Industry Greenhouse Gas and Carbon footprint

The Chicken meat is the second biggest contributor to global meat production with 24 % by volume in 2010, while the swine industry is the biggest contributor

with 37 percent. Global demand for pig meat, chicken meat and chicken eggs are forecast to increase by 32%, 61% and 39% respectively in the 2005-2030 period. (Food & Agriculture Organization of the United, 2013) Plus, the world has more than 23 billion poultry on the planet-about three birds per person, and about five times more than 50 years ago. (Mottet & Tempio, 2017)

Owing to population growth, growing incomes and urbanization, demand for animal-derived food is increasing and poultry meat has shown the fastest trend in the last decades. During the past 50 years the average annual growth rate for poultry meat was 5 percent while it was just 1.5 % for beef, 3.1 % for pork and 1.7 % for small ruminants. Poultry production has been chiefly energetic in developing countries, especially in East and Southeast Asia with a yearly growth rate of 7.4 % in poultry meat production. And global per capita poultry meat consumption raised from 2.88 kg to 14.13 kg (Mottet & Tempio, 2017)

Poultry contributes to climate change by releasing greenhouse gasses either directly (from fertilizer management) or indirectly (from feed processing practices or from forest conversion into agriculture lands). Based on a life-cycle assessment approach, it was estimated that poultry supply chains emit approximately 836 million tons of CO₂ equivalent, approximately 11% of total livestock supply chains' GHG emissions. Furthermore, Poultry production uses large quantities of land and water mainly by producing feed crops. Poultry production is a sector that needs the most land for cereal production, which in 2010 will require an estimated 93 million ha. (Mottet & Tempio, 2017)

Most of the CO₂ originated from the poultry industry is fundamentally from the use of fossil fuels. This can be attributed to the purchase of fuel, the use of propane in stationary combustion units and the use of diesel in mobile combustion and generators used on the poultry farm. Nitrous oxides and methane gases are also emitted from manure during handling and storage, beside the emissions from fossil fuel used on poultry farms. Nitrous oxide and methane emissions are based on management decisions on manure disposal and storage as these gases are produced as a by-product of nitrification / denitrification and methanogenesis, respectively, in the

decomposition of manures. (Dunkley, 2014)

Even though, the amount of greenhouse gas emission of poultry is one of the lowest among other farm animals due to the size and weight (amount of GHG emitted per unit of production produced. (Mottet & Tempio, 2017) But the massive production and consumption of poultry are around the world could count as poultry industry as one of the key impacts to climate change. (news, 2018)

Figure 2: Categories of GHG Emission

Category	Description	
Feed N ₂ O	Direct and indirect N ₂ O emissions from organic and synthetic N applied to feed crops and crops residues	
Feed CO ₂	Feed: non-crop	CO ₂ arising from the production of fishmeal and synthetic feed additives (and lime for chickens)
	Feed: blending and transport	CO ₂ arising from the production and transportation of compound feed
	Feed: fertilizer production	CO ₂ from energy use during the manufacture of urea and ammonium nitrate (and small amounts of N ₂ O)
	Feed: processing and transport	CO ₂ from energy use during crop processing (e.g. oil extraction) and transportation by land and (in some cases) sea
	Feed: field operations	CO ₂ arising from the use of energy for field operations (tillage, fertilizer application). Includes emissions arising during both fuel production and use.
Feed LUC CO ₂	CO ₂ from LUC associated with soybean cultivation	
Feed rice CH ₄	CH ₄ arising from the anaerobic decomposition of organic matter during rice cultivation	
Indirect energy CO ₂	CO ₂ arising from energy use during the production of the materials used to construct farm buildings and equipment	
Manure N ₂ O	Direct and indirect N ₂ O emissions arising during manure storage prior to application to land	
Manure CH ₄	CH ₄ emissions arising during manure storage prior to application to land	
Enteric CH ₄	CH ₄ arising from enteric fermentation	
Direct energy CO ₂	CO ₂ arising from energy use on-farm for heating, ventilation etc.	
Post farmgate	Processing and transport energy use	

Note. Source from “Greenhouse gas emissions from pig and chicken supply chains: A global life cycle assessment”, by Food and Agriculture Organization of The United Nation, Animal Production and Health Division, 2013.

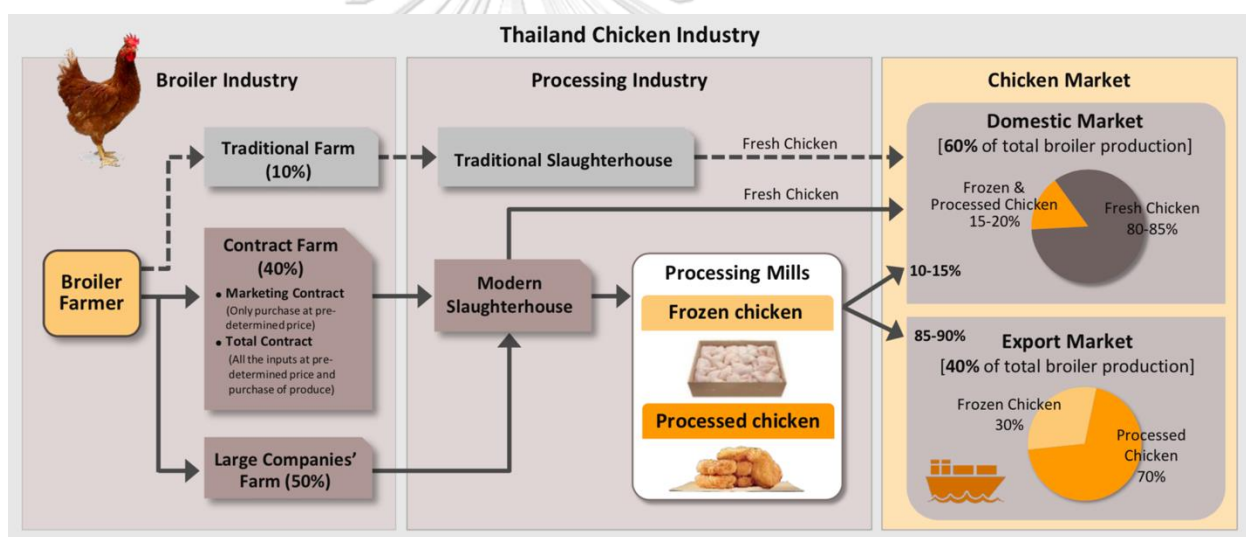
2.8 The poultry system in Thailand

There are Seven companies dominate the domestic Chicken market in Thailand: Charoen Pokphand Foods, Betagro, Sahafarms, Cargill, Thaisfoods, GFPT and Laemthong Industries. All of these have invested in operations across the length of the supply chain, from animal feed to farming (both running their own farms and carrying on contract farming operations with independent farmers) to manufacturing.

These players are able to manage costs, take advantage of economies of scale and turn inputs into value-added export goods.(Chuasuwana, 2018)

Farms run by the major players in the frozen and processed chicken sector constitute around 50% of all domestic production and this output is slaughtered and processed for export as boned and prepared chicken, frozen and processed. In addition, contract farmers' output contributes another 40%. The volume of this inventory is bought by domestic customers,hotels, restaurants, or families, with a smaller proportion going to market for value-added goods. The remaining 10% of domestic production comes from small farms outside the supply chain for frozen and processed meat.(Chuasuwana, 2018)

Figure 3: Thailand Chicken Industry



Note. Source from “Frozen & Processed Chicken Industry” in Thailand Industry Outlook 2018-20, Bank of Ayudhya (Krungsri) by Chetchuda Chuasuwan, 2018

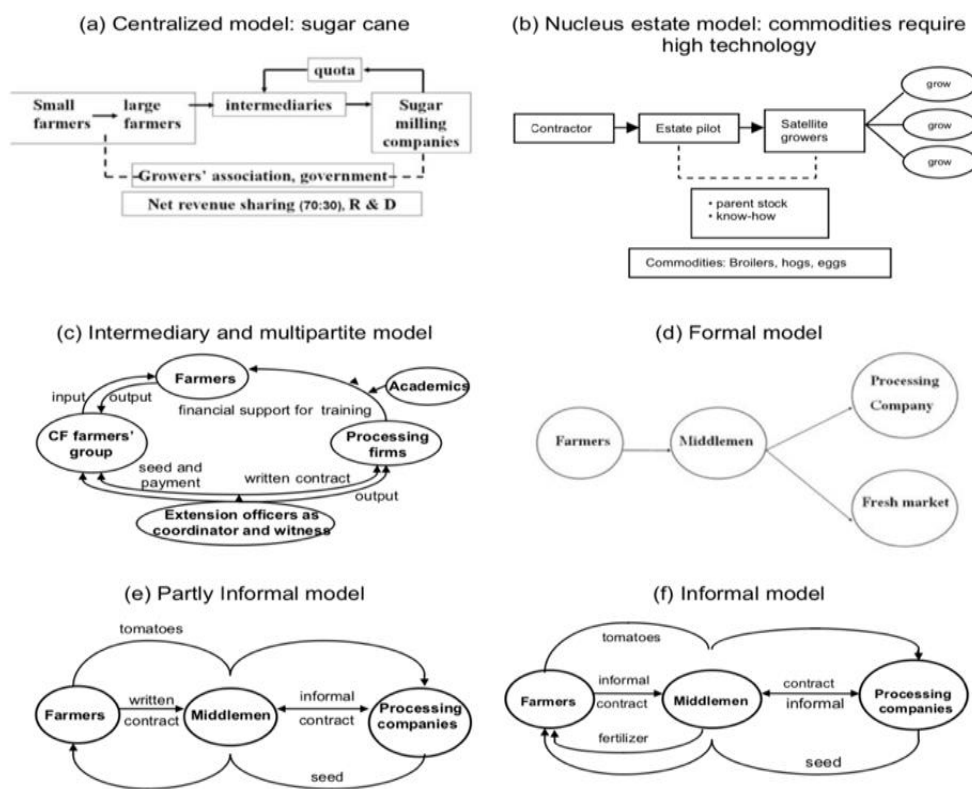
Contract farming in Thailand started since 1975 by Charoen Pokkaphan (CP), the biggest agribusiness company in Thailand. Thai government on that time had promote contract farming in Thailand in the 6th National Economic and Social Development Plan (1987-1991) for “New Industrial and Agriculture Development”, which it made Thailand, became one of the leaders of Contract Farming in Asia. In 1970s, a joint venture between CP and the U.S. company Arbor Acres began importing American-grown broilers and layers into Thailand and introduced the

country's industrial poultry production practices. (The office of Public Relations, 2004)

Although, the statistics of total number of contracts farmer in Thailand has no data, observers from the Livestock Department, industry, FAO and local NGOs believe that this mode of production continues to expand along with Thailand's ambition to become "the world's kitchen" (The office of Public Relations, 2004) According to the FAO Regional Program for Integrated Pest Management, "contract growth becomes the most dominant system for export production" (P.Kumar, 2004). According to CP, the corporation has presently 6,000 contract farm including chicken farm, pig farmers, rice farm and corn growers under contract. (E-news, 2018)

Contract farming is built on the basic of the crops or products, the contractor's objectives and resources and the farmers ' experience. (Eaton, 2001) Four typical contract models can be identified in Thailand: the centralized model, the nucleus estate model, the intermediate and multiparty model as outlined, and the formal model as below. (Wiboonpoongse, 2008)

Figure 4: Contract farming model in Thailand



Note. Source from “Overview of Contract Farming in Thailand: Lessons Learned” by Songsak Sriboonchitta and Aree Wiboonpoongse, 2018

In General, contract farming was implemented and managed differently in Thailand from other countries, with very strong intervention and promotion under the four-sector plan as well as sub-regional economic cooperation in Mekong. Substantial incentives and promotion were given to agribusiness. Because Thailand is an agricultural exporting country, agribusiness has dominated policy making.(Wiboonpoongse, 2008)

Contract farming in the North has been successful in crops such as soybean, baby maize, sweet maize, potatoes, tomatoes and eggplant, as well as vegetable and maize seed.(Wiboonpoongse, 2008). In Northeast, Export success depends on irrigation water supply. Production can be extended during the wet season and the introduction of high-marketability dry seasonal crops and non-traditional crops. (Wiboonpoongse, 2008)

Farmers start the first step for crop field after presage the seed by preparing and managing the soil, there is few ways that farmer to clear all the weed. The first one, using the chemical because it's the fastest way to do. The second one, burning the land which cause to the wildfire if the farmer can't control it. The third one, plowing the soil with tractor then dry the soil 1-2 months, this way is the most popular way among the farmer because it will requalify of the soil and ready for next cultivate. (Boubphakaisone, 2016)

