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Final Thesis

**Assessing Motivations for Improving Pregnant
Sow Welfare in Vietnam's Pork Supply Chain**

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ABSTRACT

The animal welfare issue has been a significant concern for communities worldwide for decades. Nevertheless, discrepancies between the scientific principles for animal welfare, societal expectations, and the reality of current animal husbandry practices have made researchers unable to adequately assess the driving forces behind animal welfare attitudes and actions among livestock stakeholders. Livestock stakeholders significantly influence animal welfare conditions, although the motivations behind their decisions remain largely unknown. Therefore, understanding the motivations of livestock stakeholders to improve animal welfare is valuable information for developing initiatives that benefit from stakeholder engagement. With an in-depth identification of elements that impede and support animal welfare programs' advancement, this study intends to fill this knowledge gap by investigating internal and extrinsic factors influencing livestock stakeholders' attitudes and behaviours toward improving animal welfare. Furthermore, this paper makes an essential contribution to the field by laying the framework for future attempts to bridge the gap between animal welfare principles and practices globally, particularly in Vietnam.

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INTRODUCTION

Animal welfare - a vital notion that has garnered paramount attention in recent years, encompasses creatures' physical and mental fortitude, whether in captivity or in the wild. With surging ethical issues, including the widespread utilization of animals for research and production, animal welfare has become a seminal matter in modern society (Lisbon Treaty, 2007). In this study, the term animal welfare is pertaining to the living conditions of animals in captivity, especially in intensive farms (or factory farms).

This essay aims to assess the dynamics of improving the welfare of pregnant sows in the pork supply chain in Vietnam through animal welfare scientific research and to assess current performance in improving farm animal welfare in Vietnam.

The impetus for this study is related to the paradox occurring in pork production in Vietnam, the second large pork consumer market in Asia is rated as a very poor performer (“F”) under the Animal Protection Index (API), and its farmed animal protection legislation achieved the worst performance rating (“G”) under the same index.

Animal welfare in the pork production sector is a critical concern that requires a comprehensive strategy. This dissertation explores the subject through an assessment of key components in the pork supply chain on a scientific basis for animal welfare.

In the first chapter, I will discuss the science of animal welfare, intensive farming/factory farming and its imperative for comprehending the ethical and humane treatment of animals. Followed by different assessments for the “well-being” of farm animals such as several prototype surveillance systems being developed in Europe or the well-known Welfare Quality project, etc. Additionally, by complying with applicable laws and regulations and developing appropriate farming and production methods to ensure animal welfare and minimize the disconnect between citizen protection and human spending consumption involves the convergence of government and private efforts, as well as education and awareness raising on animal welfare issues.

Secondly, the use of gestation cages in the pig industry has raised concerns for animal welfare. Issues such as physical health, mental health, and behavioural problems, as well as unresponsiveness and hostility, are associated with the use of these cages. However, there is a growing movement towards crate-free production, driven by research, public policy changes, and industry advancements. Pig farming businesses need to prioritize animal welfare and shift away from gestation cages towards updated housing systems that better

meet the needs of the animals. This will not only improve animal welfare but also reduce the cost of gestation cages. The paramount importance of pork production in both the worldwide economy and local agriculture necessitates prioritizing the implementation of animal welfare principles in farming practices. Chapter 2 explores the complex interplay between animal welfare and pork production by examining the various facets, such as production methods and supply chain considerations, while also shedding light on the challenges that negatively impact animal welfare in pork farming, including disease control, housing systems, and breeding practices. Through a thoughtful synthesis of both perspectives, this chapter endeavours to explore practical and effective strategies for ensuring the well-being of animals in pork production.

Chapter 3 focuses on the welfare of farm animals in Vietnam, with a particular emphasis on pregnant sows, analyzes the state of pig production and welfare in Vietnam and highlights challenges and opportunities for improvement, including a poor API score, lack of locally produced pork meeting animal welfare standards, limited infrastructure and technology, and shortage of agricultural services. The role of financial institutions and NGOs in promoting animal welfare and the need for research are discussed, and the importance of better enforcement and education for animal welfare and profitable pig production is emphasized.

The benefits of improving animal welfare in the Vietnamese pork supply chain are threefold: improved animal health and performance, increased customer satisfaction and ethical purchasing, and enhanced economic growth and development. Improved animal welfare leads to improved physiological and behavioural performance in pigs, including improved growth rates, food intake, and food utilization efficiency. Chapter 4 mainly focuses on this point and leads to the conclusion of elevating animal welfare in the livestock industry in Vietnam will require a concerted effort from all stakeholders. The government, the public, and the private sector must all work together, leveraging technology and cultural values, to make the industry more humane and environmentally responsible. Encouraging alternative protein sources and promoting meat alternatives can also play a role in this transformation. With cooperation from all parties, improving animal welfare sustainably in Vietnam is possible.

Animal welfare in the pork production sector is a critical concern that requires a comprehensive strategy. This dissertation explores the subject, including the welfare theories and the Five Freedoms, and the welfare concerns associated with gestation cages for pregnant sows. An analysis of animal welfare in Vietnam highlights the challenges and opportunities for improvement, such as a low API score and limited access to technology. The final chapter emphasizes the need for collaboration among all stakeholders to improve

animal welfare and promote sustainable livestock production practices. Improving animal welfare in the Vietnamese pork supply chain requires a collective effort, including updated housing systems, investment in technology, and policy and public awareness initiatives. Financial Institutions like World Bank, and IFC can play a crucial role in providing investment support, but a combination of policy and public awareness will be necessary to ensure animal welfare remains a top priority in the pork production industry.

CHAPTER I: A REVIEW OF THE ANIMAL WELFARE THEORIES

1.1. Chapter 1 Overview

The term “animal welfare” is a relatively new science and is gaining increasing awareness worldwide. The definition of “animal welfare,” as well as the supporting evidence and arguments, will be covered in the first chapter. Additionally, with the growing global need to improve the welfare of farm animals in the supply chain, global welfare issues, especially those concerning farm animals, will be addressed; that is to say, the basic welfare scientists discussed in the first part of the chapter, such as the five freedoms and other related social problems. In part three of this chapter, some of the assessments for animal welfare, such as the most recognised one – The Welfare Quality Project – will be discussed. Lastly, part four of the chapter extends the topic to the economic perspective of animal welfare since this term is expected to be promoted among all parties of the food supply chain.

1.2. Animal welfare definition

1.2.1. What is animal welfare?

Animal welfare is an important concept that has recently gained increased attention. It is a complex issue that involves considering the health and well-being of animals, whether they live in captivity or in the wild. Despite the extensive use of domesticated animals throughout history, it is now one of the most critical issues in our contemporary civilisation due to growing ethical concerns, including the widespread use of animals for research and manufacturing. Animal advocates have used the term for a long time to promote better welfare for animals, and scientific researchers have studied the topic for decades. Their research has basic goals, such as research to understand animals’ emotional and cognitive capacities, but also applied goals, such as work to reduce animal stress on farm animals, usually to improve their performance yield, reproduction, etc. The issue of animal sensitivities is currently at the centre of societal concerns. Animals have acquired the legal status of living beings in European law (The treaty of Lisbon., 2007) and in French law (“sensité de l’animal” as provided for in the French Civil Code through legislation number 2015-177 February 16, 2015). Animal

protection now concerns all animals whose lives depend on humans (pets, laboratory animals, farm animals, zoo animals, etc.)

The Terrestrial Animal Health Code of the World Organization for Animal Health, article 7.7.1, states: “Animal welfare means the physical and mental state of an animal about the conditions in which it lives and dies.” (World Organisation for Animal Health (Founded as OIE), 2019).

Animals experience good welfare if they are physically and mentally healthy. In addition, they have the freedom to express their natural behaviours and receive appropriate care, such as disease prevention and veterinary provision, shelter, a stimulating and secure environment, humane handling, and slaughtering or killing.

1.2.2. The science of animal welfare

Since animal welfare is a vital issue to society, its concept should be understood in order to promote the humane and ethical treatment of animals. In this section, these concepts are delved into The Five Freedoms and The Three Concepts as the main framework of animal welfare. When it comes to understanding the needs and environments of animals, using these frameworks is necessary since they are important in protecting the well-being of animals. In the following sections, I will discuss each of them to provide a basic understanding of animal welfare and to identify ways to ensure that animals are well cared for.

1.2.2.1. The Five Freedom

In animal welfare science, in the context of food chains, animal welfare is articulated into four areas that represent the contribution of research related to animals, their housing, the role of society, and animal welfare policy. The beginnings of animal welfare as a science, especially the welfare of farm animals, date back to the 1960s (Brambell Roger, 1965); (Harrison Ruth., 1964).

Because society wanted to know that animals from which the food, they eat is derived did not have poor welfare, and in 1965, the so-called ‘Brambell Commission’, commissioned by the United Kingdom government to investigate the welfare of intensively farmed animals, published the first widely accepted framework for

capturing the key aspects of animal welfare. Based on this report, five separated freedoms of animals, which together provides an overall picture of animal welfare, have resulted in the following:

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury, or disease
- Freedom to express normal behaviour
- Freedom from fear and distress.

The fact that animals aren't fed enough healthy nutrition seems to be a great problem, and this should be solved by making more efforts to check and clean these sources as well as providing a balanced diet carefully researched in different animal species. In fact, animals have diverse nutritional requirements attributed to their favourite type of food as well as their age, size, and activity level. For example, herbivores, such as cows and horses, require fibre in vegetables, while carnivores, such as cats and dogs, require a diet high in protein from meat; and growing animals may require a diet that is higher in protein and energy than adults (Kirk, 2013).

Animals should be provided with shelter and a comfortable environment that meets their species-specific needs. For example, some animals require more space to move around and explore, while others prefer to sleep in enclosed spaces. Furthermore, the living environment should be clean and hygienic, with adequate bedding material, and the temperature should be appropriate for the species. It is also important to consider natural behaviours, such as the need to climb and explore and provide stimulating toys or objects to encourage these activities (Curtis, 2016).

Animals deserve to be taken care of properly, which means at least making sure they're healthy and safe. This includes taking them for regular check-ups with the vet, giving them the necessary vaccinations, controlling parasites, and treating any illnesses or injuries right away. Nevertheless, it's not just about treating problems when they

arise. It's also about being proactive and doing what is able to prevent them from happening in the first place. Solutions should be taken to make sure their living environment is clean and safe and that they're not exposed to things that could stress them out or make them uncomfortable, such as extreme temperatures or loud noises (Sachs, 2013).

The lack of freedom of normal expression, including behaviours and interaction with their environment, is a worth-considering matter. This should be solved by providing them with the opportunity to explore, forage, and interact with other animals as well as encouragement to do these activities by giving them objects that are familiar to their natural habitat (including toys, scratching posts, climbing frames etc.) Furthermore, it is important to consider the specific behavioural needs of the species, such as the need for social interaction in some of them (Reid, 2014).

Last but not least, animals should not be subjected to fear, distress, or suffering. There should be more attention from animal caretakers to avoid any practices that cause fear or distress to animals, such as physical punishment or loud noises, and to provide a living environment that minimises sources of stress such as overcrowding, unfamiliar animals, or unfamiliar environments. Nevertheless, actions should not be hastily taken since this also negatively affects animals' health. Therefore, it is essential to make gradual changes to the living environment by taking into consideration the individual needs of each animal (McMillan, 2016).

1.2.2.2. The three concepts

The topic of animal welfare has been a subject of ongoing debate for many years, with different opinions on what constitutes appropriate care and treatment for animals. Fraser (2009) identified three key goals which encapsulate an overarching view of animal welfare: ensuring good physical health and functioning, minimising unpleasant emotional states such as pain and fear, and allowing the animal to act naturally. These three goals not only underpin the ethical and moral considerations of animal welfare but are also based on the scientific understanding of how animals interact with their environment. For instance, the notion of allowing an animal to act naturally implies that

the animal is able to express its natural behaviour, such as foraging and socialising, without interference from humans (Fraser, 2009).

Although interrelation is based on scientific understanding, these three goals can potentially conflict with one another. For example, the pain and distress that may result from medical procedures necessary to ensure good physical health and functioning. It's necessary to find a balance between the three goals, and as much as possible, a preventative approach should be taken to protect animals from situations that could reduce their welfare. Legislation can be used to ensure that animal welfare is not compromised, for example, by outlawing cruel practices such as animal testing.

Fraser's three goals stem from different philosophical views on animal welfare, and the interpretation of what 'good' animal welfare entails is highly subjective. The truth is, despite the various philosophical perspectives, Fraser's three goals provide a common framework for understanding and assessing animal welfare. Nevertheless, these goals are limitedly used due to the great difficulty in assessing and analysing animal welfare, which is further compounded by the fact that animals have the ability to adapt to their current conditions (Fraser, 2009).

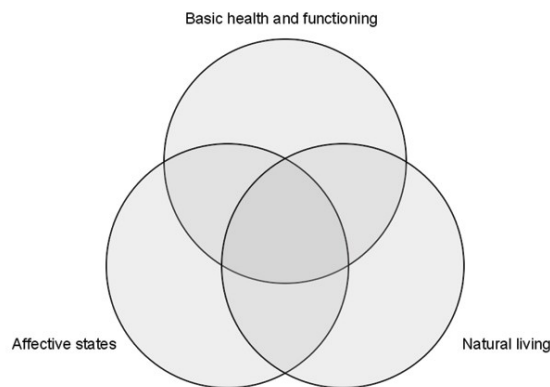


Figure 1. Three conceptions of Animal Welfare. Source: (Appleby, M. & Lund, V., 2021)

1.2.2.3. The World Organization for Animal Health's definition

Animal welfare is a complex concept that has been subject to considerable debate in recent decades. Animal welfare is the physical and psychological well-being of an animal regarding the conditions in which it lives and dies. Additionally, it is important

to note that animal welfare is distinct from animal rights. While animal rights advocates argue that animals should be granted certain rights on par with humans, animal welfare advocates focus on improving the quality of life for animals in their current state (Animal Welfare Institute, 2022).

Nowadays, the World Organization for Animal Health (OIE) covers all approaches and published a definition of animal welfare in the Terrestrial Animal Health Code, section 7 – Animal Welfare – 2008, to which 118 countries agreed (Humane Society, 2019). Currently, this definition provides the strongest reference for the term animal welfare and is defined as the physical and psychological well-being of an animal regarding the conditions in which it lives and dies. The animal's welfare is considered good when it is healthy, comfortable, sufficiently nourished, safe, and not subjected to pain, fear, or distress. To ensure this, the animal must have access to preventive measures against the disease, appropriate veterinary care, shelter, management and nutrition, a stimulating and safe environment, humane handling, and a humane method of slaughter or killing. Animal welfare is closely related to terms such as animal care, animal husbandry, and humane treatment (OIE,2019).

This definition of animal welfare provides a comprehensive framework for understanding and promoting animal welfare across a range of contexts. It encompasses principles such as disease prevention, access to veterinary care, appropriate housing and nutrition, and humane handling and slaughter (Humane Society, n.d.). Aside from focusing on the physical health and well-being of animals, these principles also consider how animals express their natural behaviours. Taking the ng importance of animal behaviour into account, the OIE definition of animal welfare also emphasizes the animals' right to freely express their natural behaviour.

Animal welfare is closely related to terms such as animal care, animal husbandry, and humane treatment. Animal care refers to the practical measures taken to ensure the welfare of animals, while animal husbandry refers to the practice of keeping and caring for animals, such as by providing them with access to appropriate housing and nutrition. Humane treatment is a moral principle that involves treating animals with respect and

kindness and avoiding unnecessary suffering (World Organisation for Animal Health (Founded as OIE), 2019).

Overall, animal welfare is an important concept that seeks to ensure the health and well-being of animals in our care. It requires society to take a comprehensive approach to animal welfare that includes preventive measures, access to veterinary care, appropriate housing and nutrition, and humane handling and slaughter. Animal welfare is closely related to terms such as animal care, animal husbandry, and humane treatment, all of which are essential for promoting the physical and psychological well-being of animals.

1.3. Intensive Farming and Animal Welfare

The highly concentrated and confined practices of “intensive” or “factory” farming have become ubiquitous across the globe, with herds of livestock being cramped into cramped indoor spaces like stalls and cages. To truly comprehend the definitions of this system on the welfare of animals, it is essential to possess a comprehensive understanding of intensive farming. Delving into the intricacies of this method is key to comprehending its profound impact on the well-being of these creatures. This section endeavours to furnish a clear and lucid explanation of intensive farming.

1.3.1. What is “Intensive” or “Factory” farming?

Globally utilized, the term “factory” or “intensive” farming encompasses systems that confine vast numbers of livestock in tiny indoor spaces such as stalls and cages. This specific approach to animal husbandry is marked by dense stocking and the incorporation of cutting-edge technology and automation to attain maximum production efficiency. Regulations and standards for animal welfare and agriculture differ from country to country, hence the definition of an intensive farm varies regionally. In other words, the different definitions reflect the political, economic, and cultural intricacies of agriculture, striving to find a balance between efficient and sustainable food production while considering animal welfare and environmental sustainability.

In fact, the criteria for determining what constitutes an intensive farm vary between the US and Europe, as each nation sets its own standards. The USDA considers a farm with over 1,000 cattle, 2,500 pigs, or 125,000 chickens as a concentrated animal

feeding operation (CAFO) or intensive farming system (U.S. DEPARTMENT OF AGRICULTURE, 2019). Meanwhile, the European Union (EU) designates farms with more than 40,000 chickens or 2,000 pigs as intensive farms (EUROPEAN COMMISSION , 2013). These standards serve as a benchmark for the European Commission to classify farms as intensive or otherwise. Despite utilizing similar criteria, the definitions put forth by governing bodies such as the USDA and the European Commission differ, offering a distinct understanding of what constitutes intensive farming in various regions.

1.3.2. Intensive farming systems and Animal welfare

With the advent of Concentrated Animal Feeding Operations (CAFOs), animal husbandry has transformed into a large-scale, industrialized enterprise. This shift has allowed for the speedy and cost-effective production and delivery of vast quantities of meat all year round. In Vietnam, the integration of automated milking machines in intensive dairy farms has proven to be a boon for farmers. By enabling faster milking processes, these machines have made dairy farming more efficient, streamlined and less labour-intensive, leading to an increase in output. Intensive farming also offers a multitude of other advantages, including the ability to produce meat at a faster pace and with reduced expenses.

The system of intensive farming, or factory farming, is a flawed approach that prioritizes short-term profits over the well-being of the animals. Animals are housed in small, cramped indoor spaces such as stalls and cages, often packed in with thousands of other animals, leaving little room for movement and normal behaviour. This style of animal production values efficiency and productivity over the recognition of animals as sentient beings, leading to widespread negative effects on their physical and behavioural health. Despite the refinement of the system for maximizing profits, the drawbacks of intensive farming cannot be ignored and demand a reconsideration of our approach to animal husbandry.

Battery cages hold at least four or even more laying hens (Shields, 2019). This cage is so small that it cannot spread its wings. They are so close that the chickens peck at each other's wings and bodies.

- Pregnant sows spend each gestation in a gestation crate (a metal enclosure slightly wider or longer than the sows itself) and suffer from skin problems, especially foot injuries (HSUS, 2013).
- A slatted structure anchors a growing pig to a bare concrete floor. They frequently bite and scratch their housemates as a result of stress from overcrowding and boredom (I. Vermeij, 2009).
- Amputations that cause pain, such as throbbing, are regularly performed. These can result in stress, damage, and less mobility, resulting in the poor physical and mental health of the animals.

Studies have pointed to the detrimental effects of intensive farming practices such as battery cages, gestation crates and slatted frames on the well-being of animals, manifesting in physical and psychological distress, pecking and biting, and skin or foot damage. These practices are unequivocally inhumane and should be discontinued in order to provide these animals with a more humane and hygienic environment.

At its core, the objective of intensive or factory farming is to increase production efficiency, often to the detriment of the animal's welfare. Even though the definition of intensive farming may differ from region to region, the paramount aim remains the same: to maximize profit through enhanced efficiency and production, rather than taking into account the well-being of animals. Studies have made clear the damage caused by intensive farming practices, such as battery cages, gestation crates, and slatted frames, and the detrimental effects have been starkly highlighted. Therefore, it is time to recognize the detrimental environmental and social impacts that intensive farming has had. As these problems keep rising, it is essential to consider the implications of this type of farming and strive towards a more humane and sustainable approach.

1.4. Top-line animal welfare concerns globally

1.4.1. Compliance and Global Standards

Consumer concerns about food demand from high welfare production systems are gradually spreading to globalised food supply chains (Consumer-Reports, 2020). To do business, producers and suppliers in exporting countries may be increasingly obligated to meet the health standards and regulations demanded by consumers in other countries (ICTSD, 2020). This is due to the fact that these exporting nations have a small national tradition of widespread concern for farm animal welfare and little legal infrastructure to protect animals from suffering (EC, 2020). These standards and regulations may be established by food chain actors, voluntary arrangements, or global bodies such as the Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (WOAH). Many European retailers will only market meat produced to specific European agricultural assurance standards, which has caused countries such as Brazil and Thailand, with a riving export market sets to Europe, to show great interest in animal welfare standards (Bracke, 2009).

In Southeast Asia, more and more farms and agribusiness lined up to meet European rather than domestic production standards. In some of these regions, where the climate is warmer and labour costs are lower and livestock works combined to reduce production costs, EU standards can be achieved or even improved, leading to, for example, maximum storage density equal to or less than the EU Poultry Standard 2011 (Bracke, 2009). Furthermore, even to be able to compete in this global trade, manufacturers must meet and maintain healthy and productive animals that meet the requirements of target market quality control standards. Animal welfare has become an increasingly important topic in the agricultural industry, with the implementation of high standards ensuring higher productivity, better quality food, increased food security, and add value for farmers (FAO and slowfood., 2012-2017). As a result, it is proposed that animal ‘happiness’ can be seen as a potential “win-win” opportunity for animals, farmers, and consumers alike in an increasingly global market (FAO and Slowfood., 2012-2017). In this context, animal happiness refers to the overall well-being and contentment of animals, which is essential for the success of the agricultural

industry. Therefore, farm animal welfare has gradually become a global phenomenon through international trade in meat and dairy products.

1.4.2. Breeding and Producing

Responsible animal caregivers should be aware that breeding plays a vital role in the overall health and well-being of animals. Breeding decisions can have an impact on the ability of animals to express their natural behaviours and interact with their environment.

To begin with, the use of intensive breeding practices may lead to animals being confined in small spaces, and unable to engage in natural behaviours. In fact, factory farming uses battery cages or gestation crates as the main way to keep animals in the process of production. This lack of room to move and engage in natural behaviours, like foraging, nesting, and socializing can have a severe impact on the physical and mental well-being of animals, leading to chronic stress and reduced quality of life (HumaneSociety, 2020). The negative impacts of intense breeding techniques not only limit animals' capacity to express natural behaviours by confining them in limited settings but also diminishes genetic variety, which might affect their overall health and well-being. Relating to modern issues, the use of intensive breeding practices can also lead to genetic diversity being reduced, which can have negative impacts on the health and well-being of animals. In fact, the reduction in genetic diversity can lead to animals being more susceptible to diseases and can also reduce the ability of animals to adapt to changes in their environment. For example, the use of intensive breeding practices can lead to animals being less able to cope with extreme temperatures or adjust to changes in food availability or predation. This can have a significant impact on the welfare of animals and can ultimately lead to a decrease in the overall health and well-being of not only the animal population but also human society (O'Neil, 2016).

In recent years, farm animal health concerns have become more pressing with the rise of zoonotic diseases and the threat of antibiotic resistance in humans, at least partly due to the overuse of antibiotics in livestock (O'Neil, 2016). One of the biggest issues associated with the excessive abuse of antibiotics is the development of antibiotic-

resistant bacteria, which can be highly dangerous for humans and animals alike. The unacceptably enormous use of colistin in animals demonstrates the problem of antibiotic resistance caused by misuse, which can lead to the creation of antibiotic-resistant bacteria that might possibly be passed to people. Colistin is one of the most powerful antibiotics available and is often used to treat serious infections in humans. Its use in animals, however, is controversial as it can lead to the development of antibiotic-resistant bacteria in animals, which could then be passed on to humans. Therefore, given the potential for the development of antibiotic-resistant bacteria as a result of the use of powerful antibiotics like colistin in animals, it is crucial to carefully manage and monitor the use of such antibiotics in both humans and animals to preserve their effectiveness (Bell, 2021). In 2020, the World Health Organization (WHO) issued guidelines on the appropriate use of antibiotics in both humans and animals, and these guidelines should be strictly followed in order to reduce the risk of antibiotic resistance.

1.4.3. Trade-related procedure

Since consumers barely pay attention to better food quality by this, animal welfare development could face challenges. Few consumers actively support initiatives to safeguard and enhance animal welfare throughout the food supply chain. This has resulted in a lack of incentive for farmers, retailers, and other actors in the food supply chain to make changes to their practices (Boffey, 2014). Despite this challenge, a growing consumer base that prioritizes animal welfare presents a potential market opportunity. Evidence demonstrates an unprecedented surge in ethical consumption, food-related public anxiety, and non-governmental groups' advocacy of alternatives to conventional agricultural techniques (NGOs).

To promote animal welfare, all stakeholders' interests must be considered, including customers, farmers, retailers, and the environment (WorldAnimalProtection, n.d.). This requires an approach that utilizes trade-related and liberal economic strategies, as well as a responsive democratic government that can ensure that the interests of all parties are considered. Additionally, implementing such a strategy demands the employment of diverse tactics as well as the assistance of a responsive government to assure its success. While there are numerous potential strategies for improving animal welfare, a

key challenge is the successful adoption of such policies. This depends largely on the ability of stakeholders to mobilize consumers in support of animal welfare and to create and maintain the necessary incentives for the actors in the food supply chain to make the necessary changes (Seccombe, 2018).

1.4.4. Overcrowded and Space limitation

Animal overcrowding and space limitations have always been a welfare concern, but recently this issue has grown urgent, particularly in emerging nations like Vietnam. This is particularly true in developing nations like Vietnam, where a lack of land ownership, inadequate infrastructure, and insufficient food safety regulations all contribute to overpopulation and a lack of space. For example, the lack of proper infrastructure and facilities to care for animals, such as veterinary clinics, feed storage, and clean water sources, can make it difficult for farmers to provide adequate care for their animals. (FAO, 2020).

Furthermore, the retail industry in Vietnam is a point of concern for animal welfare due to its inefficiency in providing appropriate space for a large number of animals. Traditional marketplaces account for most of the retail economy, leaving little room for the animal agricultural sector, leading to overcrowding. The market needs to provide more space for the animals to be kept in a humane and healthy environment. Moreover, the lack of food safety standards and the inability to provide consumer animal welfare information further contribute to the problem. Since customers are raising awareness about the affection of animals' treatment to their meat quality, this matter leads to a shift in customers' choice to buy food from credible local farms and producers instead of commercial industries that are untrustful about their production methods. (FAO, 2020).

1.4.5. Media and Social Awareness

In recent years, there has been a severe shortage of media and societal awareness on animal welfare, hindering the public from comprehending animal suffering and the remedies that might assist. Because other social challenges frequently overshadow it, a lack of awareness and comprehension leads to a lack of public participation and attention to the issue (WSPA, 2017). Furthermore, the flaws in coverage not only

contribute to a lack of comprehension but also impede constructive discussion and debate by offering a shallow or sensationalized view of the problem (Animalsheltering.org, 2018). When animal welfare is covered, it is sometimes exaggerated or oversimplified, inhibiting genuine discussion and debate about the best ways for improving animal wellbeing. Conversely, the fact that other societal concerns frequently gain more media attention, causing animal welfare to be disregarded, further worsens this problem (CIWF, 2017). Therefore, it is obvious that there is a serious issue with social awareness of animal welfare in the media and that this issue must be addressed.

1.5. Conflicting practices of The Five Freedoms

Although companies and manufacturers often claim to adhere to the five freedoms, this can be very misleading as many standard farming practices are contrary to a common framework. The Five Freedoms is a widely recognized framework, but is not self-executing or precise enough, and therefore ineffective without specific guidance. Many food manufacturers/ companies mention the five freedoms on their websites or sustainability reports but have weak or non-existent policies or guidelines regarding housing, management, transportation, or slaughter. For example, slotted floor and crate systems are common, although one of the freedoms is “to be free from discomfort by providing a comfortable resting area” (WorldAnimalProtection, 2020). In this section, I discuss the Five Freedoms principles in more detail for some popular cattle, including pigs, as their welfare is at the core of this thesis.

1.5.1. Freedom from hunger and thirst

Animal welfare involves providing animals with freedom from hunger and thirst. This is an issue that is often overlooked in the pork industry, where pigs are bred to gain weight and grow quickly. In order to prevent obesity and ensure that productive herds can only be fed every other day, pigs are often restricted in food, receiving only 50-60% of their voluntary food intake. This chronic hunger can lead to aggression, frustration, and behaviours such as stick biting, a sign of persistent psychological stress (FAWC, 2021). Moreover, during transportation, most farm animals are deprived of food and

water. Cattle, pigs, and sheep can be transported by truck for up to 28 hours without food or water, according to US law. Such long transportation times can contribute to distress and suffering in animals, while also causing their weight and health to deteriorate (aphis.usda, 2021).

Providing animals with enough food and water to satisfy their physiological needs and the freedom to select when and how much to eat and drink is also a crucial part of animal welfare. A cow, for example, should have access to fresh, clean water and enough food to satisfy its nutritional needs, as well as the freedom to eat and drink when it wants rather than being force-fed or constrained to set mealtimes. Clarifying further, a fulfilled diet for animals that allows them to eat and drink freely maintains not only their physical strength but also their mental health. For instance, a chicken that is kept in a small cage with limited access to food and water may become aggressive and stressed as it is unable to fulfil its natural behaviours, but providing it with enough food and water, and allowing it to move freely and forage for food can reduce stress, aggression and frustration (FAWC, 2021).

1.5.2. Freedom from discomfort

Understanding the notion of discomfort-free living entails assessing the varied treatments of various animal species in multiple contexts. In other words, this examination must take into account the specific needs of each animal species by evaluating diverse factors of the specific housing conditions, feeding methods and living environments that animals are subjected to. Although animals are needed to be treated humanely and ethically, most farming factories do not understand the importance of achieving this. For example, pigs are often housed on concrete bar floors, geese and ducks used in foie gras production are force-fed, and cows in intensive dairy farms are often kept in barns with fewer stalls than the number of cows (Gunther, 2012). Such conditions can lead to a range of negative impacts on the animal's welfare, especially discomfort for the animals, such as standing or lying in barren, concrete alleys. It is vital to keep in mind that distinct animal species have varied needs, and how they are treated in various contexts should reflect this. Therefore, animal rights organizations advocate a switch from intensive farming to

pasture-based systems in order to create a more compassionate and humane way of producing meat that allows animals to thrive (World Animal Protection, 2020).

1.5.3. Freedom from pain, injury, or disease

Farm animals are often subjected to painful practices, such as having their tails amputated, their horns burned, their beaks, toes and claws cut off, and being castrated without pain relief. To identify individual pigs, their ears may be cut off, and in the case of merino sheep, prized for their wool, the skin may be cut from their rumps in the practice of mulesing. Unfortunately, these practices are still widely used, and although solutions exist, the issue of animal welfare remains a serious concern (AWI, 2020).

Tail biting is an animal welfare issue that is often addressed by amputating the piglets' tails (HumaneSociety, n.d.). However, this is a short-term solution that does not address the root cause, which is boredom and lack of enrichment. To prevent this behaviour from occurring in the first place, straw and other enrichment materials can be provided as an alternative to tail amputation. Similarly, in the case of poultry, providing enrichment materials to prevent abnormal feather pecking behaviour can eliminate the need for hens to be decapitated (Weaver, 2017).

The issue of mulesing and providing adequate care for poultry must be addressed in order to ensure the welfare of farm animals. Breeding “regular body” sheep, which are less appealing to fireflies, would be an alternative to skinning the rump. However, even with this approach, sensitive animals may still suffer pain, necessitating more studies to discover pain alleviation options (RSPCA, 2020). Furthermore, personalized veterinarian treatment is seldom offered in the case of chickens, so additional study is needed to investigate potential solutions to this problem.

Overall, while solutions exist, further research is needed to reduce the suffering of farm animals. By exploring alternatives to tail amputation, providing enrichment materials, breeding ‘normal body’ sheep, and developing more humane methods of killing sick or injured animals, the welfare of farm animals can be improved.

1.5.4. Freedom to express normal behaviour.

Most intensive indoor systems around the world do not allow farm animals to freely exhibit natural behaviour. Laying hens are often kept in “battery cages” (CIWF, 2018), small wire mesh cages that provide so little space that the chickens cannot even spread their wings freely. Their complex natural behavioural repertoire includes dust bathing, scratching, pecking on the ground (in search of food), perching, and nesting, which is not possible in a sterile cage. Pregnant sows are housed in “pregnancy crates”, metal cages so narrow that they can’t even turn around for the duration of their pregnancy, 114 days (CIWF, 2018). They are prevented from burrowing, rooting, and choosing a preferred sleeping place. Dairy calves are kept in individual “calf stalls” where they cannot run, play, or socialize (FAO, 2011).

The five freedoms can overlap. For example, grazing animals not only inhibit natural behaviour (grazing), but because of this, they are also associated with stress, pain, and disease. Feedlots are popular for cattle and sometimes sheep in the United States, Canada, and Australia. While cattle are adapted to grazing all day, ranches keep livestock in barns, often without shade, shelter, or windbreak (Ferreira, 2019). Concentrated diets for finished grain cattle can lead to digestive problems including acidosis, flatulence, and if prolonged, liver abscesses, and even episcleritis. Fattening cattle are also susceptible to a bovine respiratory illness known as “carrier fever”, in part due to the combined stress of weaning and being transported from their natural pasture to the fattening barn (Awad, 2007). To facilitate the commercial production cycle, some farm animals are weaned at a very young age. Calves in the dairy industry are often separated from their mothers within 24 hours of birth to retain the best milk for sale. Piglets are weaned after 2-4 weeks, before their natural maternal dependency. There is no room for natural mother-infant bonding in highly intensive commercial breeding systems and little opportunity for natural maternal behaviour. Indoor-intensive duck farming is popular in many parts of the world, especially in Eastern Europe and Asia. Ducks are waterfowl and typically spend most of their lives bouncing around in ponds, streams, and swimming, but they rarely have access to open water in industrial facilities (Yoon, 2011).

1.5.5. Freedom from fear and distress

The transportation and slaughter of animals is a stressful experience, particularly for inexperienced animal handlers. Pigs, cattle, and sheep are often reluctant to move when they perceive humans as predators, leading to handlers employing rough tactics such as electric whips to deliver painful shocks and force the animals to move. Low-stress animal handling courses are available, though not all companies require them, and the quality of training can vary. Once loaded onto a truck, the movement of the vehicle, the mix of strange animals, new situations, and noise continuously stress the animals' (Animals transport and slaughter, 2020).

For poultry, the process of "livestock farming" is especially problematic. Chickens and ducks that are raised for meat are caught and carried upside down by their feet, with sometimes three or more in each hand when loaded into shipping containers. Research has demonstrated that turning the chicken upside-down causes distress. At the slaughterhouse, an "electrical-stunning" system, which renders animals' unconscious before they are slaughtered, is often employed (NCBI, 2014). The process involves putting the animals into an electrically charged water trough to pass an electric current through the brain of the animal, leading to its unconsciousness. To most people, this method is one of the most humane and effective methods of stunning animals before slaughter. However, it is crucial this process could not be done properly without any specialized equipment and trained personnel for animal welfare monitoring (Forsberg, 2018).

Despite the Five Freedoms of Animal Welfare providing a baseline for acceptable animal care, the practices employed in the transportation and slaughter of animals often conflict with these freedoms. Animals are subjected to high-stress levels and inhumane practices during the process, leaving animal welfare in a precarious state. To achieve the highest level of animal welfare, it is essential that animal handlers are given appropriate training and that the Five Freedoms are respected (RSPCA, 2020). Only through a comprehensive welfare assessment and implementation of animal welfare standards can the true impact of conflicting practices on animal welfare be accurately determined.

1.6. Welfare Assessment

This part discusses welfare assessment since it's an essential part of any project related to animal welfare. By assessing the welfare of animals, all the stakeholders can understand their current and future state of well-being and identify areas of potential risk and improvement. This assessment can help individuals to better understand how to improve animal welfare and develop effective strategies and projects to ensure that animals are treated ethically and with respect.

1.6.1. Variety of Welfare Assessments

Several (prototype) surveillance systems are currently being developed in Europe. These include the Austrian Tierschutzindex TGI35L (Bartussek H., 2001) and the associated German TGI200 (Cozzi Giulio, 1997), Denmark 's Ethikkonto (Sorensen JT., 2001), and the UK's Freedom Food Schemes (Royal Society for the Prevention of Cruelty to Animals). Decision Support System for General Welfare Assessment of Sows in the Netherlands (M. B. M. Bracke, 2002), France (Capdeville J, Visser ,2001) and Italy (Scott, et al., 2001). Most of these systems are primarily based on environmental observations. Implementing constructive measures to positively impact animal welfare and observing the performance of animals with discernment is believed to unveil their inner condition (van der Staay, 2001). However, the relationship between specific measures and animal welfare is not always clear. For instance, with the intention of improving animal welfare, certain farming practices or regulations and guidelines may be implemented to protect animals, but the effectiveness of these measures may not be clear or may vary depending on the specific circumstances following distinctive cultural, societal, and personal perspectives of each country. Furthermore, a single value is often calculated for all measurement dimensions of welfare. This carries a high risk that the "welfare rating" resulting from the negative aspects will be adjusted by satisfying others, which can lead to an unreliable and inaccurate measurement of an animal's well-being (Van der Staay, 2001).

Consumer perception of food quality is determined not only by its general nature and safety but also by the welfare state of the animal from which it is made. In other words, animal welfare is an important attribute of the overall "food quality concept".

Recent surveys conducted by the European Commission as well as studies in Welfare Quality®, confirm that animal welfare is an issue of considerable importance for European consumers and European citizens demonstrate a strong commitment to animal welfare (European Commission, Brussels, 2007)

1.6.2. The Welfare Quality® Project

The Welfare Quality® aims to address animal welfare concerns and enable clear communication regarding the animal quality of life and product profiling. The latter is essential for combining animal husbandry practices with knowledgeable presentations and purchases of animal products. In fact, product profiling provides a comprehensive understanding of the animal's quality of life, enabling consumers to have adequate information about animal products before choosing to buy them. This process can also encourage farmers and producers to optimize their practices to ensure that the best possible animal welfare comes with the best quality of products (Keeling, L. & Veissier, I., 2005). In a truly integrated approach, Welfare Quality® combines analysis of consumer/citizen perceptions and attitudes with existing knowledge from animal welfare science, thereby identifying 12 problem areas that should be adequately covered by measurement systems. Identified. These are tabulated as welfare criteria that point in the direction of maximizing welfare. Each standard covers a separate aspect of good animal welfare, and the list has been selected to minimize the total number of standards while still covering all potential problem areas. To further reduce the number of items and make them easier to understand, the criteria are divided into four classes (Keeling, L. & Veissier, I., 2005). These are named in the table below and correspond to the question.