Next step after soil management, the famer will drop the seeds to grow the maize and using the fertilizer for better soil quality and more production. When the crops reach 50-80 centimeters, farmer will apply the fertilizer and clear the weed. On this step, the farmer will use the chemical again to clear the weed. The water management also need at this step for growing the crops. To harvest, will be around December – April each year which a few ways. After that all the maize production will transfer to the maize buyer and distribute to the animal food factory. (Boubphakaisone, 2016)

2.9 Commodity chain

Commodity chain is focus on the point of consumption which has been moved from the point of production. Commodities are seen as originating in manufacturing regions and passing across economic agent networks, as with manufacturers, retailers, and transporters, to market regions where they are sold, retailed, and consumed. The notion of commodity chain has possibility to exhibit the environment and consumption on labor effect, plus with the knowledge about the commodity chain concept, consumers able to consider and make their own choices. (Hartwick, 2015)

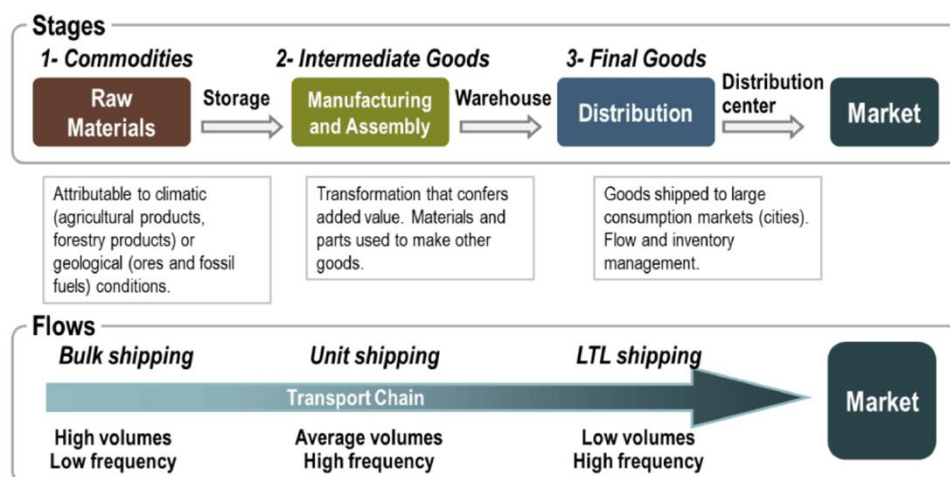
Commodity chain has introduced and be used academically in the 1980s since the economic activities were became main interest and ship from territory expanse. There are three forms of commodity chain analysis; global commodity chains; commodity circuits; and systems of provision. (Hartwick, 2015) The Global Commodity Chain (GCC) was introduced in 1994 by Gereffi. (Clancy, 1998) The

GCC definition was formulated within the context of a study of the development and underdevelopment political economy, originally derived from the theory of world systems and the theory of dependence. (Bockel, 2005) Global commodity chains underline the organizational reach of transnational development arrangement; the relations between economic agents, for example producers of raw materials, manufacturers, traders and retailers. (Hartwick, 2015)

In addition, the commodity chain is a specific way of separating and showing the structure of production. The chain is the implementation of a basic explanatory model of flow organization (of resources and finances) and of the involved actors stressing their interdependence and the regulatory structure under which they operate. And the analysis of the commodity chain assistances the analyst to define the relation.

ships between the various stages of transformation in the agricultural or agro-food system network, whether they are linear, complementary, or sequential. More precisely, the commodity chain is the succession of operations and agents that, beginning upstream with a raw material, ultimately emerge downstream with one or more final products at the consumer level after several stages of transformation and increase in value. (Bockel, 2005)

Figure 5: Commodity Chain



The Value Chain (or Commodity Chain)

We can see that all the step of commodity chain from raw material to market or final goods destination are involve with natural resources and energy with impact directly to climate change and greenhouse gas emission. Having say that, transport fuel consumption in most developed countries generates a significant proportion of all energy-related emissions. And developing countries are expected to rise greenhouse gas emissions due to combination of conjunction between the increases of personal travel and freight transportation. (Lipman, 2007)

1.Contact Maize Farming, soil management is one of the keys to contribute to climate change because in order to get enough land for maize crops, farmer often burn the forest and it became deforestation in dry season every year. And Herbicides also one of contribution to climate change as it is one types of chemicals which quite common use in Worldwide. This chemical is mingling with nature resources such as water and soil. When the soil became the depleted soil, farmer must move and find for new land which cause to deforestation.

2.Middleman is the one who transfers all maize product to the feed production company for next step of productions. This logistic step is required the four-wheels vehicle or the truck to transfers from contract farm to the factory. The main factor of contribution to climate change is fuel energy due to CO₂ emission and unsustainable energy. As well as **feed mill industry** which must deal with energy power to supply with engine machine and cause to pollution during the manufacture process in feed mill.

We cannot deny that transportation is always a crucial part of any product supply chain. Transportation and logistics are responsible for 2800 megatons of CO₂ emissions, or 5.5 percent of global CO₂ emissions; according to research published by the World Economic Forum in 2009, half of them occur from land transportation. According to this, logistics activities generate many environmental impacts, such as increasing greenhouse gas emissions. (Gustavo M. Ugarte, 2016)

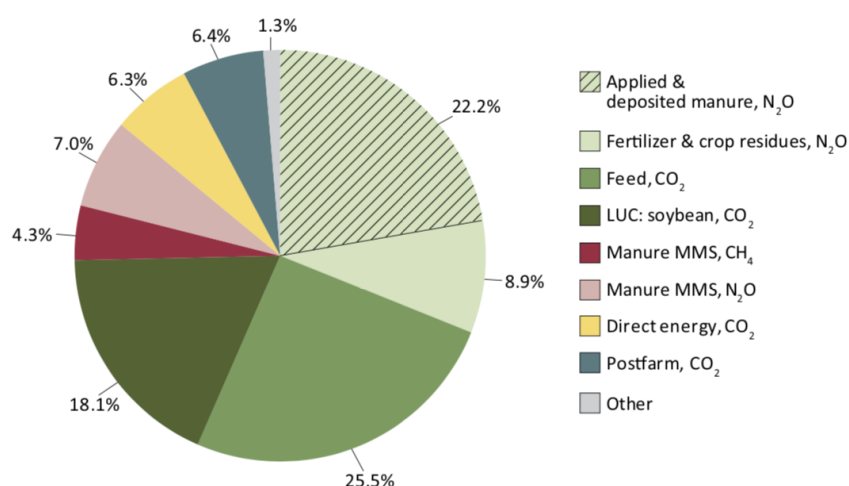
3. Feed Mill

Feed processing is the process of supplying feed to livestock. Corn, broken rice, and soybean meal are all essential feed items. The majority of large-scale farms have their feed mills, which allows them to absorb feed supply costs internally. (Sullivan, 2014)

Feed production accounts for 78 percent of chicken meat emissions, with direct on-farm energy usage accounting for 8%, post-farm processing, transport accounting for 7%, and manure storage and processing accounting for 6%. Feed production accounts for 69 percent of egg emissions, with direct on-farm energy usage accounting for 4%, post-farm processing, transport accounting for 6%, and manure storage and processing accounting for 20%. (Food & Agriculture Organization of the United, 2013)

Feed emissions from fertilizer application and energy use are significant for both meat and eggs: N₂O from fertilizer application accounts for 32% of meat and 30% of egg emissions, respectively, while CO₂ from energy use in feed production accounts for 25% and 27% of meat and eggs emissions, respectively. The entire direct and indirect energy consumption across the supply chain⁵ accounts for 41% of total beef emissions and 37% of total egg emissions. (Food & Agriculture Organization of the United, 2013)

Figure 6: Breakdown of total global GHG emissions by category for chicken meat and egg supply chains



Note. Source from “Greenhouse Gas Emissions From Pig and Chicken Supply Chains: A Global Life Cycle Assessment ” by FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2013

3. Poultry and Livestock farms

The study of greenhouse gas emissions in chicken meat production by MacLeod et al. (2013) found that feed production covered the most significant regions of the environmental effect coming from chicken meat supply chains. Broiler farms account for 91 percent of greenhouse gas emissions.(Phairat Usubharatana, 2016)

Many tiny home farms make up Thailand's broiler chicken farms. In 2012, Thailand had 42,029 broiler chicken farms, with 35,947 private farms accounting for 86.0 percent of the total and 6,082 commercial farms (14.0 percent of total). Commercial farms may be divided into three categories based on their size: small farms with a chicken population of 500 to 2,000 birds account for 10.5 percent of the total. Medium farms with 2,001 to 5,000 hens account for 17.5 percent of commercial farms in Thailand and big farms with over 5,000 chickens account for 72.0 percent. (Sullivan, 2014)

Poultry and Livestock farms are needed the nature resources for raising farm animal such as water to drinking and servicing, land, feed products. Approximately 45% of the worldwide water budget used in the livestock industry. Besides that, livestock accounts for 35–40% of worldwide emissions from anthropogenic sources.(Osofsky, 2007) and most of water used for drinking and servicing are return to the environment which cause to water pollution. Moreover, livestock excrements contain amount of drug, pathogens, heavy metal and nitrogen etc. (Osofsky, 2007) And the lack of solid management also causes to pollution.

In 2000, Thailand agriculture sector migrated greenhouse gas 51.88 million ton or 22.60 percentage of over Thailand but less than greenhouse gas emission in power sector. The greenhouse gas emission of agriculture sector is mainly from methane, animal dropping management, rice file, soil and combustion.(Thailand, 2019)

Besides that, livestock farms need a ton of water to feed animals farm, half kilogram of meat using 6,800 litter. The lack of solid management also causes to pollution. Last October, the scientist said we need to consume less meat product 90 percent and increase soy product 5 times to replace meat production. (Online, 2019)

4.The slaughterhouse can produce gas emission from animal waste; stomachs, blood and livers etc. One slaughterhouse can cut methane with a lot of amounts and one year a factory is creating animal waste from chickens, cows, pigs around 55,000 tones. Methane and carbon dioxide are significant contributors to climate change. These gasses are developed during the slaughter process by wastewater degradation. (H. S. International, 2011) Besides that, electricity is also one of primary source of these emission, used to operate the slaughterhouses and get rid of the above-mentioned wastewater as well as packaging, cooling and carrying the dead animals. (H. S. International, 2011)

5. Distributor, the last component of the food chain is distributing the meat product to market, wholesale, retail, and customer. On this final stage have to deal with all kinds of transportation after done the meat production process, will deliver to retail, customer for internal consumption and around the world for export. The long-distance transport occurs CO₂ emission significantly.(Osofsky, 2007)

2.10 Knowledge gaps

The purpose of this literature review is to understand more about the concept of this research and the background of the meat production industry, especially the poultry industry in Thailand. Also, understand the role of the meat production industry in greenhouse gas emission as the key actor in this issue. Moreover, this research will be filled in more about assessing the contribution of agribusiness in Thailand, poultry industry towards mitigating climate change by using the background from this literature review.

In addition, the poultry industry and greenhouse gas emission in Thailand, along with Thailand's poultry industry system and poultry commodity chain, also

focus on the literature review to show and understand how the poultry industry plays a vital role in greenhouse gas emission in the world.

This research will focus on the poultry industry from the first step of the supply chain; contact maize farming, till the last one, which shows that the greenhouse gas emission occurred since the beginning step, and it had been promoted and supported by the government as one of the keys activates of Thailand economic since the 1960s.

According to that, it is challenging to see how the Thailand government's greenhouse gas emission and a related policy enforced climate change regulations to the meat industry and agribusiness sector. Meanwhile, the civil society sector is watching these matters closely.



CHAPTER III: Which are the key policy networks on climate action by the poultry industry? And what are the networks share interest?

3.1 Introduction

As the impact of climate change becomes more apparent, policymakers and industry leaders have begun to take action to reduce the environmental footprint of the poultry industry. Key policy networks have emerged to address the issue of climate change in the poultry industry, with a focus on sustainability and reducing the carbon footprint of poultry production. And since the outbreak of COVID-19, global warming, and the emission of carbon dioxide in various industries, including animal husbandry, have been important and hot topics on the news and social media. During the lockdown period, many industries had to suspend operations, resulting in a decrease in production and greenhouse gas emissions, which had a significantly positive impact on the environment.

The purpose of this chapter is to answer sub-question 1 , namely: Which are the key policy networks on climate action by the poultry industry? And what are the networks share interest? And to identify the key policy networks on climate action by the poultry industry and explore their shared interests. By understanding the organizations involved and their collaborative efforts, we can gain insight into the strategies and actions being taken to address the impact of the poultry industry on the environment.

There is a few key actors in this matter including Government or Thailand authorities who has a responsibility in this case, private sector which we will focus on poultry industries and the civil society sector. This chapter will show you how all of actors collaborate and how they work.

In addition, this article also highlights the origins of each sector's response to the greenhouse gas reduction policies, including the responsibilities and challenges

involved in formulating such policies. It aims to provide readers with a true understanding of the origins and deeper context behind the policy development.

3.2 Identifying policy networks

3.2.1 'Transition network' for climate action of the poultry industry

Government Sector

Thailand Greenhouse Gas Management Organization (TGO), a public organization, serves as the primary agency promoting and supporting the implementation of climate change measures in Thailand. Therefore, a work strategy must be established in accordance with the global trend of development. TGO is the main organization responsible for managing greenhouse gases and driving development through networking with government agencies and various sectors. Together, they aim to achieve Thailand's greenhouse gas reduction policy goals and promote the participation of different sectors in driving the development of a low-carbon society. (Thailand Greenhouse Gas Management Organization: TGO, 2017)

Moreover, Thailand greenhouse management organization (TGO) has launched the strategic plan and issues are: (Thailand Greenhouse Gas Management Organization: TGO, 2017)

- 1) Encourage the reduction of greenhouse gases.
- 2) Develop tools and mechanisms for creating economic incentives for a low-carbon society.
- 3) Promote sustainable consumption and production to reduce greenhouse gas emissions.
- 4) Support and integrate with relevant parties to formulate and monitor national greenhouse gas reduction results.
- 5) Enhance capacity building and develop knowledge on climate change management.
- 6) Increase the efficiency of organizational management

Additionally, Thai government authorities had launch the related policy goal which mainly focus on the participation from all actors as below. (Pollution Control Department, 2017)

1) The government sector including provinces, local authorities, and related agencies, continuously organize campaign activities for public relations. They aim to make the province the center of information distribution at the local level and work closely with the media to disseminate accurate information. Additionally, they utilize a network of volunteers from various departments to distribute and publicize information to reach the public and raise awareness about preventing and resolving haze.

2) The private sector provides support for solving haze problems, particularly in the form of budget contributions and operations to increase efficiency. This support comes from businesses involved in planting maize and other agriculture businesses sectors.

3) The Civil society plays a crucial role in preventing and tackling the haze problem. Community involvement is the key to success, so efforts should be focused on encouraging people and communities to continually participate in operations and raising awareness of the issue.

Private Sector

As Thailand is one of the top three of poultry products exporters globally, there is a few tops main roles in the poultry industry such as Betagro group and Charoen Pokaphand group (CP) who take more than a half of this business market share in Thailand.

Betagro group is currently focus on sustainable business operations based on economic, social, and environmental responsibility considering the potential impact reduction from business operations by combining technological advances and innovation with development to get more environmentally friendly and higher quality products to consumers. Under the framework of ESG (Environment, Social, and

Governance) principles covering the environment, society, and good governance. To address the United Nations Sustainable Development Goals (SDGs), it is necessary to consider the circular economy in the development and design of methods that make the most efficient use of resources and reduce greenhouse gas emission.

Betagro's sustainability efforts extend beyond their internal operations to include collaborations with various stakeholders. They work with government agencies, non-governmental organizations, and academic institutions to identify and implement effective solutions to address sustainability challenges in the poultry industry.

One of the main ways Betagro prioritizes sustainability is through the implementation of a comprehensive environmental management system (EMS). This system aims to minimize the impact of their operations on the environment. Betagro utilizes renewable energy sources, such as solar power, and employs innovative waste management practices, such as converting organic waste into compost and using it to fertilize crops. They also have a robust water management system that includes recycling and reusing wastewater. The EMS is designed to ensure that the company complies with all relevant environmental laws and regulations and meets its environmental responsibilities. (Betagro, 2022)

The EMS covers all aspects of Betagro's operations, including production, packaging, distribution, and waste management. It also includes the company's supply chain, the farmers who supply Betagro with raw materials. The EMS provides a framework for the company to identify and assess environmental risks, set environmental objectives and targets, and monitor its performance in achieving these goals.

Moreover, the key elements of Betagro's EMS include: 1) Environmental policy; Betagro has a commitment to protecting the environmental and natural resources which communicated to all suppliers, stakeholders, and employees. In the part of poultry sector, there is an efficient management of water, wastewater, and

energy in the production process of Betagro. This is achieved by reducing water usage, reusing water, and treating wastewater to meet the legal standards. It also reduces waste generation and encourages employees to segregate waste before disposal. Also, there are projects to improve and develop the utilization of waste for maximum benefits. Betagro has also adjusted the animal feed formula to improve nutrient absorption, which helps to reduce greenhouse gas emissions and odors. And the company has chosen to use alternative energy from solar energy technology by installing solar panels in more than 35 facilities nationwide, which can produce more than 40 megawatts of clean energy. This can reduce greenhouse gas emissions by more than 22,000 tons, helping to save costs and reduce carbon dioxide emissions at the same time. (Betagro, 2022)

Figure 7: Renewable energy from solar energy technology



Note. Source from “Transformation Point of Betagro towards the goal of becoming a “Leading Global Food Company for Sustainable Living.”, 2022

2) Environmental risk assessment; Betagro normally conducts environmental risk assessments to identify potential environmental hazards and impacts from their industry. In terms of the poultry industry, Betagro only sources raw materials (such as maize) from contract farmers who are reported to not engage in forest burning and deforestation. However, according to one employee, it can be quite difficult to verify because the company has a plenty of contact farms nationwide and some of them are

small farm with limited of land. By the way, Betagro promoting the assessment of an organization's carbon footprint and their products.

Figure 8: Anaerobic Pond



Note. Source from “Transformation Point of Betagro towards the goal of becoming a “Leading Global Food Company for Sustainable Living.”, 2022.

By implementing an EMS, Betagro is demonstrating its commitment to environmental sustainability and taking a proactive approach to managing and reducing the environmental impact of its operations.

In conclusion, Betagro's commitment to sustainability is commendable, and their efforts to promote sustainable practices in the poultry industry are crucial in ensuring a more sustainable future for all.

Charoen Pokphand Group (CP) is one of the leading agribusinesses in Thailand, with operations in various sectors, such as agriculture, food, retail, etc. CP is one of the major players in the poultry industry in Thailand, CP has been focused on climate change action and taking steps to reduce its environmental footprint from other sectors and Thailand authorities who relevant to this issue.

CP has established primary objectives to attain carbon neutrality by 2030 and reach net zero emissions by 2050 to minimize potential effects on society.

Additionally, the company is involved in promoting the Paris Agreement. CP Group's efforts to achieve these objectives are not only limited to its own operational procedures and processes, but also extends to encouraging business partners throughout the supply chain to adopt their goals and operational guidelines in their respective businesses to ensure a constructive contribution. (Pokphand, 2022)

Recently, CP is on processing to reduce greenhouse gas (GHG) emissions in the poultry industry. As one of the biggest poultry product producers in the world, CP has committed to address the climate change issue and reducing the environmental impact of its operations.

The poultry industry, animal waste is one of the significant contributors to GHG emissions. CP has implemented measures to manage and reduce the climate change and environmental impact of animal waste by utilizing it to generate biogas which allows CP to capture methane emissions from animal waste and use it as a source of renewable energy, thus reducing GHG emissions and dependence on fossil fuels. They also invested in renewable energy sources, such as solar power, to reduce non-renewable energy sources. CP also has installed solar panels in many of their poultry farms which they are considerably as reduced carbon footprint.

Figure 9: CP's solar panel



Note. Source from “Charoen Pokphand Group Sustainability Report, 2021.”, 2021.

Aside from minimizing its own greenhouse gas emissions, CP has put in place measures to encourage sustainable practices in the poultry industry. They have instituted a program to assess supplier sustainability, which reviews suppliers'

environmental and social performance to ensure that they meet CP's sustainability criteria. Moreover, CP encourages suppliers to adopt sustainable practices, such as reducing their greenhouse gas emissions.

Overall, CP is efforts to reduce GHG emissions in the poultry industry demonstrate its commitment to environmental sustainability. The company's investment in renewable energy, adoption of biogas technology, promotion of sustainable practices in its supply chain, and efforts to reduce waste and emissions in its operations highlight its role as a leader in the poultry industry in addressing climate change.

Civil Society

There are a few of civil society in Thailand that monitor and address the issue of climate change caused by various industries, mainly the animal agriculture industry. This industry is the largest contributor to GHG from the beginning of the supply chain with the cultivation of animal feed such as corn which lead to deforestation and pm 2.5, to transportation, livestock farming, slaughterhouses, and meat processing. Thailand is also one of the top producers and exporters of poultry products in the world. That's why it is important to address and monitor the environmental impact of the poultry industry in the country.

Greenpeace Thailand Organization has been running a campaign to raise awareness about the impact of greenhouse gas emissions (GHG) from livestock industries in Thailand. Their campaign aims to highlight the need for the livestock industry to reduce GHG along the supply chain since the beginning and shift towards more sustainable and less GHG-intensive practices.

The campaign focuses on the fact that the livestock industry is a significant contributor to GHG emissions in Thailand, and that these emissions are accelerating climate change. According to Greenpeace, the livestock sector in Thailand emits over 200 million tons of CO₂ equivalent per year, which is equivalent to the emissions of over 40 million cars.

In the meantime, Greenpeace also promoting “Eat less meat” campaign. In this campaign, aim to promote and show how changing habit consumption and food system can protect the health of people and the planet, based on scientific evidence that demonstrates. By reduce the production and consumption of animal products by 50 percent within year 2050 and to transform our food system. (Greenpeace, 2018)

Our food system, including changes in land use related with agriculture, accounts for one-fourth of all greenhouse gas emissions which affects to climate change. The production of meat and dairy products alone emits almost as much GHG emission as the entire transportation sector. If we do not take any action, greenhouse gas emissions from the food system could increase to half of all emissions globally by the year 2050, because of human activities. (Greenpeace, 2018)

3.2.2 ‘Transformative network’ for climate action of the poultry industry

The transformative network for climate action of poultry industry in Thailand has been on processing since Thailand ratified the Kyoto Protocol on 28 August 2002. The Kyoto Protocol is an international joint agreement to set clear GHG reduction goals through a legally binding contract. Nevertheless, there are still some limitations to such collaboration which prevent complete solutions to climate change. Conversely, there are still some limitations to such collaboration which prevent complete solutions to climate change. One significant drawback is the United States of America, a member country in Annex I, had released a substantial quantity of GHGs from the past and had not joined the Kyoto Protocol. Due to the desire of Congress to prevent the country from being required to engage in reducing GHG emissions as the agreement did not contain or include commitments from developed countries with high GHG emissions, such as China mainland. Hence, Negotiations under the Kyoto Protocol had centered on reaching a new agreement apart from the Protocol itself, which includes countries responsible for high GHG emissions.

Office of Natural Resources and Environmental Policy and Planning is under Ministry of Natural and resource, directly in charge for the international framework for climate change and greenhouse gas emission like, United Nations Framework Convention on Climate Change (UNFCCC) for The Paris Agreement, Intergovernmental Panel on Climate Change (IPCC) and Kyoto protocol etc. Besides that, Thailand Greenhouse Gas Management Organization or TGO (Public Organization), was formed in 2007 as an autonomous public agency under Thai law to manage and accelerate the creation and implementation of greenhouse gas mitigation projects, and to support collaborations between public, private, and international organizations to promote climate action. And response to the increased and widespread economic and social impacts of climate change and awareness of the need to control and minimize greenhouse gas emissions in Thailand.

TGO is the main organization that drives GHG campaigns with private companies and also offers training courses to support the promotion and enhancement of capacity, as well as provide guidance to government and private sector organizations on greenhouse gas management. For example, TGO has developed a monitoring and reporting framework for greenhouse gas emissions under the Thailand Voluntary Emission Trading Scheme (Thailand V-ETS). This framework aims to track and report greenhouse gas emissions at the organizational level within the Thailand V-ETS system. The process begins with measurement, reporting, verification, and reporting submission to TGO. For Feed Industrial sector, the guidelines of the Thai industrial sector have defined the scope of assessment for greenhouse gas emissions of organizations in a gate-to-gate approach. The data is collected bottom-up from all relevant public utility units associated with greenhouse gas emissions. This is done within the operational boundaries of the organization, following the standards set by ISO 14064-1. It covers only the sources of direct and indirect greenhouse gas emissions from energy use, specifically carbon dioxide and methane. (Thailand Greenhouse Gas Management Organization, 2021)

Moreover, Ajinomoto Betagro Frozen Foods (Thailand) Co., Ltd. under Betagro Public Company Limited led by Mr. Patama Boonprom, Factory Manager,

has signed a collaboration agreement on "Science-based Targets" and the implementation plan to reduce greenhouse gas emissions to achieve the Net Zero Emissions goal. This agreement was made with the "Private Sector Collaboration for Low Carbon Green Growth (PCGG)" and the Energy and Environmental Economics Excellence Center, Thammasat University.