- Are the animals properly fed and supplied with water?
- Are the animals properly housed?
- Are the animals healthy?

- Does the behaviour of the animals reflect optimized emotional states?

Principles	Welfare criteria	
Good feeding	1.	Absence of prolonged hunger
	2.	Absence of prolonged thirst
Good housing	3.	Comfort around resting
	4.	Thermal comfort
	5.	Ease of Movement
Good health	6.	Absence of injuries
	7.	Absence of disease
	8.	Absence of pain induced by management procedures
Appropriate behaviour	9.	Expression of social behaviours
	10.	Expression of other behaviours
	11.	Good human-animal relationship
	12.	Absence of general fear

Figure 2. Table of Giving welfare principles and criteria. Source: (Keeling, L. & Veissier, I., 2005)

Applying the Welfare Quality® project could help to solve the consumer’s concerns and behaviour is of importance in defining the kind of information that they want about the final products and in developing effective strategies for communicating welfare standards to the public (Welfare Quality®, n.d.).

While the goals that were originally formulated evolve as results emerge and opportunities arise, the key goals remain true:

- Develop practical strategies/measures to improve animal welfare,
- Develop a process for animal welfare assessment on the farm and at slaughter,
- Develop a protocol to translate animal welfare assessment data into product information,
- Integrate and connect the most relevant expertise in the multidisciplinary animal welfare sector in Europe.

Research has shown that the European Union (EU) has some of the highest animal welfare standards in the world, and there is a significant amount of interest and investment in improving the welfare of farm animals within the EU (European Commission, 2019). Nevertheless, the Welfare Quality® project not only aims to improve the welfare of farm animals in Europe but also in other countries. Basically, this project is a collaboration between a wide range of stakeholders (including researchers, farmers, industry representatives, and other stakeholders) working together to improve animal welfare in a

way that is both economically viable for farmers and socially acceptable for consumers and other stakeholders (Welfare Quality®, n.d.). To clarify this point, the collaborations between researchers and farmers, and industry representatives allow for a multidisciplinary approach to animal welfare, where the scientific knowledge and expertise of researchers are combined with the practical experience and situations of the agricultural industry. Additionally, the inclusion of other stakeholders, such as animal welfare organizations, consumer groups, and government agencies, is important for ensuring that the solutions developed to improve animal welfare are comprehensive and take into account a wide range of perspectives. Their valuable insights and oversights of the ethical and moral considerations, the public's expectations and concerns, the governmental laws and guidelines, and the funding and resources significantly contribute to more effective and sustainable animal welfare outcomes (Welfare Quality®, n.d.).

1.7. An economic perspective to animal welfare

One of the most important perspectives of Animal Welfare is related to the economy, which is carefully discussed in this part. Upon closer examination, this issue is divided into two parts: The Economic Framework of Animal Welfare and Supply/Marketing Chain Conditions, and these will be addressed in detail in the following sections of the thesis.

1.7.1. The Economic framework of Animal Welfare

In some documents of Microeconomics, one of the most important concepts is the Production Possibilities Frontier (PPF), which is a graphical representation of the maximum possible output of goods and services by balancing the given resources available (Investopedia, 2020). In order to improve economic performance and efficiency, companies in a competitive supply chain must evaluate the trade-offs between animal welfare and animal productivity. In his published article in 2020, S. Olga claimed that this necessitates an understanding of the economic context to find the ideal balance between animal welfare and productivity, as well as production costs. This balance is required for businesses to provide the levels and standards of animal care mandated by society while also ensuring that their production methods are efficient and cost-effective. By continually

assessing and adjusting their approach, companies can make sure that their production processes are as efficient and cost-effective as possible without falsely compromising animal welfare (Olga, 2020).

Meanwhile, S. Hagen uncovered an important trade-off between animal welfare and production. He contended that adopting stricter animal welfare standards will raise the net cost of production and lower meat productivity. Companies must strike a balance between enhancing animal welfare and meeting production targets in a competitive supply chain. In other words, they must weigh the costs and advantages of increasing animal welfare, as well as how it will affect their overall performance and market competitiveness. Organizations that do not achieve this requirement, on the other hand, may be unable to fund their operational costs, let alone continue to improve animal welfare over time (Hagen, 2020). More efficient research and development (R&D) and dissemination of information, along with competition in the supply chain, could rapidly spread these best practices not only across the industry but also throughout the international economy. However, as much as consumers and their representatives (grocery retailers) are willing to pay to improve animal welfare, chain actors are at least as interested in improving consumer/retailer health awareness. The more domestic market chains are restricted by regulations and laws for animal welfare, the more special care must be taken by market chain actors. Therefore, animal Welfare is also a vital process of domestic market chains, focusing on meeting the minimum level of protection required at the expense of maximizing animal productivity. Understanding this framework is key for navigating further trade-offs between animal welfare, animal productivity, and cost (*idem*).

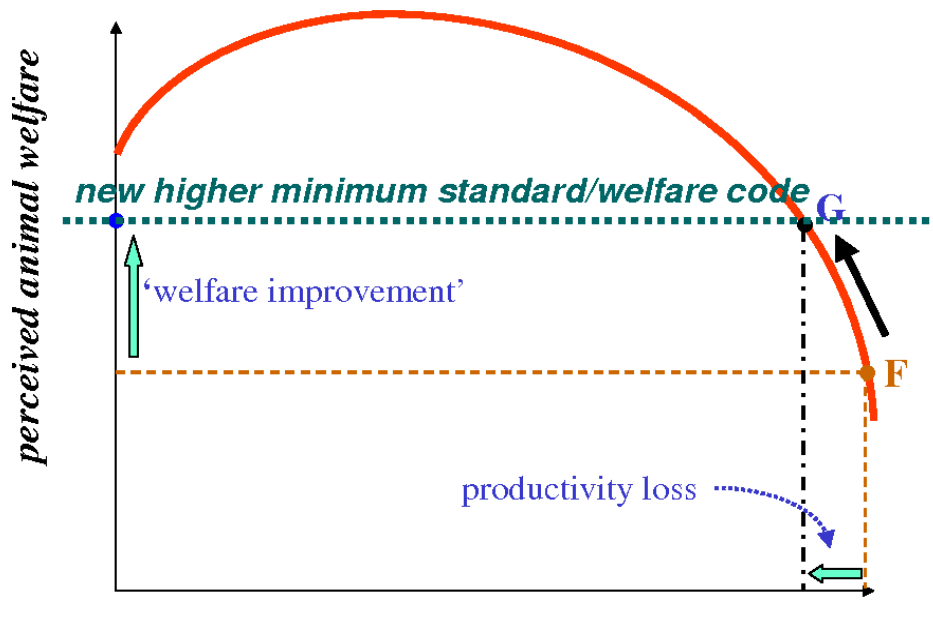


Figure 3. An economic trade-off of animal welfare. Source: (McInerney, J., n.d.)

1.7.2. Supply-Marketing Chain Conditions

The key conditions that determine a supply chain's ability to guarantee animal welfare can be divided into two conceptually distinct factors:

- *Capacity*: the supply chain's ability to innovate and adapt to meet society's needs for improved animal welfare. The company meets or approaches industry best practices (PPF)
- *The Citizen/Consumer Gap*: the extent to which consumers are willing to pay for animal welfare improvements.

These conditions determine the position of the supply chain on the PPF where it tends to adapt (Kühne & Seidl, A., 2013).

1.7.2.1. Capacity

The literature on the supply chain's ability and willingness to deliver what consumers want and are ready to pay for is very limited. Traditional economic analysis usually assumes that competitive pressures and the constant struggle for firms and businesses to survive and thrive will ensure that enterprising individuals and firms can find their 'niche markets'. They also argue that the unfilled gap is the result of a practical problem

that the costs to close the gap is not sufficiently offset by sales to make the business worthwhile (Banerjee, 2016).

The capacity of the supply chain to manufacture goods that comply with animal welfare norms in order to meet consumer demand is a major issue for businesses, governments, animal welfare organizations and other related stakeholders alike, including consumer groups. Studies show that there is a significant gap between customer demand for products that advance animal welfare and the supply of those products on the market. (Harper & Henson, 2001). In fact, meat producers are familiar with the acceptable expenses associated with providing traditional products. Therefore, the demand-supply gap is clearly attributed to the higher costs associated with providing animal-friendly products, and so businesses are less inclined to invest in them (Taylor, 2006). To clarify this point, to market premium, animal-friendly products, the supply chain must be properly segmented, differentiated, and traceable, which is usually more costly than a marketing chain that ignores product origins, processes, and provenance. When striving to enhance animal welfare conditions in the supply chain, it is critical to address the assumption that brands and speciality niches are minor in the meat market and that price competition is dominant, especially in countries with limited resources. It is critically more difficult for businesses to differentiate their products and develop demand for animal welfare-friendly products in such a competitive meat industry (Koene, I., & van Zanten, B, 2014). Similarly, while firms must charge higher prices for animal welfare-friendly items to meet their production costs, they cannot do so since customers may be less willing to pay more for them. While advocating for animal welfare standards in the supply chain is compelling, it is not practical for all enterprises to comply because of cost restrictions (Rhoades, 2004). However, recent research suggests that the capacity of the supply chain to deliver animal welfare products is improving, which is provided and proved in two main points below:

- First, supply chains are constantly evolving and adapting to changing conditions. Consumer surveys have found that their willingness to recognize and pay for food quality and differentiation, including animal welfare, has significantly improved. Research has shown that relatively few people seem to think that the animal welfare situation is getting worse, but the majority think that things are getting better.

Market trends confirm that more people today than in the past are willing to pay the necessary premium for improved (or at least differentiated) quality., and there is no compelling reason to believe that these trends will not continue (Eurobarometer., 2007).

- Second, an increasing number of companies and organisations have started to make more effort toward further improving coordination and operations. The EU project (ECONWELFARE, 2011) has identified and researched a varying number of initiatives across the EU that demonstrate both the ability of at least parts of the supply chain to ensure improved animal welfare and the ability and willingness to engage in public-private partnerships and collaborations to further improve animal welfare conditions across the demand-supply chain. This has included initiatives such as the creation of certification systems for animal welfare standards, as well as the provision of technical help and training to farmers and decision-makers. These operations have proved the potential for both economic and animal welfare gains, as well as the value of collaboration among many stakeholders. As previously said, the establishment of standards and certification systems provides a potential platform for additional conversation, public awareness, and collaboration, ultimately leading to improved animal welfare across the supply chain (Taylor, 2006).

In terms of animal welfare, the willingness of customers to pay more for ‘better’ meat products, as well as the supportiveness of certain partnerships, are all clear signs that the supply chain’s capacity to produce sufficient quality goods for animal welfare standards is growing. Despite the progress made, there is still more that can be done to ensure animal welfare. A major unresolved issue is an apparent disconnect between public aspirations and ambitions for animal welfare improvements and their willingness to pay for such improvements (GlobalAnimalPartnership., 2013). In order for the supply chain to stay profitable, businesses must not only continue to engage in programs that enhance animal welfare circumstances but also attract customers to continue to pay for animal welfare goods. Only through ongoing commitment and engagement on the part of both enterprises and consumers can the supply chain’s potential to produce animal welfare goods be fully realized.

1.7.2.2. The Citizen/Consumer Gap

As societies become richer and more informed, more welfare-friendly product lines and chains are proliferating, and a growing number of scientific consumer willingness-to-pay (WTP) studies. These appear to represent a significant premium available for enhanced wellness products, including a premium for animal welfare (Harvey, 2003). However, the general belief remains that citizens vote for better animal welfare far more than they are willing to pay as consumers. Harvey claimed that the voice of the citizen advocating for animal welfare improvements should take precedence over the consumer's willingness to pay, which is driven by self-interest. Animal welfare is generally viewed as a public good and as a result, it is often argued that governments should be held accountable (Singh, 2018). While governments can establish and enforce policies and laws to promote and preserve animal welfare, people can make conscientious buying decisions that affect animal welfare. For instance, vegetarians and vegans influence the market by refusing to buy animal products, lowering the number of animals needed to fulfil demand regardless of the animal welfare level. Therefore, individual and governmental initiatives can both contribute to the overall enhancement of animal welfare when conducted together (Osuji, 2020).

When it comes to voting, citizens cannot abdicate their moral responsibility by delegating it to the government. Citizens' concerns for animal welfare will be meaningless unless they are ready to take the required steps to assist local suppliers in attaining better standards (Singh, 2018). To elaborate on this issue, people must understand that consumer demand for animal goods governs the entire degree of animal well-being, which is why citizens must take responsibility for the economic costs of expressing their animal welfare preferences. Animal products and their associated well-being are not public goods but rivals for consumption, and individuals must be conscious that solely raising their voices in support of greater animal welfare is not enough. Everyone has a moral duty to consider the well-being of animals when making purchase decisions, and citizens must be ready to take the required support steps to achieve their targets to increase the general level of animal wellbeing (Singh, 2018).

Several studies concurred that consumer expenditure for animal welfare improvements may not always reflect people's preferences or beliefs, since there are four major causes for this gap. These include the lack of reliable information and labels, the effort required to check the available information, the prioritization of other matters that are perceived as more important or urgent and the issue of the general education (Girard, et al., 2015).

Because many labels are untrustworthy and do not give enough information for customers to make an educated choice, this issue may be especially difficult when items are imported from countries with varying standards and laws. Supply chain procedures can be introduced to alleviate this issue, as long as the increased returns justify the expense. However, delivering trustworthy information is a public good, which means that it benefits all consumers. As a result, the government has a role to play in providing and supporting information resources, such as third-party verification of labelling and marketing claims, research and development, and distribution of best practices (FAO, 2019).

Despite meat providers' efforts to promote animal welfare, customers still require great effort to read labels, and the providers' efforts are insufficient to make animal welfare a priority for humans (World Animal Protection, 2020). As a result, many customers may be unwilling to check the labels before making an informed selection. To assist with this, measures such as giving clear instructions, clearer language, and faster access to information might be used to make reading labels easier and more pleasant.

Many consumers may prioritize other issues over animal welfare, such as food security, climate change, and poverty. Even though there are numerous opinion surveys and choice experiments on this topic, they primarily focus on the issue of animal welfare without considering other factors that can impact people's lives and livelihoods. As a result, although the numbers might show that citizens have a basic knowledge of animal welfare, they have a limited understanding of how to form their thoughts and preferences and how those might change in reaction to shifting circumstances. (World

Animal Protection, 2020). There should be a more public discourse on the importance of animal welfare and its effects, particularly on the global economy.

By educating people about animal welfare, they may become more aware of the issue and therefore be more likely to care about it and take steps to support higher animal welfare standards. However, despite increasing education and awareness, there may still be a critical difference between citizens' actions to support animal welfare and the choices they make as consumers, especially between their votes and their WTP for animal welfare-friendly products. To clarify this point, this is because it is an inherent part of human behaviour and not necessarily a sign of market or regulatory failure. To help address this problem, there could be more initiatives, such as public campaigns and educational programs, to raise awareness of animal welfare issues and the benefits of supporting higher animal welfare standards (World Animal Protection, 2020).

1.8. Conclusion

In conclusion, animal welfare is a complicated and diverse subject. In order to be applied in farming productions, this term requires a comprehensive strategy considering the Five Freedoms, global norms, ethical concerns, economic variables, and welfare analyses. It is significant to guarantee compliance with applicable rules, devise proper breeding and production techniques, evaluate appropriate management procedures, handle overcrowding and space restrictions, and raise societal and media awareness to solve animal welfare concerns successfully. Governments should also use a range of welfare assessments to ensure that animals receive the best possible care. Last, and most importantly, while considering animal welfare, related stakeholders, especially researchers, should consider an economic viewpoint since market circumstances and supply chains may substantially influence animal welfare. The following chapter will go deeper into these distinctive subjects and present a more in-depth examination of current research and its practical implications for the pig farming business.

CHAPTER II: ANIMAL WELFARE IN THE PORK PRODUCTION

2.1. Chapter 2 Overview

Pork production plays a vital role in the international economy in general and in the local agriculture of every single country. Therefore, all the related stakeholders should prioritize the most prominent market when they discuss applying animal welfare concepts to farming production. Exploring the two-sided connection between animal welfare and pork production is necessary to understand the application. Firstly, this chapter delves into various aspects of animal welfare specific to the pork industry, from production practices to supply chain considerations. Secondly, the problems of pork production related to animal welfare, such as disease management, housing systems, and breeding practices, and their impacts on animal welfare, will be discussed in depth. Lastly, and most importantly, by combining both perspectives, this chapter discovers some alternative assessments and policies that are efficient and practical to maintain animal welfare in pork production.

2.2. Pork Farming

Pork farming is an essential source of income for many individuals and businesses. It provides jobs to farmers, processors, and other pork industry workers, making it a significant employer in the agricultural sector. For instance, farmers raise and care for pigs and workers in the pork industry, such as processors, truck drivers, and meat cutters. These jobs provide employment and income for individuals and families and support the growth and development of related industries such as feed production, transportation, and equipment manufacturing (USDA, 2016). Therefore, the pork industry is a significant contributor to the local and national economies, generating billions of dollars in revenues each year. In the United States, it is estimated that the pork industry accounts for more than \$20 billion annually, an enormous number that proves the importance of this industry to the national economy (American Meat Institute, 2021).

Pork farming is also essential in providing a consistent source of food for many people across the world. According to the United Nations Food and Agriculture Organization, worldwide pig meat output in 2018 was 112.6 million metric tons, accounting for 38.3% of total global meat production (FAO, 2018.). Being considered one of the most crucial food supplies, pork is, hence, considered a staple in many diets by providing essential nutrients and proteins to people of all ages. The pork business, via cultivation, processing, and distribution of pork products, plays a vital role in supplying customers' demand and providing a sustainable food source for people. This is why hog farming is essential for the economy and food security, and nourishment of many people worldwide, leading to the importance of applying animal welfare standards to it. (National-Pork-Board, 2022).

2.3. Pork Production

2.3.1. Production Cycle

Pork production is a straightforward process, but every step inside it requires a thorough examination. To clarify this point, the cycle of pork production contains four key steps: breeding, feeding, housing, transport and slaughter.

Breeding techniques may be used to promote animal welfare by selecting features that improve the health and well-being of the animals in order to reach a higher welfare standard for pigs. Genetic selection and artificial insemination are two significant strategies used in animal breeding because they provide several advantages compared to traditional breeding methods. While the genetic selection is used to identify animals with desirable traits, artificial insemination enables breeders to create litter of piglets with those traits without the animals being physically near to one another. Actually, pork producers frequently mix the two procedures, allowing breeders to create animals with certain desired qualities more quickly and efficiently while conserving population genetic variety (Hui, 2003).

The current cycle of pork breeding starts with selecting a boar (male pig) and a sow (female pig) with desirable features, including fast development, lean meat content, and

disease resistance. While the boar is frequently picked for desired traits, the sow is chosen for general health and reproductive capabilities to assure the quality and number of piglets. Once the boar and sow have been selected, the breeding process begins with choosing the optimal breeding method (ThePigSite, 2021). Based on the specific breeding goals and the resources available, the breeding process can be done whether in a controlled breeding program or a more intensive system. A controlled breeding program is a type of breeding in which boars and sows are brought together for a set amount of time, usually a few days, to allow mating. This method gives breeders more control over the breeding process since they can carefully choose the boars and sows to be brought together and closely monitor the breeding process to guarantee that the sows are pregnant. On the other hand, an intensive approach requires keeping the boar with the sows in a group-housing arrangement, where the boar has access to numerous sows at once; this method is more efficient but less predictable (ThePigSite, 2021).