Previously, Ajinomoto Betagro Frozen Foods (Thailand) Co., Ltd. has been actively involved in continuous greenhouse gas emission assessments since 2018. They have set targets to reduce greenhouse gas emissions through various projects such as electricity reduction, utilization of solar rooftop energy, machinery efficiency improvements, and raising employee awareness and participation in energy conservation. (Betagro, 2023)

3.3 Interests of policy network actors

3.3.1 'Transition network' for climate action of the poultry industry

Thailand has submitted a proposal for the country's participation in reducing greenhouse gas emissions and addressing climate change post-2020 (in the year 2023) under the Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) since October 1, 2015. The proposal sets targets to reduce greenhouse gas emissions by 20-25 percent across all economic sectors from business-as-usual levels by 2030 (in the year 2023). Subsequently, during the 21st Conference of the Parties (COP) held in 2015, also known as COP 21, the Paris Agreement was adopted, calling on member countries to achieve the emission reduction targets outlined in their respective INDCs. The Paris Agreement came into force on November 4, 2016, and the country's participation in reducing greenhouse gas emissions and addressing climate change post-2020 is now referred to as the Nationally Determined Contribution (NDC) instead of the INDC. (Energy, 2019)

TGO has developed the Thailand's Nationally Determined Contribution Roadmap on Mitigation 2021-2030 (NDC Roadmap) to serve as a framework for

greenhouse gas emissions reduction in the country. The roadmap was approved by the Cabinet on May 23, 2017. According to the NDC Roadmap, the projected reduction potential for the energy and transportation sectors by the year 2030 is 113.0 million tons of carbon dioxide equivalent (Mt-CO₂eq). (Energy, 2019)

Based on the above information, it can be seen that the Thai government is determined to reduce greenhouse gas emissions in various industries within the country. This is achieved through setting targets for reducing greenhouse gas emissions through the country's emission reduction plan. Once the plan was approved by the Cabinet, it transformed into policies implemented by various sectors. It is noteworthy that there has been a significant change in response, particularly in major industries in Thailand, towards the government's policies. However, it is worth noting that this response has occurred rapidly in the past 2-3 years, possibly due to increased environmental awareness among consumers and growing international importance placed on this issue. The urgency of addressing the issue of global warming has multiplied, making it a matter that requires urgent attention worldwide.

Meanwhile, Greenpeace has called on the Thai government to take action to address the issue of GHG emissions from livestock production. Specifically, the organization is calling for the government to implement policies that encourage the shift towards more sustainable and less GHG-intensive livestock production practices.

The campaign has also highlighted the role of the private sector in reducing GHG emissions from livestock production. Greenpeace has called on companies operating in the livestock industry to take responsibility for their environmental impact and adopt more sustainable practices, such as reducing waste and GHG emissions, and investing in renewable energy sources. (Thailand, 2018)

Certainly, these changes have impacted various industries in all sectors. In the case of Thailand, being a major exporter of animal products globally, it has responded well to these measures. This is because the import measures of foreign markets, particularly Western countries with stringent regulations on imported products regarding carbon emissions, have led to the implementation of carbon footprint measures. Initially, the livestock industry had limited clarity and information publicly

available. However, it has significantly improved over time with ongoing collaboration between government, private sector, and civil society. This can be considered as a transformation taking place.

3.3.2 'Transformative network' for climate action of the poultry industry

If we look deeply into different sectors in Thailand, there have been positive changes. Despite initial challenges regarding time and policies, it must be acknowledged that this transformation is driven more by external pressures than internal ones. This is due to economic reasons and Thailand being a major exporter of food and other products globally. Without adaptation and adjustment, the trade opportunities for Thai exporting companies would be greatly impacted and result in significant losses. In the past, there have been campaigns addressing the issue of global warming caused by industrial sectors in Thailand from the civil society. However, there hasn't been a significant response for better changes from the government or the industry compared to the aforementioned economic reasons.

The policy transition to reduce greenhouse gas emissions across all sectors in Thailand began with the government's initiative to collaborate with the private sector through various policies and regulations. These include carbon dioxide control and reduction measures, advocating for participation in carbon credit assessment and training programs offered by the Industrial Production Sector of the Thailand Greenhouse Gas Management Organization (TGO). On the surface, there appears to be good collaboration between the government and private organizations, with increased engagement from civil society. However, upon closer examination, it is evident that there is still insufficient cooperation or effective action that directly addresses the core issues at hand.

However, it is acknowledged that addressing the core issues directly may have implications for large industrial businesses and investors who play a significant role in Thailand's economy. Concerns and certain barriers within the government may hinder them from taking strong and impactful actions to pressure the industrial sector and investors to fully comply with the desired objectives. Instead, policies that accommodate all sectors may be formulated, possibly due to the bureaucratic process

of policymaking and regulation in Thailand, which may leave opportunities and gaps for excessive involvement of the private sector.

3.4 Chapter summary

In conclusion, as we might know that the poultry industry is a major contributor to greenhouse gas emissions, and as such, it has become a major target for climate action policies. Key policy networks have emerged to address the issue of climate change in the poultry industry, with a focus on sustainability and reducing the carbon footprint of poultry production. By understanding the organizations involved and their collaborative efforts, we can gain insight into the strategies and actions being taken to address the impact of the poultry industry on the environment. The interests of policy network actors in both the 'Transition network' and the 'Transformative network' are centered around sustainability and reducing the environmental impact of poultry industry.

The above information shows a significant effort from all sectors to demonstrate a response to the policy on reducing greenhouse gas emissions, including the Thai government's efforts to develop and enforce policies and regulations across all sectors. The data also indicates that the private sector, particularly the poultry industry, has developed action plans and strategies focused on reducing greenhouse gas emissions and promoting sustainable practices. However, it is worth noting that these efforts may be limited to corporate social responsibility (CSR) initiatives, as they primarily involve planning and may require time to assess the success of the set targets. Additionally, there seems to be a lack of deep analysis and consideration of the broader issues in animal husbandry, starting from the supply chain of animal feed, such as corn cultivation, to the end consumers. The discussions primarily focus on the use of alternative energy sources within the farming sector.

However, this demonstrates that at least each sector has a shared interest in striving for maximum reduction of greenhouse gas emissions into the atmosphere, regardless of the underlying reasons. This includes the civil society sector, such as Greenpeace Thailand, which consistently advocates for this issue, as well as news agencies like Green News that frequently highlight the problem. Regarding Greenpeace Thailand, Overall, Greenpeace Thailand's campaign to raise awareness

about the impact of GHG emissions from livestock production is an important step towards addressing climate change. The campaign highlights the need for the livestock industry to take responsibility for its environmental impact and shift towards more sustainable practices that can help reduce GHG emissions and mitigate climate change.



CHAPTER IV: What are the main narratives of these networks?

4.1 Introduction

This section explores the main narratives of different networks and their influence on policies within the context of the agricultural sector in Thailand. It delves into the sensitivity of the agricultural sector, the importance of poultry meat compared to other types of meat, and the emphasis on sustainable farming practices. Understanding these narratives is crucial for comprehending the dynamics and impacts of policies related to agriculture and food production in Thailand.

Firstly, Thailand's agricultural sector holds significant importance on the global stage. The country is recognized as a major player in the global agricultural market, contributing to the production and export of various agricultural products. With its diverse range of agricultural activities including crop cultivation, livestock farming, and aquaculture, Thailand has established itself as a key supplier of commodities such as rice, fruits, vegetables, seafood, and poultry products. The sensitivity of the agricultural sector in Thailand arises from its influence on the economy, employment, and food security within the country.

However, poultry meat is considered less important compared to other types of meat, such as pork, in the context of Thailand. The consumption patterns and cultural preferences of the Thai population play a significant role in shaping the demand for different meat products. While pork remains a staple in Thai cuisine, poultry meat has a relatively lower consumption rate. Understanding the dynamics of meat consumption and preferences is essential for assessing the market dynamics and policy implications within the poultry industry.

Moreover, the concept of sustainable farming practices has gained prominence in recent years. The emphasis on adopting sustainable practices aligns with the global push towards environmental conservation and responsible resource management. In the context of agriculture, this translates into efficient resource utilization, responsible

waste management, and the integration of renewable energy sources. Sustainable farming practices aim to minimize environmental impacts, conserve natural resources, reduce greenhouse gas emissions, and enhance the long-term viability of agricultural activities. The promotion of sustainability within the agricultural sector has influenced policy formulation and implementation, with the integration of sustainable farming practices becoming a priority for government initiatives, industry associations, and stakeholders involved in the poultry industry.

4.2 The sensitivity of agricultural sector in Thailand: Thailand is an important player in the global agricultural market.

Agriculture holds significant importance in the context of Thailand. Agriculture is an integral part of the daily lives of Thai people. Thai agriculture can be traced back through history, science, and society. Thai agriculture has evolved from hunting and gathering to sustainable agriculture practices that are prominent today. The development of agriculture in Thailand has been continuous and significant, as development is crucial for progress in all aspects, particularly in the agriculture sector, which is fundamental to improving the quality of life. (Thongmeethip, 2021) Quality of life encompasses the physical and mental well-being of individuals, enabling them to sustain themselves and coexist harmoniously with nature, as well as community development that contributes to economic, social, and cultural prosperity in rural areas. The recent development in agriculture has resulted in increased employment opportunities and overall self-improvement of the population. Most of the people have experienced personal development, better living conditions, and improved consumption after engaging in agricultural activities. Despite challenges such as fluctuating agricultural produce prices, Thailand had approximately 7.4 million farmers or 10 percentage of total population in 2021 as it's earning the title of "Kitchen of the World." (Statista, 2023)

As mentioned above, agriculture plays a crucial role in the economy, society, and food security of Thailand. Here are some key points highlighting the importance of agriculture in Thailand:

1. Economic Contribution: Agriculture is a significant contributor to Thailand's economy. It accounts for a significant portion of the country's GDP and employment. The agricultural sector provides livelihoods for millions of people, particularly in rural areas, and contributes to rural development and poverty reduction. Agriculture contributes a substantial share to Thailand's Gross Domestic Product (GDP). While the exact percentage may vary from year to year, agriculture consistently remains one of the major contributors to the country's economy. It provides a reliable source of income for millions of farmers and supports related industries along the agricultural value chain.

2. Food Security: Agriculture is fundamental to ensuring food security in Thailand. It provides a substantial portion of the country's food supply, including staple crops like rice, as well as fruits, vegetables, livestock, and seafood. The agricultural sector's productivity and resilience are crucial for meeting the growing demand for safe, nutritious, and affordable food for the population.

3. Export and Trade: Thailand is a major player in global agricultural markets. The country is renowned for its exports of commodities such as rice, rubber, fruits, seafood, and processed food products. Agriculture contributes significantly to Thailand's export earning and contributing to economic growth and stability. And Thailand is one of the top exporters to the global market for varieties of commodities such as poultry product which made Thailand has a plenty of poultry farms all over the country.

4. Rural Development: Agriculture is closely linked to rural development in Thailand. Many rural communities depend on agriculture for their livelihoods and income. Investments in agriculture, infrastructure, and rural services help improve living standards, create employment opportunities and Some young individuals are inclined to return to their hometowns to develop agricultural products, aiming to create niche markets and add value to produce premium products.

5. Preservation of Cultural Heritage: Agriculture in Thailand is deeply connected to the country's cultural heritage and traditions. Traditional farming practices, agricultural festivals, and local knowledge are integral parts of Thai culture. Preserving and promoting agricultural traditions helps maintain cultural identity and supports tourism and cultural heritage preservation efforts. (Thongmeethip, 2021)

6. Environmental Stewardship: Agriculture plays a critical role in environmental conservation and stewardship. Sustainable farming practices, such as organic farming, agroforestry, and efficient water management, contribute to biodiversity conservation, soil health, water resource preservation, and mitigating climate change. Agriculture has the potential to be a key driver of sustainable development and environmental sustainability in Thailand.(Thailand, 2018)

7. Employment Opportunities: The agriculture sector is a significant source of employment in Thailand, particularly in rural areas. It provides livelihoods for a large portion of the population, supporting farm owners, agricultural laborers, and individuals engaged in various agricultural activities. This employment stability helps alleviate poverty, reduce income disparities, and foster rural development.

Recognizing the importance of agriculture, the Thai government implements policies, initiatives, and support programs to promote sustainable and resilient agricultural practices, enhance productivity, improve market access for farmers, and ensure the sector's long-term viability. Overall, agriculture holds immense significance in Thailand, contributing to economic growth, food security, rural development, cultural heritage preservation, environmental stewardship, and sustainable development.

Moreover, Government Support for Farmers: The Thai government implements policies and support programs to ensure the welfare of farmers and promote agricultural productivity. This includes providing subsidies, access to credit, agricultural insurance, and technical assistance to enhance farmers' capacity to produce sufficient and high-quality food. These support mechanisms aim to bolster food security by empowering farmers and improving their livelihoods.