The sow will carry the piglets for around three months after fertilization until giving birth. Typically, piglets are weaned from their mothers 2-3 weeks after birth. The piglets are then raised until they are prepared for the market, which naturally occurs between 6 and 8 months old. They are fed and taken care of throughout this time to ensure they reach the ideal weight and quality for sale. After that, the mating procedure is repeated to create a new litter of piglets with improved genetic traits. This repetition is to maintain the population's quality and keep enhancing the animals' health and welfare (Gonyou, 2019).

As well as breeding, feeding is an important phase in pork production that has a direct influence on pig welfare. In other words, it takes a suitable system of health management practices to promote the physical and psychological health of animals, because improper practices can lead to starvation, sickness, and low welfare for pigs (Goulet, 2014). To clarify this point, feeding is the primary way to provide vital nutrients to animals, and the type and quantity of food offered can have a direct impact on their health and welfare. Inadequate diets can lead to malnutrition, which can cause various health problems, including growth and development disorders, reproductive concerns, and even mortality. On the other hand, supplying the proper sort and amount of food can promote healthy growth and development and provide the essential energy

for animals to engage in natural behaviours (worldanimalprotection, 2020). Additionally, health management is also essential for animal welfare since it entails providing the proper environment, avoiding sickness, and treating illnesses. Poor health management can lead to disease transmission, which can be fatal to animals. Conversely, adequate health management may help keep animals healthy while decreasing disease outbreaks. Likewise, frequent health checks can assist in identifying any health issues, which can then be handled promptly.

In short, both feeding and health management are critical for animal well-being since they are essential parts of animal welfare. Because these two aspects are interrelated, they must be appropriately monitored and handled in tandem to maintain the general well-being of the animals (OIE, 2017). Another factor should be cared about is the housing systems, together with feeding and health management, play a key part in the whole pig production cycle. The housing system utilized for animals, as well as environmental management approaches, can have a substantial influence on their welfare (Bronsvort & de Jong, I. C., 2005).

To illustrate this step, housing in pork production refers to the structures and systems used to contain and care for pigs. This includes the design, construction and maintenance of the housing itself, as well as the methods used to provide enough space, appropriate ventilation, and suitable materials for animals to rest and perform their natural behaviours. An appropriate housing system can provide a safe, comfortable and secure environment for animals, while an unsuitable system may cause distress, injury or even death. For example, animals living in overcrowded or poorly ventilated conditions can suffer from heat stress, while animals in barren housing can become bored and frustrated. Similarly, animals in poorly designed or maintained housing systems can experience physical injury or disease (RSPCA, 2021). Environmental management procedures are necessary since the conditions in which animals are kept inside, such as the temperature, humidity, air quality, light, and noise levels, may significantly affect their welfare. Animals can experience critical discomfort and anguish if the environment is excessively hot, too cold, too humid, or too dry. Furthermore, poor air quality can induce respiratory problems, and extreme noise levels

might cause hearing damage. As a result, appropriate environmental management is vital to ensure the environment is safe for animals (NC3RS, 2021).

Finally, housing and environmental management are crucial in determining animal welfare. People responsible for animal care should consider the significance of these factors; consequently, they must ensure that housing systems and environmental management procedures are adequate and routinely examined to sustain animal wellbeing (RSPCA, 2021). In the context of pork production, transport refers to the movement of pigs from their farm of origin to the slaughterhouse. During the transport of animals, there are numerous challenges and problems that workers may face. Overcrowding, inadequate access to food and water, improper handling and inadequate stunning are their major transport-related issues (National Hog Farmer, 2019). Due to the fact that pigs are often moved over long distances and handled in an inhumane manner, poorly designed transport can cause great suffering to the animals.

Firstly, when animals are transported in congested situations with little ventilation, they might get stressed and exhausted. The animals may not have enough space to move freely and may be too close to one another, disrupting their social order, increasing competition for resources, causing physical stress and pain, and leading to boredom and discontent (FAWC., 2021). Secondly, animals transported over long distances may be deprived of food and water, resulting in dehydration and starvation. Dehydrated and malnourished may develop a variety of health issues for animals, including reduced immune systems, lower fertility, and greater susceptibility to illness (thepoultrysite, 2017). Lastly, when relocated and handled improperly, animals may experience physical and psychological discomfort. Improper handling can cause cuts, bruises, and broken bones. Additionally, it can cause mental stress, reducing productivity and increasing the risk of sickness (WorldAnimalProtection, 2020).

In terms of pork production, slaughter refers to the killing of pigs for their meat. During the slaughter process, there are a variety of matters that workers may face. These issues are mainly related to including improper or inefficient slaughter methods, especially inadequate stunning, inadequate bleeding, and the use of inappropriate equipment. Because of the lack of proper technology and technique, the slaughter

process itself can also cause critical suffering to the animals (HSI, 2020). Initially, stunning is an essential part of the slaughter process, as it renders the animal unconscious before slaughter. Improper stunning can lead to the animal remaining conscious and experiencing extreme pain and distress during the slaughter process. This can be due to the use of inappropriate equipment, incorrect stunning techniques, or inadequate stunning time. As a result, the use of inappropriate equipment may result in the animal not being adequately stunned, while wrong tactics and insufficient stunning time may result in the animal staying conscious during the slaughter process (HSI, 2020).

In addition, insufficient bleeding may result in a delayed death since the animal may take longer to bleed out. Furthermore, if the animal is moved or mishandled during the slaughter, this may cause further insufficient bleeding and extreme discomfort and lengthen the dying process (Animals-Australia, 2020). Finally, the use of inappropriate equipment in the slaughter process can lead to a number of welfare and food safety concerns. During the bleeding process, if the equipment used is not sharp or not properly kept in good condition, it can result in incomplete bleeding. This happens when the animal's brain and heart are still not inactive, which later causes the animal to suffer a prolonged death (Animal Welfare Institute, 2020). Consequently, if the equipment is not cleaned and maintained correctly, it may become infected with bacteria, viruses, or other harmful germs. As a result, the danger of cross-contamination and food safety issues increases, potentially leading to disease transmission. Eventually, faulty meat production equipment might lead to people purchasing infected meat (National Cattlemen's Beef Association., 2015)

In conclusion, the transport and slaughter of pigs are the final steps of pork production, and they all have critical impacts on animal welfare. However, the inefficient and inhumane handling methods and the shortage of proper techniques and technology have caused serious problems in pigs' slaughter. The pork industry, hence, should invest in developing handling methods and related technology, as well as the training of personnel in proper animal welfare practices Governments must also establish strict restrictions and standards for the transport and killing of pigs to guarantee that their welfare is protected throughout the pork production process.

Furthermore, further scientific research should be conducted to better understand the impact of distinctive animal handling practices and technology on animal wellbeing (Rajabipour, 2020).

2.3.2. Pork Production Supply Chain

The supply chain contains four key players: Producers, Processors, Retailers, and Regulators. All these key players have a vital contribution to the supply chain of pork production, with each target and impact of them on the interconnected improvement of animal welfare will be discussed below.

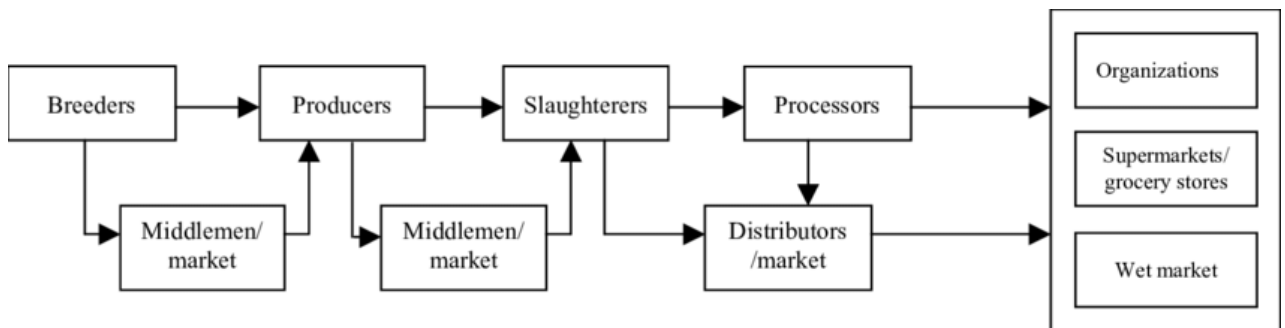


Figure 4. Flowchart of Pork Supply Chain (Wang, H. et al., 2017)

Producers are responsible for raising and breeding pigs in a way that assures their welfare and the quality of the pork they produce as the beginning point of the pork supply chain. By providing the pigs with proper housing, feed, advanced health care, and following regulations (especially proper disposal of manure and safety practices) set by regulators, producers have to ensure that the pigs are treated humanely, and that the final product is safe and of high-quality (Pork Checkoff, 2020).

Processors play an important part in the pork supply chain and the environment since they are in charge of humanely treating, slaughtering, and processing the pigs. They must guarantee that the animals are handled humanely throughout the whole process, beginning with transportation to the slaughterhouse and ending with the actual slaughter. Also, they must ensure that the waste created during the slaughter and processing of the pigs is disposed of in an ecologically responsible way in order to avoid contamination and reduce the negative impact on the environment. Therefore,

taking into account specific guidelines and regulations regarding sanitation, hygiene, and inspection of facilities, equipment, and personnel can assist processors in ensuring the pork they produce is safe, of high quality for consumers, and produced in a manner that is environmentally friendly and protective of animals (National Pork Board, 2018).

Retailers must ensure that the pork they offer is safe, of good quality, and produced in a way that preserves animal welfare. Indeed, being the final link in the pork supply chain, retailers have a close relationship with all other essential stakeholders in this chain. To clarify this point, since strict restrictions bind them, retailers are responsible for ensuring that the pork they sell is correctly labelled, stored, and uncontaminated by other foods. They also have a mission to choose products from producers and processors that uphold higher animal welfare standards and to provide customers with information about those products' origins. This information includes the welfare and environmental standards of the production process and any certifications that may apply for a general improvement of animal welfare in the pork production (TheGuardian., 2020).

Regulators are in charge of developing and implementing regulations and norms that protect animal welfare in the pig sector. Their operations have a significant influence on all other essential participants in the pork supply chain, because farmers, processors, and retailers are required by regulators to obey all regulations and recommendations. Regulators are responsible for ensuring that their rules have practical advantages to pig production by understanding their implications (ThePigSite, 2021). First, they should set standards for the treatment and care of animals on farms, during transport, slaughter, and processing, and guidelines for the disposal of animal waste and manure, as well as for the use of drugs and other substances in animal feed. These regulations aim to protect animals' welfare throughout the supply chain and ensure that they are treated humanely. Second, regulators assure pork safety and quality by establishing standards and norms for checking facilities, tools, and workers. They imply these restrictions to guarantee that the pork is healthy and satisfies the required criteria. Finally, they should examine farms, processing factories, and retail operations on a regular basis to verify that standards are followed, and animals are handled properly (TAMU, 2020). This would allow authorities to hold farmers, processors, and retailers

accountable for animal welfare and to levy penalties and fines on those who break the standards, acting as a disincentive to non-compliance.

Throughout the supply chain of pork production, there are several matters arise at each step, requiring each key player to find solutions. This part will discuss three major challenges that critically affect society (Miles, A., et al., 2013), relating:

- Traceability
- Food safety
- Consumer demand

Animal welfare traceability is critical for ensuring that animals in the food supply chain are appropriately treated and their well-being is preserved throughout the manufacturing process. Animal welfare traceability difficulties include providing precise and transparent tracking of animals along the supply chain, from farm to plate. Due to the complexity of the supply chain and the absence of consistency in traceability systems, this might be problematic. Animals can transit into numerous phases of production and processing, with multiple individuals participating in each stage, making reliable tracking impossible. Because of this complexity, it can be difficult for farmers, processors, and retailers to know where their animals originate and how they are handled. Additionally, there is no global standard for animal welfare traceability, and different countries and regions may have their own systems in place. This lack of standardization can make it difficult for stakeholders in the supply chain to understand and comply with different traceability requirements (Nguyen & Janssen, M. , 2020). According to a report by the Food and Agriculture Organization of the United Nations (FAO), only 29% of countries have a traceability system in place for animal welfare. This low percentage proves that many countries are not prioritizing animal welfare in their supply chain, leading to a critical lack of effort in implementing traceability in pork production. Hence, implementing and maintaining effective traceability in animal welfare is such a complex task that requires cooperation and coordination among all stakeholders in the supply chain, as well as the support of regulators and standard-setting bodies from every nation (FAO, 2020).

Food safety and animal welfare are interconnected issues, as poor animal welfare can lead to an increased risk of disease and food safety hazards. To clarify this point, food safety challenges in relation to animal welfare include the potential for disease outbreaks in intensive farming systems and the use of antibiotics in animal feed, both of which can lead to poor animal welfare (worldanimalprotection, 2020).

The confinement and control of numerous animals is part of intensive farming practices, sometimes known as factory farming. These procedures aim to increase efficiency and productivity; however, they may harm animal care and food safety. One of the primary issues with intensive farming methods is that they can severely influence animal welfare by limiting the ability to participate in natural behaviours and exposing them to stressful settings, which can lead to poor health and greater susceptibility to zoonotic illnesses. As a result, because diseases may easily move from animal to animal in intensive farming systems, the proximity of animals might encourage disease spread (worldanimalprotection, 2017). To clarify this point, zoonotic diseases are diseases that can be transmitted from animals to humans, and they can pose a significant public health risk. This is particularly harmful to society since research has shown that several zoonotic illnesses, such as swine flu, avian flu, and E. coli infections, may spread from animals in intensive agricultural systems to people. According to the World Health Organization, animal illnesses account for 60% of all human diseases and 75% of all new infectious diseases. Therefore, a consistent and comprehensive set of animal welfare standards that promote animal health and well-being and biosecurity measures that restrict pathogen transmission must be applied to lower the risk of disease outbreaks in intensive farming systems (WHO, 2019).

Antibiotic use in pig feed refers to adding antibiotics to feed to improve growth and prevent or treat illnesses. While antibiotics are commonly used in pig feed to prevent illness outbreaks in intensive farming systems, recent overuse has resulted in the development of antibiotic-resistant bacteria that can be transferred to humans via the food chain. When bacteria are exposed to antibiotics over time, they can develop resistance mechanisms, making them more challenging to treat when they infect humans. Because the enormous number of animals in intensive farming systems increases the chance of disease outbreaks, personnel in pig production frequently rush

to abuse antibiotics as their only answer to prevent and treat these infections (Prakash & Thilakarathna, 2020). This matter might result in the critical consumption of pig-meat outputs having an overly high percentage of antibiotics, contributing to the growth of antibiotic-resistant microorganisms. According to the WHO, antibiotic resistance is one of today's most severe dangers to global health, food security, and development. It makes it difficult to cure infections and increases healthcare expenditures and productivity loss. As a result, all stakeholders in the food sector must work together to guarantee the responsible and sensible use of antimicrobial agents, including antibiotics, in animal husbandry, particularly in hog production (WHO, 2018).

Consumer demand for pig goods refers to the desire for pig-derived products such as pork, bacon, ham, and other pig-derived products to be produced humanely and sustainably. To clarify this point, consumers often want to know that workers in pork production handled the pigs used in these items humanely and that the manufacturing process was ecologically sustainable. In reality, consumer demand for humane and sustainable animal products is growing as more people become aware of the harmful effects of intensive farming practices on animal welfare and the environment. However, satisfying this demand will be difficult (TheConversation, 2018).

One of the most significant issues is that customers may lack appropriate information about the animal welfare standards of the items they buy. This might make it difficult for customers to make educated purchasing decisions and identify things produced humanely and sustainably. Another issue is that merchants and processors may lack dependable and transparent methods of sourcing products from producers who adhere to higher animal welfare standards. This can make it difficult for merchants and processors to meet customer demand for humane and sustainable animal products, as they may need a sufficient supply (National Agricultural Library, 2022). According to research published by the World Society for the Protection of Animals (WSPA), just 20% of customers are ready to pay more for items from better welfare farms. This implies that while consumer interest in humane and sustainable animal products is growing, there is still a gap between consumer demand and product availability. In fact, many customers might be unaware of animal welfare's benefits and added value in the food items they eat and might be unwilling to pay extra for such goods (WSPA, 2020).

To address these issues, it is essential to increase consumer education and understanding about animal welfare and the environmental effect of animal agriculture, as well as increase transparency and traceability in the food supply chain so that consumers may make educated purchasing decisions. Furthermore, regulators should fulfil a need for strict laws and certifications that guarantee animal welfare standards; this may assist in expanding the availability of humane and sustainable animal products and make it more straightforward for merchants and processors to find these goods (World Animal Foundation, 2020).

2.4. Welfare Issues with Gestation Crates for Pregnant Sows

After the discussions above, throughout the process of pork farming and pork production, there are diverse challenges and issues arise in terms of animal welfare. Although solutions have been made, problems are still not completely solved, and research even discovers more of them. One of the massive problems to the pigs' breeding and housing is the wide usage of gestation crates for pregnant sows, which will be explored in the sections below.

2.4.1. Gestation Crates

Gestation crates are small enclosures used to house pregnant sows in the pork industry. They are typically made of metal bars and measure approximately two feet wide and seven feet long, with slatted floors and feeders. The sows can barely turn around in the crate and cannot walk or engage in any natural behaviour, such as rooting or socializing with other sows. The idea behind using gestation crates is to maximize efficiency in the production of pork by controlling the sow's environment and ensuring that she is fed and observed regularly (CIWF, 2020).

In the past, the pork industry has used gestation crates since the 1970s, when the technology was first developed. Since then, the crates have become a standard practice in pork production, with up to 90% of sows in the United States being kept in individual gestation crates during their pregnancy. In other words, the use of gestation crates has become a standard practice in the pork industry for more than 40 years. Proponents of

gestation crates argue that the practice is necessary for maintaining a healthy, disease-free herd and for controlling the sow's environment to ensure she is receiving the proper nutrition (Kestin, 2013).

On the other hand, animal welfare organizations recently have opposed the usage of gestation crates, claiming that the procedure is harsh and inhumane. Because the containers are so tiny, the sows can't stand or turn around, and they can't engage in any regular activity. Furthermore, the crates might be unpleasant for the sows, especially during the hot summer months. As a result, many animal welfare advocates call for the banning of gestation crates in favour of more humane options (Humane Society, 2020).

Despite the controversies surrounding gestation cages, they are still widely used in the pork business. Crates are a practical approach to regulating the surroundings of the sow, and they help farmers to maximize productivity and profit. However, if public opinion shifts against gestation cages, pork producers may be forced to re-evaluate their use (Mckinley, 2019).

2.4.2. Concerns about the Gestation Crates for Pregnant Sows

As previously said, for several reasons, many animal welfare organizations urge the removal of gestation cages in favour of more humane alternatives. In fact, in terms of the Gestation Crates for Pregnant Sows, research has shown five main aspects of animal welfare that should be carefully considered about: physical health concerns, mental health and behavioural concern, stereotypies, unresponsiveness and aggression (Langhout, 2009). These aspects will be discussed in five parts below.

2.4.2.1. Physical Health Concerns

The usage of gestation crates is highly controversial, as there are numerous physical health concerns associated with their use when pigs are being kept in a confined space for the duration of pregnancy (Hughes, 2007).