However, there are numerous research studies that demonstrate how the agricultural sector is also a contributing factor to the issue of global warming. As we might already know that agriculture plays a complex role in contributing to the issue of global warming, as it serves as both a source of greenhouse gas emissions and a carbon sink, carbon storage, and carbon sequestration. Agricultural activities related to greenhouse gas emissions include the release of methane and nitrous oxide from rice fields and livestock areas. On the other hand, being a carbon sink in agricultural

areas refers to the accumulation of carbon in plants and soils through various agricultural practices such as grassland livestock production, soil improvement using organic materials or high-carbon materials, and promoting agroforestry systems. Additionally, efforts to reduce activities that accelerate carbon degradation in soils, particularly the burning of crop residues in cultivation areas, are also encouraged. (Fund, 2012)

Having say that, Office of Natural Resources and Environmental Policy and Planning (ONEP) under Ministry of Natural Resources and Environment, plays a vital role in addressing the environmental impacts of the poultry industry in relation to climate change. ONEP is responsible for formulating and implementing policies and strategies to mitigate climate change and promote sustainable environmental practices across various sectors, including agriculture. Within the poultry industry, ONEP works towards developing guidelines and regulations that encourage the adoption of climate-friendly practices. ONEP also monitors and evaluates the environmental performance of the poultry industry concerning climate change. This involves collecting data on greenhouse gas emissions, energy consumption, and other relevant parameters. By tracking these indicators, ONEP can assess the industry's progress in reducing emissions and identify areas where further improvements are needed.

However, the Office of Natural Resources and Environmental Policy and Planning (ONEP) acknowledges that the agricultural sector in Thailand is relatively sensitive, as mentioned earlier. Currently, Thailand does not have mandatory policies in place to reduce greenhouse gas emissions from the agricultural sector. Implementing such policies may create challenges and potential disruptions to the agricultural sector, which is a significant part of the population and has been a traditional way of life. Nevertheless, it is necessary to incorporate these policies into the country's future greenhouse gas reduction targets. Currently, the only agricultural product that has a carbon footprint assessment or carbon footprint report is rice. This is important to avoid potential trade restrictions on Thai exports, particularly from Western trading partners. However, there may be plans to develop carbon footprint assessments for other agricultural products in the future. Thailand has already made progress in reporting on its greenhouse gas emission reduction efforts in its annual reports.

4.3 The important of poultry meat: Poultry is less important than other meat.

In Thailand, pork holds a prominent position as the most widely consumed meat, surpassing the consumption of poultry meat. Several factors contribute to the relatively lower importance of poultry meat compared to pork in the country:

1. Cultural Preference: Thai cuisine has a strong emphasis on pork as a key ingredient in various dishes. The use of pork in traditional recipes and street food favorites has deep cultural roots and has become ingrained in the Thai culinary tradition. The cultural preference for pork plays a significant role in its higher consumption compared to poultry meat.

2. Availability and Tradition: Pork has a long history in Thailand and has been readily available in local markets for generations. The established supply chain and widespread availability of pork make it a convenient choice for consumers. Additionally, certain festivals and cultural events in Thailand have specific traditional dishes that feature pork, further reinforcing its importance in the local food culture.

3. Culinary Practices: Pork is highly versatile and can be used in a wide range of Thai dishes, including soups, curries, stir-fries, and grilled preparations. Its versatility in cooking techniques and the ability to impart flavor to various dishes make it a preferred choice for many Thai cooks and chefs. Poultry meat, while also used in Thai cuisine, may have a narrower range of traditional preparations compared to pork.

4. Price and Affordability: The cost of poultry meat is generally lower compared to pork in Thailand, making it a more affordable option for many consumers. Pork, on the other hand, may be relatively more expensive due to factors such as higher demand, production costs, and market dynamics. The affordability of poultry meat contributes to its consumption among price-conscious consumers.

It's important to note that while poultry meat may be less important than pork in Thailand, it still holds a significant place in the country's meat consumption and agricultural sector. Poultry farming and the production of poultry meat contribute to employment, export earnings, and food security in the country. The preference for

pork over poultry is primarily influenced by cultural, taste, and culinary factors deeply rooted in Thai society.

Meanwhile, currently, there is an increasing trend in the consumption of chicken products. This is due to the growing awareness of weight loss, the importance of consuming healthy food, and the affordability of chicken products. Chicken meat is a high-protein animal product specifically chicken breast meat is known for its high protein content. Additionally, it is low in fat. These qualities make it suitable for weight loss diets. The protein in chicken breast helps promote a longer feeling of fullness, reducing the desire to eat in subsequent meals. This helps prevent overeating and avoids consuming excessive calories.

As a result, producers have developed various chicken-based products, such as ground chicken and clean eating meals made from chicken. These products have been marketed through influencers who are fitness enthusiasts or individuals striving for weight loss, and they have yielded positive results. This has led to a significant surge in the consumption of chicken meat. Many people believe and hope that consuming chicken meat will contribute to their physical fitness and overall well-being.

At the same time, the global chicken meat market has shown an increasing trend in production from 2019 to 2023, with a growth rate of 2.05% per year. In 2023, global chicken meat production reached 100.93 million tons, a 0.42% increase from 100.51 million tons in 2022. The United States remains the top producer of chicken meat, accounting for approximately 20.85 million tons, making it the world's leading producer following by Brazil, China, and Thailand. (Livestock Department, 2022)

In terms of marketing, the global chicken meat industry has experienced significant growth and market demand. The increasing production of chicken meat has been accompanied by effective marketing strategies to promote and distribute the products. Various marketing channels and techniques are employed to reach consumers worldwide. One important aspect of chicken meat marketing is product differentiation. Producers and marketers often focus on highlighting the quality, safety, and nutritional value of their chicken products. This includes emphasizing factors such as organic, free-range, or antibiotic-free production methods to meet the growing consumer demand for healthier and more sustainable food choices.

From 2019 to 2022 global chicken meat consumption has shown a modest increase at an annual rate of 2.09 percent. In 2022, global chicken meat consumption reached 98.25 million tons, slightly higher than the 98.08 million tons consumed in 2021, with a growth rate of 0.17 percent. The United States remains the largest consumer of chicken meat, consuming 17.61 million tons. (Livestock Department, 2022)

China and Brazil experienced a decline in chicken meat consumption by 4.20 percent and 4.86 percent, respectively, compared to 2021. On the other hand, the United States and the European Union saw an increase in consumption by 2.62 percent and 2.88 percent, respectively, compared to the previous year, 2021. (Livestock Department, 2022)

From 2019 to 2023, chicken meat production in Thailand has shown a steady increase at an annual rate of 3.59 percent. In 2023, the country produced 1,771.99 million chickens, which is equivalent to approximately 2.83 million tons of chicken meat. This represents a slight increase from the 1,754.04 million chickens, or approximately 2.80 million tons of chicken meat, produced in 2022, with a growth rate of 1.02 percent. (Livestock Department, 2022)

The increase in production can be attributed to the growing demand for chicken meat, both domestically and internationally. The relaxation of COVID-19 prevention measures has contributed to the higher consumption of chicken products.

Thailand's chicken meat industry plays an important role in meeting the demand for protein-rich food, both within the country and globally. The sector's growth reflects the country's ability to meet the needs of consumers and contribute to the agricultural and food production sector.

These consumption trends reflect the preferences and dietary habits of different countries and regions. Factors such as population growth, economic development, cultural preferences, and dietary shifts contribute to the variations in chicken meat consumption among nations.

In summary, the global chicken meat market utilizes various marketing strategies to meet consumer demand and promote their products. Product differentiation, branding, packaging, and digital marketing play important roles in capturing consumer attention and driving sales. As the industry continues to grow,

effective marketing practices will remain crucial for success in the competitive global market.

4.4 Sustainable Farming: Emphasizing the adoption of sustainable farming practices, such as efficient resource, responsible waste management, and renewable energy integration.

Sustainable poultry farming in Thailand places a strong emphasis on adopting practices that minimize resource consumption, promote responsible waste management, and integrate renewable energy sources. The industry recognizes the importance of reducing its environmental footprint and ensuring the long-term viability of poultry production. Here are some key aspects of sustainable poultry farming in Thailand:

1. Efficient Resource Utilization: Sustainable poultry farms in Thailand prioritize efficient resource utilization to minimize waste and reduce environmental impact. This includes implementing technologies and practices to optimize water usage, such as automated watering systems and water recycling methods. Energy-efficient equipment and lighting systems are also employed to reduce energy consumption and greenhouse gas emissions. (Pokphand, 2022)

2. Responsible Waste Management: Waste management is a critical component of sustainable poultry farming. Farms implement responsible waste management practices, such as proper handling and disposal of poultry litter and manure. Some farms utilize advanced waste treatment systems, including anaerobic digestion, composting, or converting waste into bioenergy, to minimize environmental pollution and extract value from waste products.

3. Renewable Energy Integration: Sustainable poultry farms in Thailand actively integrate renewable energy sources into their operations. This includes harnessing solar energy through the installation of solar panels to generate electricity or using biomass from poultry waste for bioenergy production. The adoption of

renewable energy helps reduce greenhouse gas emissions and dependency on fossil fuels. (Betagro, 2022)

4. Responsible Antibiotic Use: Sustainable poultry farming in Thailand promotes responsible antibiotic use to mitigate the development of antibiotic resistance. Farms adhere to strict guidelines and regulations regarding the use of antibiotics, following veterinary advice and proper dosage administration. Alternative strategies, such as vaccination programs and improved biosecurity measures, are also employed to maintain flock health and minimize the need for antibiotics.

5. Environmental Conservation: Sustainable poultry farming practices in Thailand prioritize environmental conservation efforts. Farms may implement measures to preserve natural habitats, protect biodiversity, and promote soil and water conservation. This includes preserving or restoring vegetation in and around the farms, implementing erosion control measures, and minimizing the use of agrochemicals that could harm the environment. (Pokphand, 2022)

6. Collaboration and Knowledge Sharing: The adoption of sustainable poultry farming practices is facilitated through collaboration and knowledge sharing among farmers, industry associations, research institutions, and government agencies. Workshops, seminars, and training programs are conducted to disseminate best practices, share research findings, and enhance awareness of sustainable farming methods. This collaborative approach helps drive continuous improvement and innovation within the industry.

7. Consumer Awareness and Engagement: Sustainable poultry farming in Thailand also involves creating awareness among consumers about the importance of supporting sustainable and responsible farming practices. Labels and certifications that indicate adherence to sustainability standards, such as organic or sustainable farming certifications, help consumers make informed choices. Engaging with consumers through educational campaigns and providing transparent information about farming practices further promotes sustainable poultry consumption.

8. Soil Health and Nutrient Management: Sustainable poultry farms prioritize soil health by implementing practices that enhance soil fertility and minimize soil erosion. This may involve incorporating organic matter into the soil, practicing crop rotation, and applying appropriate nutrient management techniques to reduce the reliance on synthetic fertilizers. (Betagro, 2022)

9. Water Conservation: Water conservation is an important aspect of sustainable poultry farming. Farms employ technologies and management practices that aim to minimize water usage, such as drip irrigation systems, rainwater harvesting, and efficient water storage and distribution systems. Water quality monitoring and responsible use of water resources are also key considerations.

10. Community Engagement: Sustainable poultry farms in Thailand engage with local communities to foster positive relationships and contribute to the overall well-being of the community. This may involve supporting local initiatives, promoting sustainable farming practices among neighboring farmers, and addressing any concerns or issues related to the farm's operations.

11. Continuous Improvement and Innovation: Sustainable poultry farming is a dynamic field that encourages continuous improvement and innovation. Farms actively seek new technologies, research findings, and industry best practices to enhance their sustainability performance. This includes adopting innovative solutions for energy efficiency, waste management, and animal welfare.

12. Compliance with Regulations and Standards: Sustainable poultry farms in Thailand adhere to relevant regulations and standards set by government bodies and industry associations. This ensures compliance with environmental, health, and safety requirements, as well as the responsible use of inputs such as feed additives and veterinary medicines.

By integrating these additional aspects into sustainable poultry farming practices, the industry in Thailand can further enhance its environmental stewardship, animal welfare practices, community engagement, and overall sustainability performance. Continuous commitment to sustainability ensures that the poultry industry contributes to a more sustainable and resilient food system in Thailand.

By emphasizing the adoption of sustainable farming practices, efficient resource utilization, responsible waste management, and renewable energy integration, the poultry industry in Thailand strives to ensure the long-term viability of poultry farming while minimizing its environmental impact. These efforts contribute to a more sustainable and resilient agricultural sector in Thailand.