The first issue is a lack of room and movement, which leads to muscular atrophy, joint difficulties, and lameness. Pigs are naturally active creatures, and when confined to a tiny cage, such as a gestation crate, they cannot roam around and stretch their

muscles like they would in the wild. Muscular atrophy, or the slow weakening and withering away of muscle tissue, can result from a lack of activity. Because the muscles cannot effectively support the joints, the animal may develop joint issues such as arthritis. As a result of the weakening muscles and joints, a lack of activity might make the animal more prone to injury (Jones & Johnson, C.J., 2018).

The second issue is that gestation crates restrict pigs' capacity to engage in natural behaviours. Pigs, being naturally curious and gregarious creatures, require the ability to express their impulses to have a healthy and happy existence. Nesting and foraging, which are biological activities, are necessary for the animal to do this because they engage their thoughts and allow them to investigate their surroundings. When pigs are placed into gestation crates, these activities are no longer available. The animal may get dissatisfied and anxious, resulting in additional physical and psychological problems. A lack of excitement can also cause the animal to get bored, leading to increased aggressive behaviour, further endangering the animal's health (Appleby & Lawrence, A.B., 2004).

The final concern is the greater risk of injury due to confinement. Injury risk rises when an animal is confined to a small space, like a gestation crate. Inside it, pigs cannot move freely and might bump into sharp objects or the carton's sides. Pigs may have cuts and scrapes due to congested conditions, which can lead to illnesses. Additionally, confinement-related stress and worry can result in physical health issues like digestive problems, a weakened immune system, and high blood pressure (Gomis & M'Sihiry, J., 2017).

2.4.2.2. Mental Health and Behavioural Concerns

The first concern is that gestation crates can lead to reduced social interaction between pigs. Pigs are highly social animals in the wild and enjoy being around other pigs; however, in gestation crates, sows are isolated from one another, unable to engage in normal social activities. Since pigs' reliance on social interaction for emotional and physical stimulation is not satisfied, this separation can lead to frustration and boredom, harming the animal's well-being. Furthermore, the inability to engage in normal social

activities can lead to increased stress levels, leading to abnormal behaviours such as stereotypies (HSI, 2020).

The second issue is that gestation boxes might reduce cognitive stimulation in pigs. When animals are placed in gestation cages, they cannot participate in normal behaviours because of environmental restraints, which stop them from developing intellectually. This is due to the animal not receiving the mental stimulation required to keep it interested and active. Without cerebral stimulation, the animal may lose interest in its surroundings and activities, resulting in indifference and low energy levels. This can worsen the animal's quality of life by causing boredom, frustration, and a loss in cognitive stimulation (Leonard & Brown, J.L., 2019).

Regarding animal welfare concerns about gestation crates, mental and behavioural issues are most prominent. To clarify this point, besides suffering health problems, pigs have to suffer such a high level of stress and discomfort from this kind of environment that it also causes further related matters on the animal, leading to a critical decrease in the animal's quality of life (Williams, 2020).

2.4.2.3. Stereotypies

Stereotypies are repetitive behaviours common in animals, especially agricultural animals maintained in small areas. Pacing, head-weaving, bar-biting, and chewing are examples of these behaviours (Mendl, 2009). Stereotypes are a symptom of low well-being and can be created by a lack of environmental enrichment in the animal's habitat.

Confinement can be particularly damaging for sows kept in gestation crates during their pregnancies as the animals cannot express natural behaviours due to the lack of space and physical and mental stimulation. This can lead to the development of sows' stereotypies as they cannot perform natural behaviours and interact with their environment. In restrictive environments, stereotypies can help pass the time and ease boredom, making it easier for the animal to cope. However, further concerns related to stereotypies in pigs include the potential for the development of physical health issues and psychological distress (Mendl, 2009).

Stereotypies can cause physical damage to the animal if the behaviour is repetitive and vigorous, leading to the development of skin lesions or abrasions. The animal might also experience muscle fatigue and joint pain, as well as difficulty maintaining an upright posture. In addition, besides extreme physical pain, pigs might be more susceptible to bacterial and viral infections due to their weakened immune system caused by the development of stereotypies (Zawistowski, S.L. & Houpt, K.A., 1995).

Stereotypies can similarly cause psychological discomfort in animals because of their inability to engage in normal behaviours and a lack of excitement. Boredom, dissatisfaction, and sadness might result, as well as anxiety and an inability to cope with their surroundings. The animal may also lose food due to the psychological pain linked with stereotypies since they may be bored or irritated with their surroundings. Furthermore, when pigs cannot connect with their surroundings because of confinement and a lack of stimulation, this might severely impact their welfare (Reenen, 2019).

2.4.2.4. Unresponsiveness

Unresponsiveness is a behaviour displayed by animals that are often associated with poor welfare. In the case of sows, restrictive confinement in a gestation crate can lead to unresponsiveness due to the lack of stimulation and the inability of the sow to perform natural behaviours, further resulting in unresponsiveness (de Passillé & Weary, D. M. , 2007). Unresponsiveness can lead to various negative physical and psychological impacts on the sow, such as increased stress levels, decreased muscle tone and diminished social interaction.

Physically, a lack of physical activity in the gestation box can cause muscular weakness and weariness in the sow. As the muscles are not engaged, and the swine cannot move, this might increase the chance of injury due to a lack of activity. Furthermore, the absence of air circulation in the gestation crate might raise the risk of respiratory difficulties. This is especially troublesome in the summer when the temperature within the box can rise to dangerous levels, and the sow cannot escape to a more peaceful location (Van Soest & Lewis, E.A. , 2011).

Psychologically, unresponsiveness can increase stress levels due to the lack of stimulation and social interaction. This can lead to increased aggression, as the sow cannot express themselves or interact with other sows. Additionally, the lack of physical activity can lead to increased lethargy and impair the sow's ability to learn and remember, harming their well-being. This can lead to even further bodily and psychological issues, such as increased aggression and decreased muscle tone (Derecka, 2018).

2.4.2.5. Aggression

Confining sows in gestation crates can lead to increased aggression in sows, severely affecting their welfare and the safety of human handlers. This is because sows cannot perform their natural behaviours, such as socialising, foraging, and nesting, leading to frustration and aggression towards other animals and humans (Johnson, 2019).

According to studies, studies show that cows kept in gestation crates exhibit much higher aggressiveness than those housed in open pens, such as tail biting, ear biting, mounting, or pushing. This is because sows cannot flee from other sows or people, resulting in greater hostility. Furthermore, the boxes' close confinement causes greater tension, which might even boost the charge (Mamo, 2013).

Sows in gestation crates cannot escape from other sows or people, resulting in heightened hostility among individuals. This can significantly affect their welfare since they are more prone to sustain physical injuries due to violent encounters with other sows. These injuries can vary from tiny cuts to major ulcers, causing the sows agony and suffering. Furthermore, the psychological stress and dissatisfaction that sows suffer due to confinement might contribute to increased aggressiveness since they cannot fulfil their natural behaviours and socialize freely (Johnson, 2019).

When sows are confined in gestation crates, they may become aggressive toward humans if they are provoked or feel threatened. This can lead to the potential of severe injuries or even fatalities for human handlers. The aggression may also be exacerbated by the fact that handlers cannot protect themselves from the aggressive sows, leading to increased psychological stress. The lack of space in the crates can ultimately limit the

handlers' ability to move away from the aggressive sows. In addition to the physical danger posed by the aggression, handlers may also experience psychological stress due to the increased levels of aggression, particularly inexperienced workers against this danger (Brown, 2012).

2.5. Higher welfare alternative to gestation crates

Overall, substantial concerns about several elements of animal care make the use of gestation crates very contentious. While these crates may be required for certain forms of farming, pork producers must consider the animal welfare effects. They must examine alternate housing options to allow more areas for the animals to move about to ensure the animals' welfare.

2.5.1. Better housing system

There has been a growing recognition in recent years of the significance of providing improved housing systems for pigs to ensure their welfare and quality of life. As a result, the advantages of modern technology combined with a variety of alternative housing systems, such as group housing and free-farrowing systems, have been designed and used in real life (Wolf, 2011).

Pigs in group housing systems have a considerably bigger room than in typical gestation boxes, allowing them to wander about and engage in natural behaviours. In other words, compared to a standard gestation box, this enables the pigs to have more space to move and engage in natural behaviours and more social interaction between individuals. Wolf (2011), for example, compared the welfare of pigs in group housing versus gestation cages, discovering that the pigs in group housing had lower mortality rates, better physical health, higher levels of activity, and a lower frequency of tail biting (Wolf, 2011). Furthermore, Koop (2017) discovered that pigs in group housing systems had superior overall well-being results with lower stress levels. Overall, group housing systems result in improved physical health and behaviour, with studies showing that pigs in group housing systems have a lower mortality rate, better physical health and higher levels of activity (Koop, 2017).

Like group housing systems, free-farrowing systems provide pigs with more space to move around and engage in natural behaviours, compared to a traditional gestation crate. The usage of this type of housing is also becoming increasingly common since it can provide a number of welfare benefits for sows. Jansen (2013), for example, compared the welfare results of sows in free-farrowing systems to those in gestation cages, discovering that sows in free-farrowing systems had better welfare outcomes in terms of mortality rates, physical health, and behavioural markers (Jansen, 2013). Furthermore, de Jong (2015) discovered that sows in free-farrowing systems were less likely to display indications of stress, indicating a better welfare result than those in gestation crates. In short, these studies demonstrate the potential benefits of free-farrowing systems in terms of improved welfare outcomes for sows (de Jong, 2015).

In addition to these alternate housing methods, researchers are investigating the use of new technology to improve pig housing circumstances. The use of sensors and automated systems to monitor the environment and the health of the pigs, as well as computerized feeders and other equipment to diminish the need for human interaction, is part of this. Sensors, for example, can be used to monitor environmental factors like temperature and humidity, allowing for quick and accurate responses to changes in the environment. Furthermore, pork producers might employ automated technology to monitor the health of the pigs, with data collected and used to diagnose health issues quickly and precisely. Automatic feeders can also reduce the amount of human intervention required during feeding. Simultaneously, automated cleaning systems and other technologies can minimize the personnel necessary to maintain them. Overall, the implementation of new technologies and alternative housing systems has the potential to improve the welfare and quality of life of pigs (de Jong, 2015).

2.5.2. The Five Freedom: Pig

The Farm Animal Welfare Council created the Five Freedoms for Pigs, a set of welfare guidelines that specify the essential needs that must be satisfied for pigs to enjoy a life free of physical and mental pain. As previously stated, this encompasses freedom from hunger and thirst, discomfort, pain, injury, or sickness, the ability to exhibit normal behaviour, and freedom from fear and anguish (FAWC, 2020). Pork producers should

note that meeting these pig welfare requirements necessitates deploying superior housing systems. In other words, housing systems must provide appropriate room and resources, such as food and water, while ensuring pigs' psychological welfare.

2.5.2.1. Freedom from Hunger and Thirst

Adequate rooms and feeding stations are required to ensure that pigs do not go hungry or thirsty. Pigs are inherently competitive creatures, and when food and water are few, there is a risk of resource rivalry. To avoid this risk, housing should allow pigs enough area to walk about and conveniently obtain food and water. Workers can build automated feeding and watering systems since they are an excellent way to ensure that pigs have constant access to food and water (PurdueUniversity, 2020). These systems may be designed to administer food and water at regular times, as well as to monitor feed and water consumption. This can assist in preventing pigs from being dehydrated or malnourished due to resource competition. Automated systems are particularly advantageous since they may be used to monitor pig health, as changes in feeding and drinking patterns might indicate illness. Furthermore, workers can utilize these systems to nourish pigs by dispensing food and water in various areas to stimulate curiosity and foraging activities. Thus, automated systems provide a quick and practical method for ensuring that pigs are not hungry or thirsty (PurdueUniversity, 2020).

Pig dietary requirements have also been researched, as has the influence of housing on feeding behaviour. For example, Arnoldo (2018) observed that pigs housed in enriched environments with access to straw bedding and objects to examine displayed a broader range of feeding habits than those housed in sterile settings (Arnoldo, 2018). Another study discovered that pigs raised in enriched environments grow quicker and use less feed (Hurnik, n.d.). In summary, investigations on pig nutritional needs and the influence of housing on eating behaviour have demonstrated that enhanced habitats with availability to natural or natural-like materials as objects to examine can raise pig growth and feed efficiency.

2.5.2.2. Freedom from Discomfort

Bedding and insulation are critical components of providing pigs with a pleasant and stress-free living environment. Bedding materials like straw may operate as an insulating layer, keeping the pigs warm and reducing moisture levels (Zawistowski, 2010). Straw, for example, is an excellent bedding material because it absorbs moisture and acts as a barrier between the pigs and their chilly concrete floors. Furthermore, straw keeps the pigs happy by providing a more natural surface for them to rest on. In addition, it's crucial to maintain the right temperature and humidity to prevent the pigs from being exposed to extremes, which can lead to stress and even sickness in the animals. Environmental management systems have been invented to enhance housing conditions since research has demonstrated that temperature and humidity substantially influence pigs' well-being (Zawistowski, 2010).

Environmental control systems can improve pig housing conditions and provide a comfortable atmosphere for the animals. To maintain pigs' mental health, workers in pork production must assess the environment's temperature and humidity often (Russel, 2016). If the temperature or humidity is too low or too high, pigs may get agitated and ill. For example, if the temperature falls below 10°C, the pigs will suffer from cold stress, which can critically impact their health. Environmental control technologies play an important role in housing systems by ensuring that the environment is kept at an acceptable temperature and humidity. For instance, it is possible to regulate the temperature and humidity using air conditioning and ventilation systems, while air circulation may be improved by using fans. Additionally, lighting systems can help maintain a comfortable environment while providing the pigs with a proper amount of light. Together, these devices may give the pigs a secure and wholesome habitat (Russel, 2016).

2.5.2.3. Freedom from Pain, Injury, or Disease

Providing suitable shelter to assure freedom from discomfort, damage, or sickness should not be understated. To avoid accidents, respiratory issues, and illness, it is crucial to completely maintain a safe and comfortable environment for animals. In fact, injury-prevention flooring can considerably minimize the risk of physical health

problems in pigs. Slatted flooring (made of narrow slats or bars) or rubber flooring (made of rubber mats or sheets) can provide a more solid and comfortable surface for pigs to walk on, avoiding accidents from slips and falls. However, while these types of flooring can help reduce accidents, they must also be well-maintained and sanitary, as well as not too slippery or rough, to ensure that the pigs are comfortable and safe (National-Hog-Farmer, 2021).

Disease control and biosecurity measures are essential in providing animals with a safe and comfortable environment by preventing respiratory difficulties and sickness. Disease management refers to the steps taken to maintain animals healthily and avoid spreading infection. Vaccination, parasite control, and other preventative measures can significantly lower the likelihood of disease outbreaks. Vaccination, in reality, has been used for decades to help the immune system identify and respond to prospective infections, which can significantly lower the danger of large epidemics (NCBAHW, 2020). On the other hand, biosecurity measures are implemented to prevent disease entry from outside sources. Quarantine techniques, cleaning and disinfection processes, and visitation controls can all be used to accomplish this. These precautions are necessary to safeguard the herd against illnesses that farmers may introduce from outside sources, such as other farms or visitors (OIE, 2021).

2.5.2.4. Freedom to Express Normal Behaviour

Animals in captivity should be given enough room and environmental stimulation to allow them to display their natural behaviours. Research has been performed to understand better the effects of housing on social behaviour, particularly the consequences of group dwelling. According to studies, animals placed in bigger groups display more social behaviours and have better overall psychological health than those housed alone. Group living also minimizes the prevalence of aberrant behaviours induced by boredom or stress, such as pacing and self-mutilation (Wielebnowski & Novak, M.A., 1999).

Every stakeholder in pork production must create new management strategies to provide animals the best opportunity to display their natural behaviours (HSI, 2018).

Enrichment activities, such as giving animals foraging opportunities or toys to play with, can be used to stimulate natural behaviours. Allowing animals to explore their surroundings and interact with other animals is also helpful. Furthermore, providing animals with a pleasant environment devoid of stresses such as loud noises or excessive handling might reduce aberrant behaviours. For instance, rooting and foraging are essential for many animals, and these actions can be unrestricted for pigs with enough space and supplies (Sneddon, 2003).

2.5.2.5. Freedom from Fear and Distress

Pigs should be provided with appropriate conditions of the environment to avoid any mental disorders. Initially, providing proper lighting, including natural light, is essential for the welfare of pigs. Natural light helps regulate the pig's circadian rhythm and reduce stress. If the area is too dark, the pig cannot distinguish between night and day and can become stressed. Workers should use proper artificial lighting in pig housing to ensure that the pigs have enough light 24 hours a day. The light should also be adjustable to account for seasonal changes in the day length (AIWC, 2020). Similarly, soundproofing the pig housing is an important aspect of pig welfare. Loud noises can cause distress in pigs, as they have sensitive hearing. Soundproofing the housing can reduce noise pollution and help to reduce the stress of the pigs. Workers should soundproof the walls and ceiling with sound-absorbing materials to help reduce noise levels. Additionally, the ventilation system should be designed to reduce noise levels and to help distribute the sound evenly throughout the space (Agriculture and AgriFood Canada, 2020).

Regular monitoring and management procedures should be conducted for promoting the humane treatment of pigs and preventing any further abusive activity (HSI, 2020). Firstly, training farm workers on proper handling and management practices can help to reduce stress and prevent abusive behaviour towards pigs. For example, training should include handling pigs with care, recognizing signs of distress, and using positive reinforcement techniques, as well as proper confinement, housing, and sanitation. Secondly, animal welfare guidelines and frequent audits can guarantee that animals are handled decently and prevent harmful practices. Requirements should,

for example, encompass healthy eating, shelter, and hygiene, and workers should perform audits to guarantee that the standards are followed. Finally, regular monitoring and assessment of pigs' behaviour and physiology can help to detect signs of distress and prevent abusive practices. For instance, signs of distress can include skin lesions, weight loss, or other changes in the behaviour (HSI, 2020).

2.6. The movement to crate-free production

The use of crates in commercial farming operations has been a source of controversy due to concerns about animal welfare and ethical considerations. This affects every single part of the stakeholders in pork production, from scientists to regulators and especially workers in pork production. The recent situation requires their collaboration to find a radical solution which can effectively change traditional pork production to a more humane one. This part discusses on the actions of each key stakeholder to solve this issue.

2.6.1. The scientists

Scientists have a significant contribution to a more animal welfare-friendly development of pork production, with numerous inventions, techniques, and technologies to different related aspects, in particular pigs' housing. Because cages may inflict physical and psychological harm to animals, scientists have performed research to develop alternative housing solutions that give a greater quality of life and lower stress levels. "Group housing" and "free-range systems" are two examples of alternative animal housing systems in commercial farming operations intended to increase animal welfare and decrease ethical problems (Guo, et al., 2017). While both systems show numerous benefits to the animals' health and natural habitat, they have distinctive drawbacks that pork producers should carefully consider before using them. For instance, group housing increases the risk of disease transmission and requires more space and resources to accommodate a larger group of animals. On the other hand, free-range systems expose pigs to predation, disease, and unfavourable weather. As a result, alternative housing systems must be devised and refined until they can guarantee that

they are useable, financially practicable, and consistently safe for animals (Esslemont, 2014).

2.6.2. Public policy change

The push toward crate-free production is driven by scientific study and changes in public policy. Local, state, and federal governments have all implemented rules and regulations prohibiting the use of crates in commercial farming operations. These rules and regulations should include prohibitions on using crates, mandates for alternate housing systems, and consequences for noncompliance. Overall, new rules and regulations can substantially influence the sector, including economic costs for farmers to comply, shifting consumer tastes and industry standards, and potential legal ramifications for noncompliance (European-Commission, 2018).

Prominent stakeholders related to this are consumer pressure and advocacy groups. They have played a role in pushing for public policy change on using crates in commercial farming. These groups may use various strategies to raise awareness, such as social media campaigns, petitions, and letter-writing campaigns, to pressure policymakers and industry leaders to make changes. Recently, the current state of laws and regulations strongly emphasizes the use of crates in commercial farming operations across different countries and regions, as well as the impact of those policies on the industry and animal welfare. As the movement towards crate-free production continues to gain momentum, regulators will likely pass more laws and regulations. As previously said, consumer pressure and advocacy will continue to play a role in shaping public policy (HSI, 2020).

2.6.3. Industrial change

Along with scientists and regulators, the movement towards crate-free production also involves changes in the commercial farming industry. As laws and regulations change and consumer demand for crate-free products increases, commercial farming operations are starting to implement crate-free systems. This can include transitioning to group housing or free-range systems and developing new and innovative housing systems that meet the requirements of the law and consumer preferences. Before

achieving this, pork producers must afford the costs associated with transitioning to new techniques, such as building new facilities and purchasing new equipment, as well as potential changes in consumer demand and prices for crate-free products. Despite these challenges, implementing crate-free systems can positively impact animal welfare, food safety, and the industry (OIE, 2019).

Scientists and researchers greatly assist in finding an efficient housing system and an ecological one. In addition, research on the current state of the industry regarding the implementation of crate-free systems and the animal welfare impact of these changes. For instance, a study by the University of Bristol in 2020 surveying pork producers in the UK found that most of them had already made changes towards crate-free systems, reporting benefits in terms of animal welfare, and being motivated by consumer demand and concerns about animal welfare. As the movement towards crate-free production continues to gain momentum, more commercial farming operations will likely implement crate-free systems in the future. Additionally, scientists and pork producers may develop new technologies and innovations to improve these systems' economic viability and animal welfare (University-of-Bristol, 2020).

2.7. Conclusion

To summarize, gestation cages for pregnant sows have been widely employed in the pig production sector, and several welfare concerns are related to them. Among them are physical health issues, mental health and behavioural issues, stereotypies, unresponsiveness, and hostility. However, there is a push toward crate-free production driven by scientific research, public policy reforms, and industry developments. The business must innovate from gestation crates and toward improved animal welfare alternatives, such as updated housing systems that fulfil the needs of the animals. Solving the problems would increase animal welfare while also lowering the cost of gestational cages. Therefore, the pig farming business must address this issue promptly to guarantee that animal welfare is prioritized.

CHAPTER III: Vietnam National Agriculture, Livestock Production and Welfare for Pregnant Sows in Vietnam.

3.1. Chapter 3 Overview

In this chapter, I will explore the subject of farm animal welfare in Vietnam, concentrating on the well-being of pregnant sows. Building on the last chapter's discussion of animal welfare, I will evaluate the status of agricultural and livestock production in Vietnam and the obstacles that pregnant sows confront in these settings. Through specific examples and data analysis, I will argue for the necessity to enhance the welfare of pregnant sows in Vietnam using specific instances and data analysis to secure their health and welfare.

3.2. Vietnam – An overview of National Agriculture

Vietnam, as a medium-sized country and the world's 15th most populous country with a population of 98.5 million, has experienced tremendous economic and social transformations since the mid-1980s. With about two-thirds of this population living in rural areas, agriculture has long played a crucial role in the country's economy. Since the mid-1980s, long-term economic reforms have transformed the economy into open markets for trade and investment. This has led to rapid economic growth, transforming Vietnam from once experiencing hunger yet its per capita food availability to ranks among the top tier of middle-income countries. In fact, this economic growth has contributed to a significant reduction in poverty rates and other improvements in social outcomes, especially in rural areas (Fforde, 2013). To elaborate on this, this part will be divided into smaller ones for an in-depth examination of the growth of Vietnam's agriculture sector throughout history to offer a complete overview of this industry.

3.3. History of Agriculture in Vietnam

3.3.1. Pre-colonial Era

Vietnam's pre-colonial agricultural history was entrenched in tradition and intricately linked to the country's rich cultural legacy. Farmers depended on time-honoured

practices passed down from generation to generation to cultivate the land and provide for their families and communities throughout this period (Schut, 2014). Firstly, oxen ploughing was an important cultural tradition in Vietnam, as families often used the same oxen and tools for generations, passing down the knowledge and technique from one generation to the next. This tradition was a source of pride and solidarity among communities and was an essential part of Vietnamese identity. Secondly, in pre-colonial Vietnam, using natural resources to provide additional food sources, such as firewood, fishing, and hunting, was an essential traditional agricultural technique. This provided enough food for families and communities to exist and maintain their ancient lifestyles (Schut, 2014).

Traditional agricultural techniques played a significant role in providing food for families and communities in pre-colonial Vietnam. These techniques, while primitive by today's standards, were highly effective in ensuring the survival of the people. For example, according to a study by Tran et al. (2020), oxen ploughing increased yields by 35% compared to manual labour. This finding highlighted the importance of oxen ploughing in pre-colonial Vietnam. It enabled farmers to cultivate land more quickly and effectively, resulting in higher yields and a more reliable food source for families and communities (Tran & Nguyen, H. T., 2020). Furthermore, according to Nguyen and Le (2019), fishing and hunting contributed approximately 30% of the total dietary energy for families and communities in pre-colonial Vietnam. The significance of these ancient farming practices in supplying enough food supplies for pre-colonial tribes, allowing them to maintain their traditional lifestyles, was stressed in this study (Le & Nguyen, H. T., 2019). In short, farmers used natural resources and traditional methods such as oxen ploughing allowing for a more diverse range of food sources and helping increase productivity, thus ensuring that the entire community had access to the food they needed.

3.3.2. Colonial Era

Agricultural productivity in Vietnam increased significantly throughout the Colonial Era, mainly due to the modern irrigation systems' adoption. Dams, canals, and more effective irrigation systems were among the sophisticated irrigation technologies

developed during Vietnam's Colonial Era. In the meantime, in fact, the construction of dams, canals, and more extensive irrigation systems was a massive endeavour with many precise aspects to consider. The Gia Lam Dam, erected on the Red River between 1885 and 1889, was one major project. This dam was built to manage floods and provide irrigation for about 4,000 hectares of land, increasing the amount of land accessible for cultivation dramatically. The Thuy Cam and Thuy Nguyet canals, constructed between 1887 and 1904, also increased agricultural productivity by supplying irrigation to nearly 5,000 hectares of land (Hartmann, 2008). These initiatives permitted more effective water distribution which improved soil fertility, and especially an introduction of new farming practices like ploughing, pruning and fertilizing, which increased crop yields even more. Because of the variables mentioned above, relevant World Bank statistics revealed that overall food production in Vietnam rose by an average of 5.2 per cent each year between 1960 and 1975 (World Bank, 2019).

The colonial era in Vietnam witnessed significant changes in agricultural technology and food provision. While sophisticated irrigation systems and farming practices increased output, they also substantially influenced conventional ways that pre-colonial farmers had utilized for generations. As a result of the displacement of these traditional techniques, food provision for families and communities that had previously relied on these methods to support themselves has decreased. These old techniques took local circumstances and ecosystems into account, and their replacement with foreign technologies led to less food being produced. The problem was even aggravated further by colonial policies that promoted exporting cash crops over the needs of the local populace. This resulted in a food crisis and decreased food security, especially for rural and underprivileged groups. These activities emphasize the significance of a sustainable and regionally tailored approach to agricultural development rather than colonists imposing one-size-fits-all solutions (Pham, 2020).

3.3.3. Post-Independence Era

Vietnam's agricultural environment changed dramatically after independence, thanks to the arrival of automated equipment like tractors, harvesters, and threshers. Increased mechanization transformed agricultural output speed and substantially influenced the

labour force and conventional farming methods. The advent of automated equipment in particular, lowered the demand for labour while simultaneously bringing more efficient and productive farming techniques. Furthermore, the source of machinery and chemical inputs supplanted more traditional agricultural approaches such as human labour and natural fertilizers. The general use of mechanization in Vietnam's agriculture after independence, hence, significantly influenced the labour force and traditional agricultural practices (Nguyen, 2015).

In the years after independence, Vietnam underwent a significant change toward agro industry, with the growth of larger industrial farms, a move toward cash crops, and an increase in agriculture focused on exports. During this transition period, large-scale farmers produced various products for internal and foreign markets, including rice, coffee, rubber, tea, and pepper. This decision significantly impacted small-scale farmers and rural communities since they now had to compete with larger farms and their access to more sophisticated technologies. Various government policies and initiatives, thus, have been established to assist small-scale farmers and rural communities to adjust to the changing agricultural environment, including loan and subsidy programs from the colonial era (The World Bank, 2017).

Agriculture in Vietnam changed dramatically after independence, with advances in irrigation and water management, new seed types and plant breeding techniques, and the widespread use of pesticides, fertilizers, and other chemical inputs. These technical improvements significantly impacted the agricultural environment, with subsurface irrigation, for example, helping to enhance water efficiency and crop production. On the other hand, pesticides, fertilizers, and other chemical inputs negatively impact the environment and agricultural sustainability, resulting in soil and water pollution and animal welfare degradation. To address these concerns, the government implemented various rules and regulations to safeguard animal welfare throughout the post-independence period (Hang, 2004).

In conclusion, after national independence, Vietnam's agricultural sector adopted contemporary farming practices, which had a complex and multidimensional impact on animal welfare. According to the passage's further explanation, using pesticides,

fertilizers, and other chemical inputs has had both positive and negative effects on the ecosystem and the long-term viability of agriculture. The shift has also impacted small-scale farmers and rural communities due to agro-industrialization since they cannot compete with larger farms and their access to more advanced technologies for animal welfare-friendly standards. Therefore, it is crucial to assess how these changes would affect Vietnam's agricultural sector, particularly the well-being of pregnant sows (Nguyen, 2018).

3.3.4. The current state of Agriculture in Vietnam

The agricultural sector in Vietnam is a major contributor to the country's economic growth, with its share of the gross domestic product (GDP) increasing in recent years. Research has shown that the agricultural sector contributes 17% to the growth of gross domestic product (GDP) in 2016, with a total agricultural output of 37.7 billion USD, a slight decrease of 2.3% compared to 2016. Despite a considerable reduction in agricultural output, agriculture nevertheless remains a fundamental source of economic growth with a stable annual growth (Anon., 2017).

Vietnam's agricultural sector has undergone significant structural changes over the past decades, most notably the shift from conventional to intensive farming techniques, a critically more productive agricultural approach. Vietnam's agriculture business has witnessed economic development regarding the increased production of these items for sale on global markets, enhancing farmer incomes. Although the relative importance of agriculture in the economy has declined over time, it remains as an important sector, as previously said, with a great contribution of 14% to Vietnam's GDP and employing 37% of the labour force (O'Reilly, 2022).

However, Vietnam's agricultural output, production and export performance are more impressive than progress in efficiency, farmer welfare and product quality. Despite remarkable advances in these aspects, the agricultural industry still has a long way to go, particularly in terms of efficiency and animal welfare. In fact, the major usage of intensive farming techniques in Vietnam is a serious problem for animal welfare. According to a recent poll performed by the Food and Agriculture

Organization of the United Nations (FAO), over 40% of respondents were concerned about the safety of the food they consume. The majority of participants expressed worry about the usage of pesticides and additives, as well as intensive farming. This serves as a reminder that much work must be done in Vietnam to maintain a sustainable and responsible agriculture business. (FAO, 2018).

Along with the problem that domestic concerns about food safety are on the rise, the present status of agriculture in Vietnam is also at a critical juncture. With a critical rise of the labour cost index from 3.2 to 4.6 over three years (World Bank, 2016-2019), this impedes this sector's ability to compete globally as a low-cost producer of undifferentiated bulk commodities. To keep ahead of the competition, the agriculture industry must develop inventive ways to enhance productivity, efficiency, and product quality while labour costs continue to rise. In this country, there are other several issues are currently affecting both national raw material productivity and the ranking in the international market. These include a lack of adequate infrastructure and a lack of access to modern technology. Therefore, to ensure Vietnam's agricultural sector is competitive in both domestic and international markets, farmers and businesses need to focus on quality, safety, and sustainability in their products (both food and non-food) (Hinh, 2018).

3.4. Animal Welfare in Vietnam

3.4.1. International Collaboration

Animal welfare is used in Vietnamese culture to confer a responsibility to care for animals. Many international corporations and non-governmental organizations (NGOs) are collaborating with Vietnam's livestock and agriculture industry to explore how to improve interactions between humans and farm animals. First, by introducing the concept of "animal welfare" and second, by encouraging farmer activities that lead to better welfare (World Animal Protection, 2020).

The first strategy refers to the effort of the organizations to raise awareness of animal welfare and best practices for caring for animals within the livestock and

agriculture industries, as well as to educate stakeholders about animal welfare. World Animal Protection (WAP) is a major worldwide organization dedicated to improving animal care in Vietnam via education and training. Since 2008, WAP has conducted projects such as “Farm Animal Welfare in Vietnam” to improve animal welfare by teaching farmers, veterinary experts, and other stakeholders about animal welfare best practices. These seminars include essential themes such as correct animal handling, feeding, housing, and necessary veterinarian care and medications. Furthermore, WAP offers farmers technical assistance and support in implementing these best practices on their farms, fostering a more sustainable and ethical approach to animal husbandry (World Animal Protection, 2020).

The second strategy refers to the efforts of organizations to support and incentivize farmers to implement practices and technologies that improve the welfare of animals. Through a number of projects, international organizations like the World Wildlife Fund (WWF) and Open Cages are significantly enhancing animal welfare in Vietnam. They are promoting alternate living arrangements that provide animals more room, access to fresh air, and natural light, such as free-range and organic farming (Open Cages, 2022). Additionally, they provide farmers with access to loans and other types of finance, technical advice for difficulties relating to animal breeding and nutrition, and other financial and technical support. These initiatives seek to aid farmers in raising the well-being of their livestock while also enhancing the profitability and sustainability of their businesses (WWF, 2019).

3.4.2. The current state of Animal Welfare in Vietnam

In Vietnam, various departments within the Ministry of Agriculture and Rural Development (MARD) are primarily responsible for animal issues. For example, the Department of Animal Health deals with rabies and supervises animal husbandry standards. Meanwhile, the Department of Livestock Production is responsible for developing livestock management policies. Furthermore, the Department of Natural Resources and Environment is critical in conserving uncommon or endangered animals. Overall, the MARD in Vietnam is responsible for directing and controlling the actions

of various departments so that animals' welfare and protection are ensured through their actions and functions. (MARD, 2020).

Amidst the MARD in Vietnam, animal welfare is governed by the Law on Animal Health (2015) and the Law on Animal Husbandry (NATIONAL ASSEMBLY, 2018). Both laws prohibit animal cruelty, and the Law on Animal Health (National Assembly, 2015) imposes a duty of care on animal owners. Vietnam has laws that provide additional protections for some species or for certain animal welfare issues, aiming to protect animals from cruelty and neglect. Specifically, pet owners are held accountable for ensuring their animals' well-being as stated in the Law on Animal Health. It also sets guidelines for breeding, raising, transporting, and slaughtering animals and prohibits any form of animal abuse. In summary, the Vietnamese legal system is crafted to uphold animal welfare and defend animals from cruelty and neglect, holding owners accountable for their animal's welfare (MARD, 2020).

Vietnam's animal welfare law is characterized by prioritizing human health and consumption. This has led to a decline in domestic animal protection. Even though livestock are protected from "ill-treatment", there are no details as to what ill-treatment is, and no additional policies or regulations governing the care, rearing, transportation, and slaughter of different species. To clarify this point, the lack of clear definitions and supplementary rules has adversely led to a decline in domestic animal protection. In addition, specific actions such as insufficient enforcement of existing laws and the absence of comprehensive policies have contributed to this deteriorating decline in the animal welfare (Nguyen, 2017).

In fact, there are serious animal welfare problems in Vietnam for all three groups of animals: domestic animals, farm animals and wild animals. Part of the three groups of animals is abused, and not guaranteed the minimum standard of living necessary to maintain their natural instincts. As an example, the practice of raising ducks in small, overcrowded cages, documented by organizations such as Humane Society International (HSI) and World Animal Protection (WAP), is a significant welfare issue (HSI & WAP, 2019-2020). Another practical example is that there are still festivals where animals are brutally slaughtered for sacrifice. The lack of regulations governing

the care, rearing, transportation, and slaughter of different species has led to livestock abuse during these processes going unchecked. A survey by Animals Australia revealed that only 2 out of 13 slaughterhouses surveyed in northern and central Vietnam meet Australia's animal welfare standards. The survey provides a glimpse into the dire state of animal welfare in Vietnam, where most of the surveyed slaughterhouses fall short of meeting even the minimal standards set by one of the countries known for its strict animal welfare laws (National Reporting Team, 2016).

3.5. Animal Protection Index (API)

3.5.1. The Definition of API

Animal welfare is an essential subject, and it is each country's obligation to safeguard it. First published in 2014 and compiled by World Animal Protection, an international animal rights group, the Animal Protection Index (API) ranks the world's 50 countries according to their commitment to animal welfare laws and policies. The Animal Welfare Index gave each country an overall score based on many factors of animal care. These scores are grouped into rating bands, with A representing the highest score and G indicating countries with the highest potential for improvement. The API is such a dynamic tool that authorized national regulators and WAP may update it regularly to reflect the most recent breakthroughs in animal welfare. By comparing the most recent results with those from previous iterations, one may learn about the evolution of this field. The API uses a stringent methodology when determining each nation's score, considering factors such as wildlife conservation, animal security, and animal care laws. Each criterion is examined and scored based on the degree to which it has been satisfied; the country's final score is the sum of these individual scores. As a result of this rigorous methodology, the API appropriately represents each country's level of animal welfare security.

3.5.2. Opportunities in the performance of Animal welfare in Vietnam

Since the publication of the first API, Vietnam has issued two new sets of laws to govern animal welfare. Specifically, the Law on Animal Health (2015) and the Law on Animal Husbandry (2018) are two Vietnamese laws aiming to improve animal welfare

standards. With the intention of benefiting humans, the Law on Animal Health (2015) is focused more on animal health for the benefit of humans. This law rules regarding animal disease prevention, veterinary treatment, and animal quarantine. On the other side, the Law on Animal Husbandry (2018) aims to ensure higher productivity through improved livestock production for the benefit of consumers. Indeed, this law requires adopting humane breeding, animal husbandry, transport methods, and proper care and housing (OIE, 2015).

The requirements of these laws are typically in accord with worldwide standards for animal care. The Law on Animal Health mandates the World Organization for Animal Health's core guidelines for animal care (2015). This includes animal handling and treatment standards, rules for utilizing animals in scientific research, and requirements for appropriate animal housing and care. Furthermore, the act compels veterinarians to follow standards governing animal quarantine, veterinary treatment, and animal transportation (vanbanchinhphu, 2015).

Additionally, the Law on Animal Husbandry (2018) in Vietnam ensures the welfare of animals through adherence to international guidelines set forth by the World Organisation for Animal Health and the Convention on the Protection of Animals Used for Food and Agriculture. These guidelines include provisions for humane breeding practices, proper care, housing, and ethical transport methods. This law mandates compliance with these guidelines and guarantees that animal welfare is considered and that regulations are implemented to protect animals in Vietnam (NATIONAL ASSEMBLY, 2018).

In this way, these laws ensure that animal welfare is taken into consideration and that necessary regulations are implemented to protect animals in Vietnam (FAO, 2018).