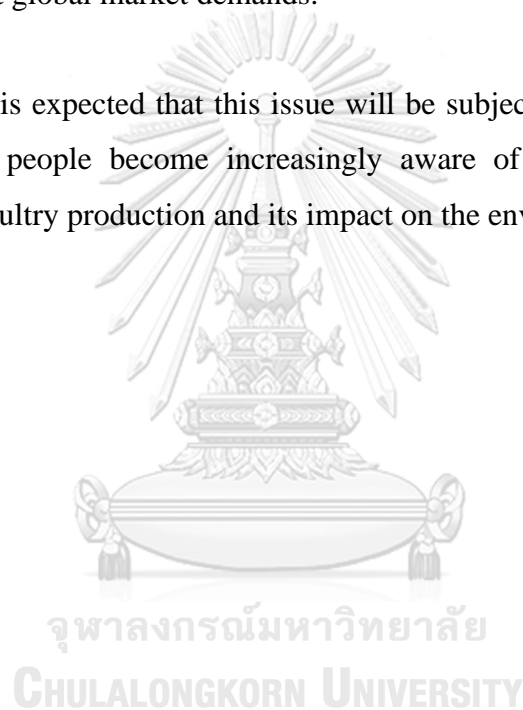
4.5 Chapter Conclusion

It can be observed that this section highlights the perspectives of various stakeholders, particularly the private sector and the agricultural sector, regarding the poultry industry and its relationship with global warming. In terms of the government sector, it is mentioned that the importance of the agricultural sector in the Thai economy and its significant workforce make it difficult to implement policies aimed at reducing global warming, as it would have adverse effects on the country's economy and agricultural practices deeply rooted in Thai culture and identity.

Although chickens are an economically valuable livestock in Thailand with high export value, they have not been given significant attention in terms of their contribution to greenhouse gas emissions throughout the poultry production process, including feed production, animal husbandry, and farm management. While chickens have smaller sizes and are not ruminant animals like cows and buffaloes, which have been extensively studied for their methane emissions, statistics on poultry product exports and consumption in Thailand show a significant volume comparable to other meat products consumed by humans.

In the private sector, there are efforts to align with the government's policies on reducing greenhouse gas emissions, mainly focusing on energy efficiency and the utilization of renewable and clean energy sources in the entire poultry production chain. However, the emphasis seems to be more on energy-related aspects rather than addressing the root issues such as deforestation caused by corn cultivation for animal feed production, which is often linked to contract farming by their companies. Moreover, the government's support for corn farming for animal feed, such as price guarantees, further encourages agricultural and industrial sectors to increase poultry production to meet global market demands.

Overall, it is expected that this issue will be subject to more public discourse in the future, as people become increasingly aware of the underlying problems associated with poultry production and its impact on the environment.



CHAPTER V: To what extent has the poultry industry changed its practices on-the-ground and why?

5.1 Introduction

This chapter will explore the extent to which the poultry industry has transformed its practices and the reasons for these changes. The poultry industry has significant changes in its practices on-the-ground over the years, driven by several causes including environmental concerns consumer demands and environmental impact. These changes have been led poultry industry to improving sustainability, eco-friendly products, and overall operational productivity.

In recent decades, the environmental impact of livestock industries, including the poultry sector has been address to environmental impact such as greenhouse gas emissions, air pollution, and deforestation associated with intensive farming practices which have prompted the industry to adjust its operations. Also, changing consumer preferences and demands for ethically sourced and sustainable have played a significant role in shaping the poultry industry's practices.

Furthermore, regulatory frameworks and industry standards have influenced the poultry industry's practices on-the-ground. Governments and organizations have introduced guidelines and regulations concerning animal welfare, food safety, and environmental protection. Compliance with these regulations has become a priority for poultry producers, prompting them to adopt new practices and invest in infrastructure upgrades to meet the required standards.

The poultry industry's shift towards more sustainable practices is also driven by economic and consumer considerations. Cost efficiencies and resource optimization have become crucial factors in maintaining profitability. By implementing practices that reduce waste, energy consumption, and environmental impact, poultry producers can enhance their competitiveness in the market and improve long-term financial viability.

Also, the poultry industry has experienced notable changes in its on-the-ground practices, driven by a combination of factors including consumer demands, environmental concerns, technological advancements, regulatory requirements, and economic considerations. These transformations have led to improved sustainability and operational efficiency within the industry. However, the extent of change varies across different regions and companies, highlighting the need for ongoing efforts to further enhance the industry's practices and address emerging challenges.

5.2 Environmental Concerns

The poultry industry in Thailand is associated with several environmental concerns like other livestock sector. These concerns arise from several aspects of poultry production and can have impacts on environments, natural resources, and public health. These are some key environmental concerns for the poultry industry in Thailand:

1. Air Pollution: Poultry operations can contribute to air pollution through the release of ammonia, particulate matter, and odorous compounds. Ammonia emissions from poultry waste can lead to air quality degradation, especially in areas with high poultry concentration. Moreover, the haze pollution also has been a big issue that arise from growing maize for livestock industry to feed animal farm. The support for growing maize for animal feed has been in place since the year 2530 B.E. (1987) under the 6th National Economic and Social Development Plan. The objective of this plan was to elevate the country's development and expand the Thai economy. The government emphasized the development of the agricultural industry to promote exports and support business partnerships between the private sector and farmers. This marked the official support for the cultivation of maize for animal feed as a key crop in the country's economy. Within the decade, the cultivation of maize rapidly spread throughout the northern part of Thailand, primarily through contract farming. (Government, 1987) However, this expansion has led to hazardous pollution during the dry and harvest seasons. This

issue is not limited to the northern part of Thailand alone but also affects neighboring countries such as Myanmar and Laos.

The northern part of Thailand has been facing significant air pollution issues, particularly during the dry season, and maize (corn) agriculture has been identified as one of the contributing factors. The burning of maize residues after harvest, commonly practiced by farmers, releases pollutants into the air and exacerbates air pollution. After maize harvest, farmers often resort to burning the leftover crop residues, including stalks and leaves, as a cost-effective method to clear the fields and prepare them for the next planting season.

Additionally, haze pollution caused by maize residue burning poses risks to human health. The fine particulate matter, known as PM_{2.5}, can penetrate deep into the respiratory system, potentially causing or exacerbating respiratory and cardiovascular problems. Due to its small size, PM_{2.5} particles can easily be inhaled deep into the respiratory system and lungs. Some particles may even enter the bloodstream, causing various health problems. This is particularly concerning as these fine particles are invisible to the naked eye, making them easier and faster to enter the respiratory system. It can exacerbate asthma symptoms in patients and contribute to the development of asthma in otherwise healthy individuals. Prolonged exposure to PM_{2.5} can also increase the risk of lung cancer. Furthermore, it has detrimental effects on the brain and heart. (Sihawan, 2019)

2. Water Pollution: Poultry farming generates wastewater containing nutrients, organic matter, and pathogens. If not properly managed, the discharge of untreated or poorly treated wastewater can contaminate surface water and groundwater, leading to water pollution. Nutrient runoff from poultry farms can contribute to eutrophication in water bodies, negatively affecting aquatic ecosystems. Likewise, the use of antibiotics, disinfectants, and other chemicals which are common use in poultry production can contribute to water pollution. Improper disposal of unused or expired medications or inappropriate cleaning practices can lead to the presence of these

substances in wastewater. Antibiotics in water systems can contribute to antibiotic resistance in human and harm aquatic organism. (Osofsky, 2007)

3. Waste Management: The management of poultry waste, including manure, feathers, and mortalities, is crucial to prevent environmental contamination. Improper storage, handling, or disposal of these wastes can result in nutrient runoff, soil degradation, and odor nuisances. Effective waste management systems, such as composting, anaerobic digestion, or utilization as fertilizer, are necessary to minimize environmental impacts. (Djekic, 2015)

4. Energy Consumption and Greenhouse Gas Emissions: Poultry production requires significant energy inputs for lighting, ventilation, heating, and feed processing. Energy consumption contributes to greenhouse gas emissions and reliance on non-renewable energy sources. Mitigating these concerns involves implementing energy-efficient technologies, utilizing renewable energy sources, and optimizing energy use throughout the production process.

5. Water Resource Management: Poultry farming requires substantial water resources for bird hydration, cleaning, and processing activities. The intensive nature of poultry operations can strain local water supplies, especially in areas prone to water scarcity. Implementing water-efficient practices, such as proper irrigation techniques, water recycling, and rainwater harvesting, is important for sustainable water resource management. (Prathumchai et al., 2018)

The National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperatives had launch “Guidance on the application of Thai agricultural standard: Good Agricultural practices for poultry farm” To ensure compliance with the standards set by the Ministry, guidelines for animal farms, including poultry farms nationwide, are provided as a framework for their practices. However, it should be acknowledged that there are still many local farms that may not undergo inspections to meet these standards. Major poultry industry companies in Thailand are making efforts to engage suppliers from local farms that meet these standards. Nevertheless, due to the increasing demand for poultry consumption, there

are instances where supply needs to be sourced from farms that have not undergone standard inspections.

Betagro has implemented measures to purchase animal feed ingredients such as corn and bran from reliable sources that can be verified and trusted not to contribute to deforestation or forest burning, which can cause air pollution or PM 2.5 particulate matter issues, particularly during harvesting and dry seasons. However, it should be acknowledged that there may be some sources that intentionally hide information or may not undergo thorough inspections to ensure their feed ingredients are not linked to deforestation. This is due to the increasing demand for poultry consumption, which has resulted in a higher demand for animal feed ingredients.

In addition, Betagro offers animal products such as pork, chicken, and chicken eggs under the brand name "S-Pure." These products are produced through the "S-Pure Natural Pure Process," which is a 100% natural farming method that does not involve the use of antibiotics at any stage of the rearing process, starting from birth. The S-Pure brand of pork, chicken, and chicken eggs has been certified as "Raised Without Antibiotics" (RWA) by the National Sanitation Foundation (NSF) of the United States, making it the world's first to receive such certification.

Figure 10: S-Pure Logo



Note. Source from “www.betagro.com”, 2022.

Betagro utilizes technology and innovation in its operations to efficiently manage water, waste, and energy. This includes reducing water consumption in the

production process and implementing water reuse systems. Additionally, they treat the wastewater from the production process to meet the required standards set by the law, minimizing waste generation at the source. The company also promotes waste separation among employees to maximize the utilization of waste materials. They have projects in place to improve and develop the utilization of waste for maximum benefits. (Betagro, 2022)

Betagro has also adjusted the animal feed composition to enhance nutrient absorption, thereby reducing greenhouse gas emissions and odors. Furthermore, the company has opted for alternative energy sources through solar energy technology. With over 35 solar panel installations across their facilities nationwide, they generate over 40 megawatts of clean energy, resulting in a reduction of greenhouse gas emissions by more than 22,000 tons. (Betagro, 2022)

Figure 11: Betagro efficient waste management is carried out through the biogas system.



Note. Source from “transformation Point of Betagro towards the goal of becoming a "Leading Global Food Company for Sustainable Living."2022.

It has been observed that in the past 2-3 years, environmental issues have gained widespread attention and the public has become more aware and concerned due to the evident impacts. Major corporations and investors have also shifted their focus towards these issues. The government has started to recognize the importance of addressing these problems, leading to various campaigns by NGOs, corporate social responsibility (CSR) initiatives, and political parties aiming to gain public support through environmental policies. The issue of PM 2.5 air pollution has become a significant part of the political agenda, with Greenpeace Thailand pushing for political

parties like Moving Forward party adopt and promote environmental policies, which could eventually become government policies since Moving Forward party won the nationwide election last month. This progress in political engagement marks a significant starting point.

During 23-28 May 2023, Greenpeace Thailand organized an exhibition called "Hazibition: Under the Haze" at the Bangkok Art and Culture Centre (BACC). The exhibition aimed to shed light on the causes of the transboundary toxic haze issue that occurs in the upper northern region of Thailand almost every year. It sought to explore the origins of the haze problem and identify the key contributing factors and responsible parties.

As reported, the period from late January to early May 2023 witnessed a severe haze crisis in the upper northern region, the most severe in 20 years. More than 2 million people in the upper northern region of Thailand were affected by the health impacts of the haze. This prompted civil society networks in the region to file petitions against the Prime Minister and government agencies for not utilizing legal measures, human rights mechanisms, policies, and existing plans to implement effective preventive measures and emergency response plans to address the haze crisis.

Furthermore, there were calls for the government to act beyond the steps and stop blaming small communities or farmers, as the root cause of the issue lies primarily with large-scale animal agriculture industries that have significant financial resources.

Figure 12: Hazibition: Under the Haze'' exhibition by Green Peace Thailand



Note. Source from "My Iphone". 2023

5.3 Consumer Demand for Sustainable Products:

Changing consumer preferences and increased demand for sustainable and ethically produced. Consumers are increasingly seeking products that are produced with minimal environmental impact.

Consumer demand for sustainable products in the poultry industry has been gradually increasing in recent years. As people become more conscious of the environmental and ethical implications of their food choices, they are seeking poultry products that are produced with sustainability. And these are the key point.

1. Animal Welfare: Consumers are increasingly concerned about the welfare of animals in the food production process. They seek poultry products that come from farms that prioritize animal welfare, such as providing suitable space for the animal to

move and exhibit natural behaviors. This includes avoiding practices such as overcrowding and the use of growth-promoting antibiotics.