3.5.3. Challenges in the performance of Animal welfare in Vietnam

Despite being among the most biodiverse countries in the world, Vietnam sadly has an abysmal score for animal protection. The latest Animal Protection Index (API) 2020 reveals that the nation earned a dismal score of 0.8 out of 10, ranking it among the lowest in the world. This score is significantly lower than the global average of 4.2 and

is classified as an “F,” indicating a severe lack of animal protection. Vietnam’s farm animal protection legislation also achieved a “G” rating, suggesting a very inadequate level of animal welfare (World Animal Protection, 2020). The API is determined using criteria such as the strength of animal protection legislation, enforcement of animal welfare policies, and animal-related research and development. In fact, it shows that most countries fail to adequately protect animals, with Vietnam being one of the worst offenders. This is concerning, given the country’s variety and abundance of animal species. Thus, more must be done to safeguard the nation’s wildlife (World Animal Protection, 2020).

Recently introduced farmed animal welfare legislation is not aligned with international standards, is limited in scope, and is focused almost exclusively on productivity and human health issues. For instance, the proposed legislation in Vietnam does not observe the Five Freedoms, commonly accepted as essential for animal welfare. These Freedoms include freedom from hunger and thirst, discomfort, pain, injury, and disease, freedom to express normal behaviour, and freedom from fear and distress. Instead, the legislation’s primary focus is on the safety and quality of the food products and the human health benefits, with scant regard for animal welfare. Additionally, research has highlighted the restricted scope of the legislation, which does not provide safeguards for animals in areas such as transport, slaughter, and housing. This is disquieting as it implies that animals are subjected to more significant risks and suffering than would be tolerable under international standards. This proof reinforces the contention that the recent farm animal welfare legislation introduced in Vietnam is inadequate compared to international standards and mainly focused on productivity and human health issues (World Animal Protection, 2021).

3.6. The pork production

3.6.1. Vietnam’s Pork Market in a Global Context

On the one hand, Vietnam has one of the largest pork markets in the world, which is not surprising given that the country is among the world’s largest pork producers and consumers. More specifically, it is the second largest pork producer in Asia, after

China and the seventh in the world (FAPRI, 2014). This is further highlighted by its high per capita pork consumption, surpassing Southeast Asia and the global average. This can be attributed to pork's integral role in the Vietnamese diet and a plentiful supply of pig farms, many of which families own, keeping production costs low. It is evident that the pork industry in Vietnam is well-established and holds a significant presence in both domestic consumption and international exports, highlighting the country's dependence on pork as a primary food source (FAO, 2020).

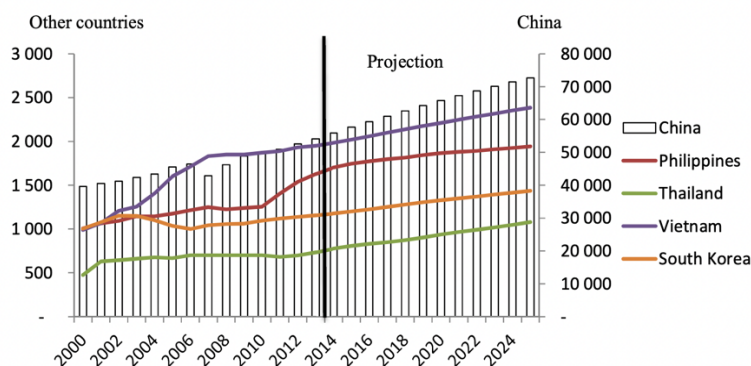


Figure 5. Chart of Pig production in 5 Asian countries ('000 metric tons). Source: (FAPRI, 2014)

On the other hand, in recent years, the pork market in Vietnam has had to deal with adverse situations such as the outbreak of African swine fever or the Covid-19 pandemic (Kesavan, 2020). Thousands of pigs have died due to the development of African swine fever, a highly infectious viral illness. This has resulted in supply chain interruptions and a rise in pork product prices. Furthermore, the Covid-19 outbreak has hit the Vietnamese pork industry hard, with import restrictions, restaurant closures, and a reduction in domestic consumer demand all leading to a dip in pork output and sales (Kesavan, 2020).

In response to the country's issues, the Vietnamese government has taken various steps to mitigate the consequences for the public and the economy. Offering loans to farmers and groups damaged by the outbreak, expanding investments in the pork business, and giving financial assistance to rural producers are all examples of this. A tracking system has also been deployed to monitor pork prices and identify potential

market concerns. These steps are taken to maintain market stability and long-term food security (Hang, 2020).

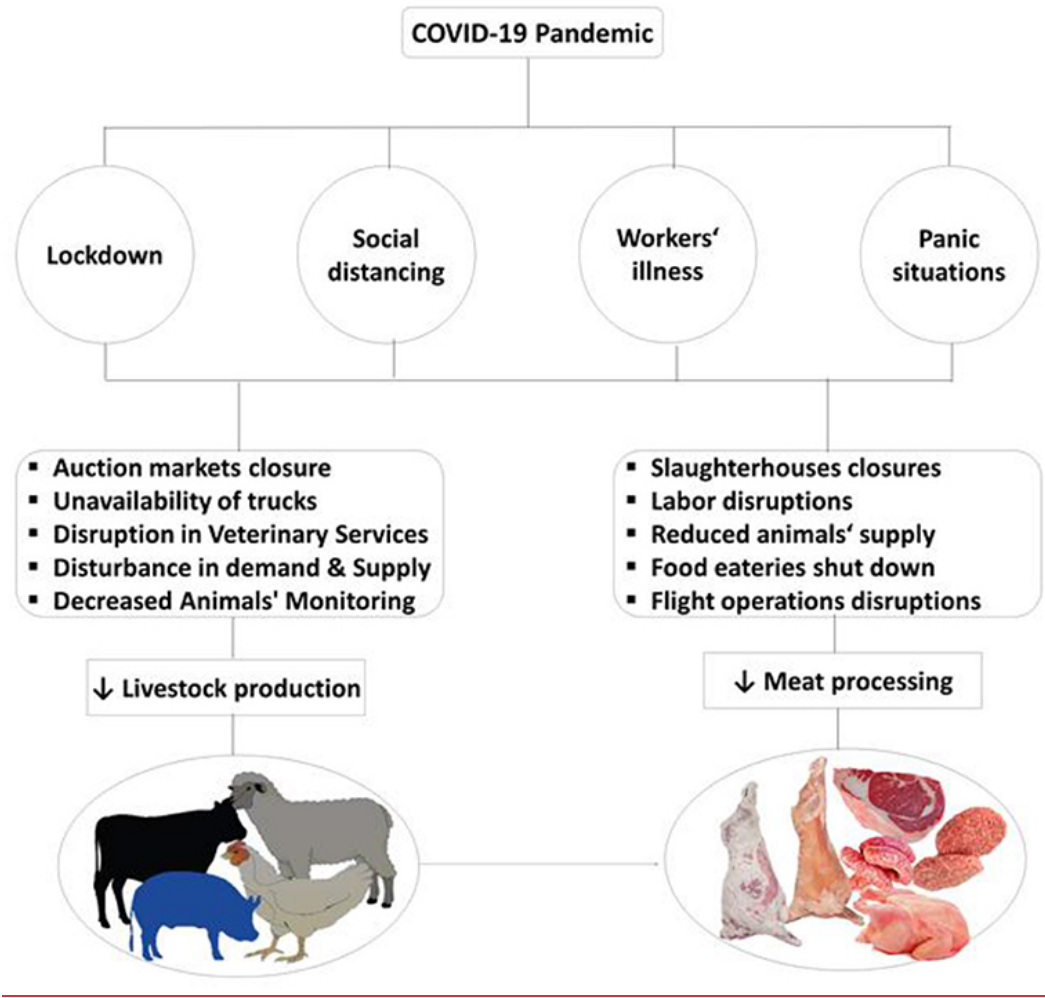


Figure 6. Meat Production and Supply Chain Under COVID-19 Scenario. Source: (Muawuz Ijaz, 2021)

Most researchers agree that the pork market in Vietnam is likely to expand, particularly with the nation’s growing population and persistent demand for pork (FAO, 2020). Nevertheless, the sector needs to stay alert and take early steps to counter potential disease outbreaks. The Vietnamese government should likewise take a proactive role to guarantee the pork industry’s competitiveness and that it can meet consumer needs. To protect the market’s stability, all stakeholders ought to be conscious of the potential challenges and work determinedly to bring solutions. The

pork industry in Vietnam has a promising future, though it is crucial to remember that the path ahead is challenging (NCBI, 2017).

3.6.2. The role of pork production in Vietnam

Pigs have been traditionally raised in Vietnam for a long time and are raised throughout the country, but mainly in the Red River Delta and Northeast and they have become one of the symbols of Vietnamese culture. So far, pig production plays an important role in livestock production as pork production now occupies 75.9% of the total meat production consumed in Vietnam (GENERAL STATISTICS OFFICE OF VIETNAM, 2021). Indeed, the significance of the pork industry in Vietnam cannot be overstated - not only is it a vital source of nourishment and financial stability for numerous households, but it also represents a significant portion of the country's exports. Beyond their economic value, pigs hold a cultural and traditional significance in Vietnam. They are often viewed as symbols of wealth, good fortune, and business success and are celebrated during festivals and ceremonies. Pigs are also employed in traditional medicine, with many body parts believed to possess medicinal properties. This further illustrates pigs' profound impact on both Vietnam's culture and economy (USDA, 2020).

According to a recent report by Fitch Solutions, total meat consumption in Vietnam is expected to increase by more than 25% between 2018-2026. Pig farming provides a food source for Vietnam's growing population and contributes significantly to the country's overall economy. A study has shown that the pork value chain provides livelihood opportunities for the poor (Lapar, 2012). This pointed out that the high and growing demand for pork and consumer preferences present market opportunities for small-scale pork producers in Vietnam. The industry contributes a significant proportion, about 74-80%, of total meat products and generates considerably about 14% of household income. In particular, smallholder farmers produce about 80% of total pig production, highlighting the sector's importance to the country (Nga, 2014). This is a blatant example of how vital the industry is to the nation on an economic and cultural level. To ensure the industry's continued prosperity, however, the industry must resolve present problems with the environment and animal welfare. Pork producers may

integrate sustainable techniques and a comprehensive strategy for pig welfare to achieve this.

In order to meet the large food demand for domestic consumption and export, Vietnam has developed a livestock strategy for the period up to 2020 with the following main objectives:

- Apply the farm method applied to raising animal products.
- Increasing the livestock production rate in agriculture from 32% in 2010 to 42% in 2020.

Various actions have been taken to put the strategy into practice, such as enhancing animal husbandry, controlling animal diseases, and implementing the farm method for raising animal products (MARD, 2010).

The process has had a profound effect on the lives of countless Vietnamese farmers. Data demonstrates that the approach has led to a reduction in the mortality rate of livestock and an enhancement in the production of animal products, thus allowing farmers to augment their income and improve their quality of life. Furthermore, the strategy has improved food availability and nutrition, which has led to improved health across the population as a result. Epidemic risks decreased, food safety improved, and environmental protection are all significant achievements of the strategy (MARD, n.d.).

Overall, the livestock strategy implemented in Vietnam has been successful in meeting its objectives and has had a positive impact on the lives of farmers and society. Nevertheless, based on the livestock development strategy, a big challenge for millions of Vietnamese farmers is how to maintain their livelihood at a sufficient level in the face of many natural and man-made problems of agriculture. Although solutions have been made, there are other serious issues (such as the eradication of animal diseases, food safety and even animal health) that have now been considerably more serious in the situation of the local pork production (Vietnam Livestock Development Strategy, 2007).

3.6.3. Vietnam's Pork Market in a National Context

According to the Economic Research Service of the United States Department of Agriculture (USDA, 2019), Vietnam is the second largest pork producer in Asia after China and the sixth largest pork producer in the world. Products are mainly supplied for domestic demand, and a few are exported to markets such as mainland China and Hong Kong. Along with rapid economic growth and the increasing affluence of the Vietnamese population, demand for pork and other meat has been increasing steadily and at the same time, consumers have become more demanding with respect to the quality and food safety aspects of meat (Humphrey, 2005)

Despite a targeted increase in the number of pigs from 27.1 million in 2011 to 33.1 million in 2015 and 34.7 million in 2020, the potential impacts of economic integration and non-tariff barriers must be taken with caution (MARD, 2020). This is because these factors may affect the actual number of pigs, making the projected increase inaccurate. Furthermore, it is important to note that these numbers are only projections, and the actual number of pigs may not increase in the same way. Additionally, the focus of the breeding strategy is shifting towards specific breeds that have the potential for international trade. The exotic sows are projected to increase by 26.8 % in 2015 and 37.1% of the total number of sows in 2020, meaning that the proportion of crossed breeds and local breeds is still high. Potentially, pork could be exported to China and Hong Kong (FAO, 2015).

No.	Items	2011	2015	2020
1	Total pig population (million heads)	27.1	33.1	34.7
2	Proportion of exotic sows (%)	17.6	26.8	37.1
3	Total sow population (million heads)	4.04	4.83	4.81
4	Number of exotic sows (thousand heads)	730	990	1.390
5	Number of finishing pigs/sow/year	18.5	20.0	21.0
6	Feed conversion ratio (for the intensive farms)	2.8	2.6	2.4
8	Exported pork production (thousand tons)	-	35-36	58-60

Source: Data base of Livestock Production Department LPD-MARD

Figure 7. Table of The oriented indicators for pig production development in the period of 2015-2020 in Vietnam. Source: (LPD-MARD, 2015-2020)

Recently, Vietnam's pork market is currently facing several challenges, including a negative trade balance for pork due to a lack of domestic supply and lower import prices. Despite being a significant exporter of suckling pigs to Hong Kong and Malaysia and live pigs to China, Vietnam relies heavily on imports of both offal and edible pork for food mainly from the US, Canada, Poland, and Denmark to meet domestic demand. This dependence on imports has led to an unstable trade balance for pork in Vietnam, with fluctuations in the difference between the domestic price and the import price (FAO, 2018).

One of the key factors contributing to this instability is the relationship between domestic production and demand, especially demand from the pork and meat processing industries. Integration with regional and global economies and the significant reduction of tariffs on pork, especially under AFTA and ACFTA, could affect Vietnam's pork production. These changes could have a crucial effect on Vietnam's pork production and the viability of small-scale pig farming (FAO, 2018).

As Vietnam continues to integrate with the global economy, it is important to note that the overall direction and impacts of these changes on the national pork market will need to be rigorously assessed to ensure the sustainable growth of the market. This includes a detailed examination of how economic integration and reduced tariffs may shape domestic pork production, as well as the effects on small-scale pig farmers and the pork industry. Additionally, the strict control of imported pork quality can be considered a non-tariff barrier to protect both domestic producers and consumers (MARD, 2016).

In summary, the Vietnamese pork market is currently grappling with various issues, including a negative trade balance and a domestic supply shortage. As the country forges ahead with its integration into regional and global economies, it is imperative to thoroughly examine the effects of reduced tariffs and other economic variables on the nation's pork production, the pork industry, and small-scale pig farmers. Furthermore, national regulators should also consider non-tariff barriers, such as stringent quality control measures on imported pork, to safeguard domestic producers and consumers. A

delicate balancing act that requires a holistic and nuanced approach is needed if the Vietnamese pork market aims to flourish in the face of these challenges (FAO, 2016).

3.6.4. Pig Supply Chain in Vietnam

Pig farming in Vietnam is typical of the agricultural production characteristics of developing countries in that the number of farmers is very large but the production scale is quite small. As the pork industry has grown, the size of household pork production has increased since the mid-1990s (Tisdell, 2008). However, the majority of producers are still smallholders. According to (Tung, 2009), in 2006 there were about 92% of households raised pigs on a scale of 1 to 10 pigs. The rate of households raising more than 10 pigs per year is very low, only 8% (Nga, 2014). The small-scale nature of pig farming in Vietnam poses a distinct set of obstacles for the industry. It is imperative to grasp the intricacies of this sector to address these challenges effectively. Pig production in Vietnam can be classified into 3 main systems (Nguyen, 2017):

- (i) small production with low biosecurity level;
- (ii) small commercial production with minimal bio-security level and with a fish bond.
- (iii) large commercial production, integration with high bio-security level.

There is only a very little number of producers operating under cooperative or group form. Biosecurity is weakly managed in almost pig production systems, except in large commercial farms (Nguyen, 2017).

It's crucial to understand that the three systems of pig production in Vietnam are not mutually exclusive, and there exists a significant degree of overlap between them. Additionally, it's vital to take into consideration the varying levels of efficiency, cost, and profitability of these systems while analysing the pig farming industry in Vietnam (FAO, 2014).

One of the primary obstacles faced by small-scale pig farmers in Vietnam is the inadequate management of biosecurity. Implementing biosecurity measures is essential in controlling the spread of disease and maintaining the well-being of the pigs.

Regrettably, biosecurity is weakly managed in almost all pig production systems, except for large commercial farms (VSSPFA, 2016). This poses a considerable risk to the industry, and measures must be put in place to strengthen biosecurity in small-scale pig farms.

Another challenge for small-scale pig farmers in Vietnam is the limited access to markets. Small-scale farmers often find it challenging to locate buyers for their pigs, making it difficult for them to turn a profit. Addressing this issue is crucial for ensuring the sustainability of small-scale pig farming in Vietnam (VSSPFA, 2016).

Despite these challenges, there are also opportunities for small-scale pig farmers in Vietnam. For instance, there is a growing demand for organic and free-range pork, and small-scale farmers have the potential to meet this demand. Additionally, there is a growing interest in local and sustainable food production, providing an opportunity for small-scale farmers to differentiate themselves in the market (VSSPFA, 2016).

3.7. Problem areas of conventional pregnant sows' pig production in Vietnam regarding animal welfare

3.7.1. Identify issues

Despite growing food safety concerns, the traceability of pigs and pork remains weak. The latest pork recall issued by the Canadian Food Inspection Agency (CFIA) in December 2020 exemplifies Canada's lack of pork traceability. The recall was made because of a possible health risk posed by *Listeria monocytogenes*; however, the CFIA could not determine which farms were involved with the tainted items. This recall highlights the country's weak pig traceability, as consumers often do not know the origin of pork and how the animals were farmed and slaughtered. There are no laws specifically relating to the welfare of animals in captivity, however, the Veterinary Act (2015) and the Animal Breeding Act (2018) may apply to this type of animal (CFIA, 2020).

The purpose of 2012's Circular No. 47/2012/TT-BNNPTNT is to protect the environment and captive animals. This collection of laws provides a foundation for

safeguarding these significant facets of our planet, highlighting the need for preservation and regard for ecosystems and natural habitats. To clarify this point, the circular allows the breeding or use of certain wild species for “possession, exchange, service or any other form of commercial promotion” or “possession, exchange and service specimens of common wild species” serving the purposes of diplomacy, scientific research, exchanges between zoos, non-profit exhibitions, non-profit circus performances; exchange of specimens between agencies of member countries” (CITES, 1973). Despite the potential benefits of Circular No. 47/2012/TT-BNNPTNT, national regulators must thoroughly examine the associated risks to animal welfare. This regulation permits exchanges between zoos, not-for-profit exhibitions, non-profit circus performances, and interactions between member countries’ agencies. Unfortunately, this could mean that wild animals are confined in inadequate or unsuitable enclosures, mistreated, or transported under extreme stress, potentially resulting in harm or death. Therefore, it is essential to assess these risks before any decision is made concerning breeding or using a wild species for commercial promotion (CITES, 1973).

Additional regulations include Chapter II, Article 3, and Clause 2, which refer to the use of means of keeping animals “safe during exploitation, without negative impacts on habitat and environment”. This regulation is paramount to preserving animal welfare in captivity. It demands that any exploitation of animals be done without detriment to their habitat and environment (CBD, 1992). Ensuring this regulation is adhered to helps guarantee that the animals in captivity are treated with respect and that their habitats remain undisturbed and unharmed. Furthermore, Chapter III stipulates that livestock production must “ensure the safety of people and animals in captivity, meet the requirements of the environment, hygiene and disease prevention”. However, as it is up to the people responsible for the animals to ensure that the regulations are followed, there is no indication that social measures are taken into account in these activities (CBD, 1992).