2. Organic and Free-Range: There is a growing preference for organic and free-range poultry products. Consumers are willing to pay a premium for poultry that is raised without the use of synthetic pesticides, hormones, or genetically modified organisms (GMOs). Free-range poultry, where birds have access to outdoor spaces, is seen as more natural and humane.

3. Sustainable Feed: Consumers are interested in poultry products that are sourced from birds fed with sustainable and responsible feed. This includes feed that is free from genetically modified ingredients, deforestation-linked commodities (such as soy and palm oil), and excessive use of fishmeal. Sustainable feed options, such as plant-based alternatives, are gaining popularity.

4. Environmental Impact: Sustainable poultry products are sought after by consumers who are concerned about the environmental impact of food production. They look for brands that implement practices to reduce greenhouse gas emissions, minimize water usage, and manage waste effectively. Poultry produced with renewable energy sources is also appealing to environmentally conscious consumers.

5. Certification and Labels: Consumers rely on certification labels, such as organic, free-range, and animal welfare certifications, to identify sustainable poultry products. These labels serve as indicators that the products meet certain standards and have undergone third-party verification.

6. Ethical Considerations: Consumer demand for sustainable poultry products extends beyond environmental concerns. They also consider the social and ethical aspects of food production. Consumers are interested in supporting brands that prioritize fair labor practices, community engagement, and local sourcing.

According to this growing demand, poultry producers are adopting sustainable practices, implementing transparent supply chains, and seeking certifications that demonstrate their commitment to sustainability and animal welfare. This shift in consumer preferences is driving changes throughout the industry, encouraging innovation, and encouraging a more sustainable and responsible approach to poultry production.

Besides that, there is a campaign by the United Nations Framework Convention on Climate Change (UNFCCC) called “Net zero” refers to achieving a balance between the amount of greenhouse gases (GHGs) emitted into the atmosphere and the amount removed or offset from it. It is a state where the net emissions of GHGs, particularly carbon dioxide (CO₂), are effectively zero.

To achieve net zero, the total emissions produced from human activities, such as burning fossil fuels and deforestation, must be equal to the amount of GHGs removed from the atmosphere through natural processes or technological means. This can be achieved by reducing emissions through sustainable practices and transitioning to low-carbon energy sources, as well as actively removing CO₂ from the atmosphere through carbon capture and storage (CCS) technologies or nature-based solutions like reforestation and afforestation.

The concept of net zero is closely linked to efforts to combat climate change and limit global warming to well below 2 degrees Celsius above pre-industrial levels, as outlined in the Paris Agreement. Many countries, organizations, and businesses have committed to reaching net zero emissions by a specific target year, often between 2050 and 2100.

Achieving net zero emissions requires a comprehensive and integrated approach across various sectors of the economy, including energy, transportation, industry, agriculture, and land use. It involves implementing policies and measures to reduce emissions, promoting energy efficiency, transitioning to renewable energy sources, improving waste management, and adopting sustainable land management practices.

Net Zero, or the goal for every country to collectively reduce greenhouse gas emissions to ensure that global temperatures do not increase by more than 1.5-2.0 degrees Celsius within this century, with a net zero emissions target by 2050, has prompted many countries to implement various measures, including those related to international trade.

For example, in July 2021, the European Commission introduced the European Green Deal, which aims to reduce carbon dioxide emissions by 55% by 2030, known as the Fit for 55 Package. This legislative framework includes: (Industries, 2021)

1. Improving emissions trading and greenhouse gas reduction efforts.
2. Promoting sustainable green transportation on land, sea, and air.
3. Implementing environmentally friendly business tax rates.
4. Setting renewable energy targets.
5. Implementing carbon capture and storage initiatives.
6. Introducing the Carbon Border Adjustment Mechanism (CBAM), which sets prices on certain imported goods to prevent high carbon emission products from entering the European Union (EU) member states.

Additionally, Carbon Footprint refers to the amount of greenhouse gases emitted throughout the lifecycle of a product, including its raw material sourcing, manufacturing/assembly processes, distribution, usage, and end-of-life waste management, as well as relevant transportation activities. It is measured in grams, kilograms, or metric tons of carbon dioxide equivalent.

The Carbon Footprint label, which can be displayed on various products, provides consumers with information about the amount of greenhouse gas emissions released throughout the product's lifecycle. This helps consumers make informed purchasing decisions and encourages businesses to adopt more environmentally friendly production technologies. The use of Carbon Footprint also enhances

competitiveness in the global market. Currently, several countries, such as the UK, France, Switzerland, Canada, Japan, and South Korea, have started implementing Carbon Footprint labeling. There is also a growing demand for imported products from Thailand to bear the Carbon Footprint label. (Thailand Greenhouse Gas Management Organization TGO, 2021)

Furthermore, if Thailand implements projects and collects clear data on greenhouse gas emission reductions, it will enhance our negotiating power in global meetings to address the issue of global warming and establish effective solutions.

Carbon Footprint and Carbon Label programs were first introduced in the United Kingdom under the supervision of the Carbon Trust in March 2007. The Carbon Label is designed to provide consumers with the option to check information on how environmentally conscious manufacturers are in their production processes, and to what extent they prioritize environmental sustainability. The Carbon Trust expects that implementing the Carbon Label program will be one of the activities that help reduce greenhouse gas emissions from the manufacturing sector, transportation, and packaging, and it has gained significant interest from consumer goods manufacturers.

Tesco Plc., a major supermarket chain in the UK, which started labeling its own Tesco-branded products with Carbon Footprint labels, indicating the amount of carbon emissions produced in the packaging of their products. This initiative initially covered approximately 20 product lines sold in Tesco stores nationwide. Participating companies are required to sign a commitment agreement to reduce their carbon emissions by a predetermined amount within a two-year period. Failure to comply with this commitment may result in the withdrawal of the Carbon Label license. (Thailand Greenhouse Gas Management Organization TGO, 2021)

Studies in the UK have shown that 66% of consumers are interested in knowing the carbon footprint of products in the manufacturing sector. Currently, there are carbon footprint calculation programs available for sale. Furthermore, the

establishment of the Student Climate Action Plan Committee aims to raise awareness among students and reduce greenhouse gas emissions through various activities in their daily lives. The committee encourages students to actively participate in reducing carbon emissions. (Thailand Greenhouse Gas Management Organization TGO, 2021)

Figure 13: UK carbon footprint label



Note. Source from “Carbon Footprint of Product” by TGO. 2019

The Japanese government has announced a reduction in greenhouse gas emissions and has encouraged the private sector and manufacturing industries to reduce their carbon footprint. This has prompted manufacturers to conduct research on reducing greenhouse gas emissions and raise awareness among consumers. As a result, the Carbon Footprint label has been developed to indicate the amount of carbon dioxide emissions produced throughout the entire production process. It shows the quantity of carbon dioxide emissions released at each production stage. Meetings have been held with experts from the public and private sectors to develop guidelines for the implementation of the Carbon Label system.

The implementation began in April 2009. The objective is to provide consumers with information and understanding of the carbon footprint associated with different types of products and their impact on the environment. This empowers consumers to make informed decisions when purchasing products. The use of the Carbon Footprint label is a new and challenging concept for manufacturers. Various companies have joined efforts to reduce greenhouse gas emissions from packaging

used in food packaging, which is known for its sophistication and multiple layers in Japan. (Thailand Greenhouse Gas Management Organization TGO, 2021)

Figure 14: Japan carbon footprint label:



Note. Source from “Carbon Footprint of Product” by TGO. 2019

In South Korea, January 2009, began using carbon labels, indicating the amount of carbon dioxide emitted from the production sector, which spread throughout Europe. The South Korean government started selling products with carbon labels attached, with two labels introduced simultaneously:

1. Carbon Footprint Label Certificate
2. Low Carbon Certification

The process of implementing the carbon label project in South Korea began by categorizing industries into groups and finding ways to calculate the carbon footprint of different types of products. Once the carbon labels are obtained, training sessions are conducted to inform product owners. Additionally, a Life Cycle Inventory (LCI) database is being developed in phases. Currently, around 2,000 types of data can be collected and stored in the LCI database in 2017. (C. F. International, 2022a)

Figure 15: South Korea carbon footprint label



In Thailand, since 2011, the Thailand Greenhouse Gas Management Organization (TGO) has been actively involved in promoting the measurement and reduction of carbon footprints for organizations in both the private and public sectors. This includes initiatives like the Corporate Carbon Footprint (CFP) program.

One significant benefit of developing low-carbon projects is their alignment with both CFP and Corporate Financial Reporting (CFR) programs. In Thailand, the Green Building Certification includes criteria related to CFP and CFR certified products. Certified products are listed under the Green Public Procurement (GPP) program, demonstrating their compliance with green standards. This also prepares companies for potential future regulations on products in Thailand.

Furthermore, CFP/CFR products and CFO considerations have been integrated into other green procurement schemes such as Green Office, Green Hotel, Green Library, and Green University. This demonstrates the widespread adoption and integration of carbon footprint and financial reporting practices throughout various sectors in Thailand. (C. F. International, 2022b)

Figure 16: Thailand carbon footprint label



Note. Source from “Carbon Footprint of Product” by TGO. 2019

It can be seen that other countries have started implementing various measures related to environmentally impactful products. This includes the development of carbon footprint labels to indicate the amount of carbon emitted throughout the production process, from the source to the hands of the consumers. These labels allow consumers to choose the most environmentally friendly products and also encourage manufacturers and exporters to adapt and implement such measures.

Although there are no strict regulations in place in Thailand, there is a significant awakening in other countries, particularly among Thailand's important trading partners such as the United States, the European Union, Japan, and Korea. This prompts Thai private sector manufacturers as well as relevant government agencies to take real action. Failing to do so may result in Thailand facing trade disadvantages or trade barriers in the long run.

Choosing products or services with lower greenhouse gas emissions is one way in which consumers can actively contribute to greenhouse gas management. It also serves as a marketing mechanism to stimulate manufacturers to develop products that meet consumer demands for reduced carbon emissions.

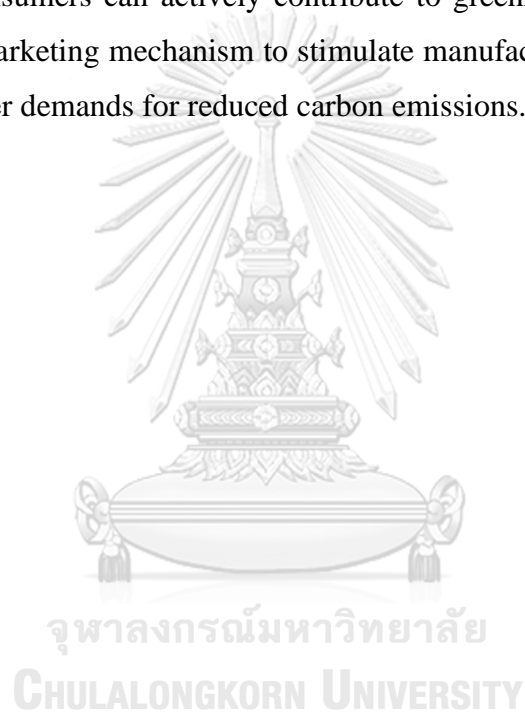


Table 4: Top 20 Thai Fresh and Frozen Chicken Export Products Market

Country	Value: Million USD			
	2021	2022	2022 (Jan-April)	2023 (Jan-April)
1. China	332.22	382.02	69.14	173.21
2. Japan	354.25	426.95	125.86	128.43
3. Malaysia	90.19	165.36	46.69	65.40
4. South Korea	33.21	36.54	7.65	22.78
5. Hongkong	40.33	44.89	15.95	11.41
6. Singapore	3.14	16.58	0.66	7.05
7. Laos	9.70	7.93	3.20	3.45
8. Myanmar	10.68	5.43	1.81	3.24
9. Cambodia	8.56	9.74	3.62	2.60
10. Netherland	10.08	18.70	2.69	1.94
Total 10 Counties	892.36	1,114.14	277.28	419.50
Others	25.78	29.54	7.51	6.76
Total	918.14	1,143.68	284.79	426.25

*Note.*Source: Information and Communication Technology Center, Office of the Permanent Secretary Ministry of Commerce, in collaboration with the Customs Department

Table 5: Top 20 Thai Processed Chicken Export Products Market

Country	Value: Million USD			
	2021	2022	2022 (Jan-April)	2023 (Jan-April)
1. Japan	1,354.46	1,455.33	484.81	430.17
2. UK	488.82	726.28	219.23	231.06
3. Netherland	141.82	250.56	72.31	62.38
4. South Korea	97.56	146.56	48.97	45.30
5. Singapore	89.44	110.80	36.32	33.78
6. Iceland	37.06	57.78	16.32	22.77
7. Germany	39.84	45.61	12.37	11.82
8. Canada	28.99	47.42	13.78	10.96
9. Hongkong	37.34	36.43	11.73	8.72
10. France	8.25	12.22	3.76	5.85
Total 10 Counties	2,323.58	2,888.98	919.58	862.81
Others	25.07	41.35	11.06	12.20
Total	2,348.66	2,930.33	930.64	875.01

Note. Source: Information and Communication Technology Center, Office of the Permanent Secretary Ministry of Commerce, in collaboration with the Customs Department.

From both tables above, it can be seen that Thailand exports poultry products to various countries worldwide, with significant and continuously increasing export values. Poultry products are undeniably one of Thailand's key economic commodities, supporting hundreds of thousands of families and generating substantial income for both large and small businesses. As society becomes more concerned about the environmental impact of products, both the private sector and the government will need to adjust and implement measures to ensure that Thailand's main economic products do not adversely affect environmental initiatives and meet consumer demands.

Beside that consumer demand for sustainable poultry products is on the rise. Consumers are seeking poultry products that align with their values, including animal welfare, organic and free-range options, sustainable feed, traceability, and a reduced environmental footprint. By responding to these demands, the poultry industry could meet consumer expectations, differentiate their products in the market, and contribute to a more sustainable and ethical food system.

5.4 Chapter Summary

This section highlights the significant changes in the poultry industry regarding environmental issues and greenhouse gas emissions. It is evident that the global emphasis on the current problem of global warming has led to positive changes in the poultry industry. In the past, human activities, driven by industrialization and individual desires, overlooked the adverse impacts caused by the unsustainable use of natural resources. However, the consequences of these actions, such as PM 2.5 pollution, greenhouse gas emissions, and chemical contamination in natural resources and habitats, have now affected human health and well-being.

Despite this, humans continue to disregard the sustainable use of natural resources. As a result, international organizations have called for member countries to significantly reduce greenhouse gas emissions, aiming for a Net Zero target which represents a state where the balance between GHG emissions and removal is achieved. It is a crucial goal in addressing climate change and requires reducing emissions, transitioning to clean energy sources, and actively removing CO₂ from the atmosphere to create a sustainable and climate-resilient future.

However, some NGOs argue that the "Net Zero" campaign may not be entirely successful, as it focuses on land use, land-use change, and forestry (LULUCF), which has faced extensive criticism and opposition. The concern lies in the fact that "Net Zero" may allow the fossil fuel industry to continue with their usual activities of exploration, drilling, extraction, and combustion of coal, gas, and oil, compensating by planting forests to absorb carbon dioxide or utilizing carbon trading or carbon capture technologies.

Furthermore, in the present era, access to various information is readily available, and social media has become a widespread platform. Marketing campaigns now focus more on the online world than offline, allowing consumers to receive more information about the environmental impact of industrial production. Consumers also have a wider range of choices in purchasing products according to their own preferences. Consequently, producers must constantly update their information and stay attuned to various social trends, as consumers have greater access to information and more options. Therefore, in order to achieve profitable products as intended, producers must consistently adapt and consider measures in international trade, which increasingly addresses the root causes and problems associated with greenhouse gas emissions, a major global concern today.



CHAPTER VI: Conclusion

6.1 Main findings

This research is focus on the politics of climate change in Thailand and its impact on the poultry industry's contribution towards Thailand's commitment under the Paris Agreement. It explores the extent to which the poultry industry has changed its practices on the ground and the factors influencing these changes. Understanding the political context and drivers of change is crucial for assessing the industry's response to climate change mitigation and adaptation efforts.

Additionally, the social sector has also expressed its concerns about the environmental impact of the poultry industry and has launched campaigns to drive change in this regard. These campaigns focus on raising awareness about the environmental consequences of the entire poultry production chain, including the negative effects of feed production, animal farming practices, and deforestation caused by contact farming. Moreover, the social sector aims to promote sustainable practices and data about how worse of greenhouse gas emission from livestock industry throughout the production process, emphasizing the importance of reducing greenhouse gas emissions.

Thailand's commitment under the Paris Agreement

Thailand, as a signatory to the Paris Agreement, has made commitments to reduce greenhouse gas (GHG) emissions and combat climate change. The Agreement aims to limit global warming to well below 2 degrees Celsius and pursue efforts to limit the temperature increase to 1.5 degrees Celsius. To achieve this, Thailand has pledged to take actions to mitigate its GHG emissions, increase resilience to climate change impacts, and transition towards a low-carbon and sustainable. Moreover, Thailand also has pledged to reduce its greenhouse gas emissions by 20-25 percent below the business-as-usual (BAU) level by the year 2030. This target applies to both the energy and industrial sectors and takes into account the country's development needs and specific circumstances.

However, the Thai government has not directly implemented policies specifically targeting the livestock industry, citing the sensitivity of the agricultural sector, which has long been ingrained in Thai culture and tradition. Consequently, there is an attempt to avoid enforcing measures to reduce greenhouse gas emissions within the agricultural sector.

The poultry industry's contribution

The poultry industry in Thailand is a significant contributor to greenhouse gas (GHG) emissions. The production and processing of poultry generate emissions primarily through three main sources: feed production, animal waste management, and energy consumption.

For the feed Production for poultry, which includes the cultivation of crops like soybeans and corn, can contribute to GHG emissions. The use of chemical fertilizers, fuel for machinery, and land-use change associated with feed production can release emissions, particularly carbon dioxide (CO₂) and nitrous oxide (N₂O).

The issue of toxic haze in the northern region of Thailand and neighboring countries, caused by forest burning and contact farming practices in agricultural areas, remains a significant problem. The cultivation of corn for animal feed is a major contributing factor to this issue. It is crucial to address this problem promptly as it poses serious health risks to the affected population. However, the Thai government has not yet implemented clear measures to effectively address this issue.

Politics of climate change and the poultry industry

The poultry industry in Thailand is a significant contributor to greenhouse gas (GHG) emissions. The production and processing of poultry generate emissions primarily through three main sources: feed production, animal waste management, and energy consumption.

The politics of climate change in Thailand have shaped the regulatory framework and policies that influence the poultry industry's contribution towards the country's commitment under the Paris Agreement. Government initiatives, environmental regulations, and international agreements have provided the impetus for changes in the industry.

The Thai government has recognized the importance of addressing climate change and has introduced policies and incentives to encourage the poultry industry to adopt more sustainable practices. These include regulations on waste management, energy efficiency, and emissions reduction. Additionally, the government has promoted renewable energy integration and supported initiatives that aim to reduce the carbon footprint of the poultry industry.

Changes in practices on-the-ground

The poultry industry in Thailand has made notable changes in its practices on-the-ground in response to the politics of climate change. These changes include improved waste management, energy efficiency, Sustainability practices and Emissions reduction. There have been significant changes compared to before, where there was almost no reporting or available data indicating that the Thai animal industry was paying attention to this issue. Now, there is easier access to information, and more companies are disclosing their practices.

In the case of the government, there have been continuous changes, as they have the authority to enact policies or measures related to greenhouse gas emissions. This includes the implementation of Carbon Footprint labeling for Thai exports to destination countries with strict labeling requirements. Therefore, there is a need for the establishment and maintenance of a continuous system and database for these purposes.

The changes in the poultry industry's practices can be attributed to various factors, including regulatory requirements, market demand for sustainable products,

corporate responsibility initiatives, and the recognition of the long-term benefits of sustainable practices. The politics of climate change have influenced the industry by providing a framework and incentives for action, as well as raising awareness about the need to mitigate GHG emissions and adapt to the impacts of climate change.

6.2 Thesis Contribution

The research or thesis makes several significant contributions in understanding the poultry industry's contribution to greenhouse gas (GHG) emissions in Thailand and the measures taken to mitigate its environmental impact. These contributions can be summarized as follows:

1) **Comprehensive Analysis:** The thesis provides a comprehensive analysis of the poultry industry's GHG emissions in Thailand, considering the various sources of emissions, including feed production, waste management, and energy consumption. By examining these different aspects, the thesis offers a holistic understanding of the industry's environmental footprint.

2) **Identification of Mitigation Measures:** The thesis explores the measures taken by the poultry industry to mitigate its environmental impact and reduce GHG emissions. By identifying and analyzing these mitigation measures, the thesis highlights the industry's efforts in adopting sustainable practices and technologies to address climate change concerns.

3) **Policy Implications:** The thesis examines the policy implications of the poultry industry's GHG emissions and mitigation efforts. It identifies the role of government regulations, incentives, and international agreements in shaping the industry's environmental performance. This analysis provides insights into the effectiveness of existing policies and suggests potential areas for policy improvement and intervention.

On the other hand, this research work demonstrates the collaboration among three sectors: the government, the private sector, and the social sector, in the

development and implementation of measures to reduce greenhouse gas emissions, which is a significant current issue and a global concern. However, it also highlights the gaps in policymaking and the hidden influence of industrial stakeholders in the livestock sector, who have negotiating power in shaping emission reduction regulations to minimize the impact on their own industry.

Furthermore, it is evident that Thailand is attempting to avoid this issue, but it appears challenging due to the fact that many important trading partners, especially those countries, have already implemented substantial greenhouse gas reduction measures.

6.3 Recommendations

Government Sector

State agencies are considered the main actors and driving force in implementing greenhouse gas reduction measures in the country, including the poultry industry. In the past, state agencies have gradually and incrementally attempted to align and modify these measures to comply with Thailand's commitments in international meetings that require annual and quadrennial reporting. The main factor that has caused the state's actions to be slow and not straightforwardly and clearly address the main industry responsible for greenhouse gas emissions to the atmosphere, which is the livestock industry, including poultry. This is due to several factors, such as the economic significance of this industry to the country, as Thailand is a major exporter, or due to the sensitivity of Thailand's agricultural sector, which accounts for more than 7% of the total population being farmers. This situation makes the state hesitant to speak the truth directly. Consequently, Thailand's efforts to reduce greenhouse gas emissions have been relatively slow compared to other countries that can act more swiftly. Therefore, it is recommended that the Thai government take more decisive and assertive actions in enforcing these measures as an authority for the collective benefit of the nation.

Private Sector

In the past 2-3 years, the private sector has made efforts to demonstrate policy changes to reduce greenhouse gas emissions in their industries. However, these efforts have mainly focused on using clean energy, treating wastewater, and managing waste before releasing it into the environment. They have not yet addressed the main cause of global warming, which is the production of chicken meat and related products. Therefore, it is essential to see a transformation in the poultry industry that specifically addresses the issue of global warming and takes responsibility for its environmental impact.

Civil Sector

The civil sector, represented by organizations like Greenpeace Thailand, has been actively driving the conversation on global warming and its link to the livestock industry. They have been engaging in various campaigns and lobbying political parties to adopt environmental policies for the future. However, it is crucial to see other organizations taking more proactive roles in this matter, not solely relying on Greenpeace Thailand to advocate for these issues.

The Thai government should have more robust measures to achieve greenhouse gas reduction targets. In addition, promoting awareness and understanding of carbon.

As Thailand is an agricultural country, it may be affected by global agricultural issues. The government needs to be prepared to establish suitable strategies and measures to support the country and seek effective cooperation and support. Clear guidelines for participation in greenhouse gas reduction initiatives should be developed, considering policy, economic, and social aspects to prevent potential issues when implementing greenhouse gas reduction activities in the agricultural sector.

Promoting research on greenhouse gas reduction in the agricultural sector is essential. This research should focus on data collection and analysis to prioritize agricultural activities that reduce greenhouse gas emissions. Suitable activities should be selected, and operational plans should be formulated. Additionally, methods for measurement, reporting, and verification (MRV) should be established to ensure accurate monitoring and reporting of results.

To conclusion, reducing greenhouse gas emissions to mitigate global warming is the responsibility of all stakeholders, including the industrial and agricultural sectors as producers, the service sector as drivers of activities, and the general public as consumers.



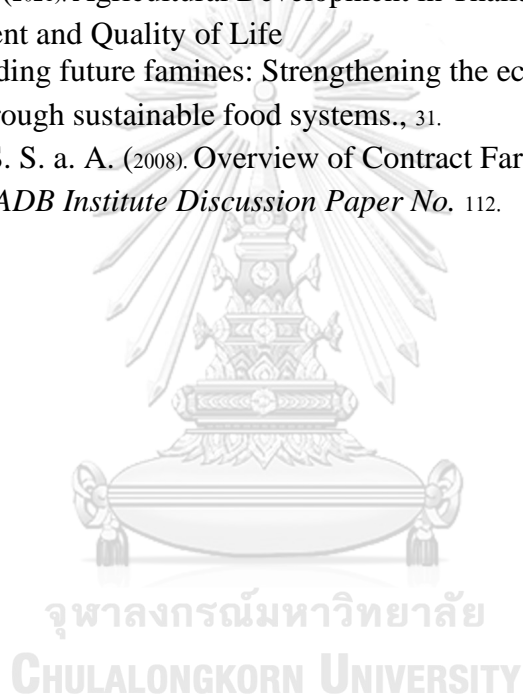
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