A World Animal Protection Group survey presented a bleak picture of animal welfare in Vietnam, with no legislative framework to safeguard farmed animals (World Animal Protection, 2020). Furthermore, according to a survey by Vietnam’s Ministry of Agriculture and Rural Development, most livestock farms had never heard of the

animal welfare (MARD, 2018). Based on information from statistical sources and the current status of “animal welfare” management in Vietnam, the government and organizations can make a preliminary assessment of progress in preserving the well-being of its farm animals. Although Vietnam is a country with a high proportion of the agricultural sector and a large market with pork consumption ranks first in the world and top in Asia, awareness and guarantee of animal welfare on the farm are very limited. The lack of a legal framework and understanding of animal welfare in Vietnam may indicate a disrespect for animal care, implying that in Vietnam, animal welfare is only to ensure economic benefits rather than because animals suffer (World Animal Protection, 2020).

3.7.2. The relation: Producers and Customers

3.7.2.1. The Producers - The problem in the husbandry system for pregnant sow

Vietnam is home to the world’s fourth-largest poultry herd in Asia. There is an egregious truth that most pork producers in Vietnam keep animals in limited cages and sow stalls (World Bank, 2017). The intensive confinement of these production systems severely damages animal welfare, as they are unable to exercise, straighten their limbs, or engage in many important natural behaviours. A relevant article noted that confinement systems tend to result in louder sounds, stressful encounters, and less social engagement among animals (Andújar-Sánchez, 2016). Due to severe limitations in sterile housing systems, animals might be subject to repeated behaviour, which can lead to a critical experience of prolonged physical and psychological aggression. Indeed, there is a great deal of scientific evidence that farm animals in careful custody feel frustration, distress, and pain. In addition, the IFC’s animal welfare GPN, relating to the Farm Animal Welfare Five Freedoms, explicitly prohibits such containment systems (IFC, 2009).

Pig production in Vietnam is mainly comprised of three systems; they are (Dzung, 2021):

- (i) small-scale householders with a low level of hygiene.
- (ii) small-scale commercial pig producers with minimum hygiene standards.

(iii) large-scale commercial pig producers with high hygienic standards

At present, about 70% of pig heads and 60% of pork products are produced by small-scale householders. The large-scale commercial pig producers with high hygienic standards supplied only about 15% of the total pig products in the market (Dzung, 2021). As the majority of pig products in Vietnam are produced by small-scale householders, it is clear that hygiene and food safety management are still a problem in Vietnam's pig production. The results of a 2018 study conducted by the Institute of Agricultural Science for Southern Vietnam show that a limited proportion of small-scale pig farmers in the country have a fundamental knowledge of biosecurity, hygiene, and food safety management in the pig production process (T.T.T.T., 2018). This highlights that there is still much to be done to improve hygiene and food safety in Vietnam's pig production industry.

Regarding the entire pig farming industry in Vietnam, it appears that small-scale pig farms still account for the largest proportion. According to the data recorded in the 2020 census, the farm size for pig production and its percentage can be ranked at five levels as follows (GENERAL STATISTICS OFFICE , 2020):

- Farms having 1 to 4 pigs occupied 71.63 %
- Farms having 5 to 19 pigs occupied 23.36 %
- Farms having 20 to 49 pigs occupied 3.6 %
- Farms having 50 to 99 pigs occupied 0.85%

The availability of money, resources, modern infrastructure, and technology may influence the scale of pig farms in rural and hilly areas. Local farmers may clarify the problem by looking at the economic climate and the cost of land, labour, and materials (IPPR, 2021). Additionally, it's crucial to investigate how much the lack of infrastructure and technology investment is affecting the size of the farms, as well as to think about the possible repercussions of the current hand-based pig farming system and the potential advantages of implementing automated systems. Furthermore, it is critical to be aware of any assumptions made regarding farm size or the effect of certain elements and to examine these assumptions. Government rules and laws may also have

an impact on farm size. By considering all these elements, regulators may gain a better knowledge of the situation and make informed decisions to enhance the husbandry system for pregnant sows (IPPR, 2021).

Pregnant sows are commonly confined to gestation crates, small cages that typically measure 0.6 m wide by 2.13 m long. Gestation crates restrict normal postural adjustments and are so narrow that they prevent the sow from even turning around. Studies have shown that restriction of movement can lead to a reduction in muscle weight and bone strength (Dormer, 2018). These restricted animals also have been found to have higher basal heart rates, which is linked to soreness and injuries from rubbing against the bars of their enclosures and from standing or lying on barren flooring. Additionally, the sows have a higher rate of urinary tract infections due to their inactivity, decreased water consumption, and infrequency of urination (Dormer, 2018).

Crated sows also suffer from psychological problems, as evidenced by abnormal behaviour. Common stereotypies of crated sows include bar-biting (on the crate that confines them) and sham chewing (with nothing in their mouth). In addition, crated sows tend to become unresponsive over time, which behavioural disorder scientists have linked to depression (World Bank, 2017).

Mavin Farm – one of Vietnam top five pig producers – has a herd of approximately 3,250 sows at its five pig facilities located in Vietnam (IFC, 2020). However, there is “very little evidence” that Mavin’s animal welfare practices meet the guidelines set forth by the World Organization for Animal Health (OIE). Organisations raised questions regarding the use of pregnancy crates, as well as the potential application of “mutations” such as castration, tailing, and tooth removal was applied to Mavin’s pigs. The IFC’s Good Practice Notes (GPNs) “identify” such breeding practices are harmful as being a welfare risk. Another concern stems from the increasing number of potential piglets born in Mavin’s breeding herd. The groups warn that raising sows to produce large litters is associated with ‘high levels of piglet mortality’, which can lead to low birth weight or non-surviving piglets, making them more vulnerable to starvation.

Consequently, Mavin Farm fails to meet the Five Freedoms established by the OIE (IFC, 2020).

3.7.3. The Buyers/Consumers

3.7.3.1. Consumers

Public concern has arisen between increased productivity in animal production systems and farm animal welfare (FAW). Consumers demand ethical production systems (EPS) and tend to purchase products that reflect their animal welfare concerns. Animals need enough room and resources, as well as rules and norms that ensure their well-being, for EPS to be successful. Pork producers should also implement accountability and transparency measures to guarantee that customers can make informed judgments about the items they buy. To secure a reliable conclusion of EPS, animal welfare must also consider the animals' physical and mental health, accessibility to wholesome food and veterinary care, and compassionate treatment (FAWC, 2019). While consumers must ensure EPS by considering each factor outlined, they are now becoming blindly judicious with growing unrealistic expectations around animal production. The increasing desire for free-range eggs amongst consumers is indicative of this situation. This has led to a negative consequence where some producers are unable to keep up with the demand, thus creating an unrealistic view of what can be achieved when it comes to animal welfare. In short, positive attitudes concerning FAW do not always correspond to purchasing behaviour, where the deeper concern is not related to the higher purchasing frequency (FAWC, 2019).

Most Vietnamese consumers often prefer warm meat that has just been slaughtered, and they often buy pork from nearby markets or fresh markets, where poor hygiene and microbial contamination are common. Despite growing concerns about food safety, pork traceability and weak pork, consumers do not know the origin and breed of pork (Nga, 2016). This might be attributed to a need for food safety education, data on the source and breed of pig, and insufficient implementation of food safety standards. Furthermore, some individuals may need clarification on the origin and breed of pigs or have false notions about the safety and quality of the pork they consume. It is noticed

that there is a changing demand for cold meat due to concerns about food safety (Lapar, 2012). Aside from food safety concerns, other variables that may impact the shifting demand for cold meat in Vietnam include convenience and longer shelf life. Freezing meat is frequently packed and sold in supermarkets or grocery shops, making it more accessible for customers to buy than warm meat, which they must purchase from a local market or fresh market. Cold meat has a longer shelf life than warm meat, allowing consumers to buy it ahead of time and keep it in the refrigerator for later use. Furthermore, some customers may prefer cold meat because they believe it is healthier. After all, it has been processed, packed, and stored under regulated circumstances that inhibit bacterial development (Lapar, 2012).

Unfortunately, in Vietnam, there is currently no brand or manufacturer that provides domestic pork products that meet animal welfare standards or have labels certifying animals with high welfare in livestock. The lack of local pork products that exceed animal welfare standards or have labels certifying animals with excellent well-being demonstrates the dramatic disparity between animal welfare regulations in Vietnam and those in the United Kingdom (Anh, 2017). In the United Kingdom, the Pig Welfare Scheme (PWS) compels farms to comply with animal welfare requirements and mark pork products prominently with the scheme's logo. This gives consumers in the UK confidence that the items they purchase have been produced under animal welfare guidelines, which is much different from the situation for consumers in Vietnam. Therefore, it can be concluded that in pig production and especially sows in Vietnam, customers have not been aware of animal welfare in the livestock production (Anh, 2017).

3.7.3.2. *Processors, restaurants, food stores*

In Vietnam, there are too many small traders participating in the pig supply chain, leading to weak management along the chain. A study performed by the International Livestock Research Institute (ILRI) in 2019 found that the majority of the pig supply chain, approximately 80%, was comprised of small traders and farmers operating with little to no formalisation. This informal structure has led to a weakened management system along the chain, and as a result, it has become difficult to trace contamination or

sources of diseases. Also, there are plenty of slaughtering facilities throughout countries, of which 96.4% are handy operational ones. As a result, food safety is poorly managed, with only 45% of facilities receiving a veterinary certificate (OIE & FAO, 2020). Better management and oversight of the pig supply chain are needed to ensure safe food.

Despite the presence of many small traders in the pig supply chain, leading to weak management and low levels of food safety being achieved, we can still observe some small improvements in national animal welfare thanks to the efforts of international NGOs (Humane Society International, 2022). Seven grocers and bakeries in Vietnam are supporting Green Nguyen Khoi Joint Stock Company (the manufacturer of the product: Nguyen Khoi - Natural Pork or Nguyen Khoi brand) in their efforts to stop cage farming and to set up communal pens as a better environment for these intelligent animals (Animal Equality. , 2022).

In response to increasing demands for better animal welfare, a global organisation is providing technical support to these initiatives by conducting farm visits and connecting Nguyen Khoi with experts (Animal Equality. , 2022). These efforts are in line with the guiding principles of animal welfare set out by the OIE, although there is no evidence of them being transposed into legislation (Humane Society International, 2022).

These initiatives demonstrate a certain level of political commitment to enhancing animal welfare. However, there still needs to be more national consensus or knowledge about the need for animal care and protection. Furthermore, additional study is required to analyse the impact of these programs, such as the number of animals assisted and the degree of welfare reached (Humane Society International, 2022).

3.8. The Actions of the Vietnamese Government

3.8.1. Overall status of Law and Regulations

The government has no central authority to promote and discuss animal welfare issues, and there is no national consensus or awareness of the importance of animal care and protection. To fill this gap, several animal welfare organizations in the country are

actively working to raise awareness on a wide range of issues (Animals Asia Foundation, 2016). In addition, the Vietnamese government also maintains long-standing relationships with many animals' welfare partners, including international NGOs, and is an active member of ASEAN and CITES. This shows a certain political will to improve animal welfare (WAP, 2016).

While this seems like a positive step forward, there is no evidence of the Government transposing the OIE's animal welfare standards or guiding principles into legislation. Research has found no adherence to the guiding principles for animal welfare in Vietnamese law or to any of the OIE's animal welfare standards. Consequently, so far, none of the full transposition of OIE standards and guiding principles into legislation has taken place in Vietnam (OIE, 2016).

On the other hand, the Ministry of Agriculture and Rural Development and the Ministry of Fisheries generally observe the standards on health set out in the OIE Terrestrial Animal Health Code and the OIE Aquatic Animal Health Code (OIE, 2016). These ministries revised their quarantine and inspection regulations to conform to OIE standards. Both Ministries have put in place a process for prompt identification and notification of listed (notifiable) diseases. This suggests that, given the government's will, some improvement may be possible.

To improve animal welfare in Vietnam, it is essential that the government transpose the OIE's animal welfare standards and guiding principles into legislation. This must be accompanied by increased awareness and education among the public and government institutions. Only then can the country make tangible progress regarding animal welfare (OIE, 2016).

3.8.2. Analysis of Law and Regulation

While animal welfare legislation has increased in Vietnam in recent years, it has limited application to prevent animal cruelty and suffering. The root cause of the limited effectiveness of animal welfare legislation in Vietnam is multifaceted. The use of vague language and a lack of enforcement mechanisms are certainly contributing factors, but they are not the only ones (Truong & Hoang, T., 2020). Cultural attitudes

towards animals and economic considerations also play a significant role. In addition, the limited resources available for enforcing laws and raising public awareness further impede progress. This is evident in Vietnam's dismal rating of F on the IPA, which indicates ineffective government management of male workers in animal welfare matters (Aspinall, 2020).

Currently, Vietnamese laws do not have a clear recognition of the concept of animal welfare. These laws, including the Animal Protection Law of Vietnam of 2012, neither specify nor foster animal welfare. This implies that the legislation does not acknowledge the notion of animal welfare or give any assistance. These acts recognise animal protection but do not define it or provide any procedures to ensure animal welfare (Smith & Nguyen, P.T.H.; , 2020). However, under the Veterinary Act (2015), people and organisations responsible for animals, including livestock, have an obligation to care for, feed and feed animals, treat them humanely, and reduce pain and fear. Similarly, the Law on Animal Husbandry (2018), which took effect on January 1, 2020, stipulates that “humane treatment of livestock must respect and harmonise with traditional beliefs, religions, and cultures and be accepted by the social community, accepted by society”. However, the lack of awareness of affection and its elements are still obstacles to improving animal protection in Vietnam (NATIONAL ASSEMBLY, 2018).

The Veterinary Act (2015) and Livestock Act (2018) apply to this type of animal - pregnant sows. These two laws prohibit the ill-treatment of animals, especially in the process of raising, transporting and slaughtering animals. The Law on Livestock stipulates that “humane treatment of livestock must be respectful, consistent with beliefs, religions, traditional culture and acceptable to the social community” (NATIONAL ASSEMBLY, 2018). However, these two laws only offer minimal protection for pregnant sows, failing to recognise the importance of animal welfare in Vietnamese law. This further results in poor animal care and a general lack of animal welfare across the country. While the Animal Husbandry Act (2018) and the Veterinary Act (2015) prohibit the mistreatment of farm animals, it remains unclear what constitutes “mistreatment”. Although there are certain requirements for the transport

and slaughter of livestock, these requirements are difficult to ensure that animals are given proper care and protection following OIE standards (Thao, 2019).

3.8.3. Education

Animal welfare education is essential for the development of effective policies and plans for animal welfare. However, in this field, there are currently no programs or manuals on animal welfare. Currently, only the Academy of Agriculture is providing dynamic health care content in the education for students and trainees, but only for the veterinary profession (Tạo, 2019). Indeed, animal welfare should not be limited to veterinarians but should include all members of society.

The lack of certificates on animal welfare may impede senior lecturers, and associate professors' research endeavours, as Hue University of Agriculture and Forestry has not yet made the topic of animal welfare a mandatory part of the curriculum (Paz-Gonzalez, et al., 2020). Consequently, these professionals have yet to acquire the required qualifications. Institutions, including this university, should instead introduce animal welfare as part of their curriculum so that students and trainees can learn the importance of humane treatment and understand the implications of animal mistreatment. As these young individuals will influence the political profession to change society's perceptions and create plans and policies for animal welfare, achieving meaningful progress in national animal welfare without providing proper education to these people is an unattainable (Valli, 2021).

3.9. Other Parties

3.9.1. Financial Institution

The main source of credit for farmers, including pig farmers, is provided by the Vietnamese banking system through a diverse network of banks and credit institutions such as VBARD, VBP, PCF, Joint Stock Commercial Bank (JSCB) and State Commercial Bank (SOCB)). However, due to stringent loan requirements, only a small percentage of small farmers could access credit from these public structures (ILO, 2019). Access to informal credit is also limited, or the loan amount is insufficient, as a

survey conducted by the International Labour Organisation (ILO) in Vietnam revealed that only 23.4% of rural households have access to informal credit and that the average loan amount is relatively low. Smallholder households still face many difficulties in getting loans from the state because their conditions do not fully meet the procedures of loan requirements such as land use rights, valuable assets, and plans to achieve viable products that can both generate income and ensure the welfare of their animals (ILO, 2019). However, this challenge is mitigated by the growing accessibility of unsecured loan products, as more and more lending institutions are now offering them. Vietnam Microfinance Network reports that the number of unsecured loan products available in Vietnam increased from 13 in 2012 to 24 in 2019, demonstrating the growing popularity approach (VMM, 2019). Additionally, the Vietnamese government has implemented various measures to support further access to credit for smallholders, such as expanding collateral-free loan programs, introducing financial inclusion activities, and establishing sector-specific credit line programs. These initiatives have made it easier for smallholders to acquire capital to finance their businesses, enabling them to obtain credit with fewer restrictions and at a lower cost, thereby allowing them to reinvest in their operations and in turn, to provide more resources for their animals (VMM, 2019).

Unfortunately, the goals of the credit institutions do not match the farmers' goals of securing and restoring capital. Despite having access to the necessary resources, such as labour and capital, farmers in rain-fed areas cannot take full advantage of their arable land due to unpredictable weather conditions (Huong, 2020). This significantly limits their agricultural production, as they can only produce a single crop during the rainy season, despite having enough labour and arable land for more than one. The Mekong Delta region of Vietnam is a prime example of the difficulties farmers face in rain-fed areas. They face a greater risk of drought or flooding. In addition, they can only produce one crop during the rainy season, decreasing total agricultural production as they cannot fully utilize their land and resources. This then limits the farmers' opportunity to generate additional income from crop and livestock production and their capacity to care for their animals (Huong, 2020).

The ability to get credit for cash flow throughout the crop cycle has enabled farmers to invest in yield-enhancing technologies and subsequently improve their income. In contrast, the lack of access to credit by many farmers today prevents them from investing in improved technologies. According to data from the International Food Policy Research Institute (IFPRI), most rural households in Vietnam lack access to formal credit, with only 8% able to get bank loans. This is a massive barrier for farmers in accessing the funds they require to engage in advanced technology, such as automation, which might considerably increase their productivity and revenue and in turn benefit animal welfare (IFPRI, 2020). In addition, limited financial availability limits farmers' ability to use better agronomic practices, invest in yield-enhancing technology, and employ soil and water conservation strategies to lessen their susceptibility to climate change. These findings highlight the importance of policies that allow farmers to obtain the financing they need to invest in such technology and enhance their livelihoods. Attention should be paid to rural women, who often play an important role in the family in managing capital. Direct lending to women is seen as an important motivator. This helps them to be more confident, have the opportunity to earn more income, gain economic independence and empower themselves financially. As this action can simplify credit requirements and procedures, financial institutions can minimize transaction costs for creditors and debtors, which also lower the costs for their animals' welfare (Pham, 2020).

Currently, there is no Vietnamese national bank with a policy on animal welfare for farmers, however, some international or foreign-owned banks have deployed their activities in Vietnam with policies and commitments to ensure national animal welfare. UK-based Standard Chartered, which funds growers in Asia, the Middle East and Africa and operates in 70 countries, has released an updated agricultural policy that outlines: "We will only provide financial services to clients who use cage-free or crate-free production systems for livestock (including both hens and sows) – applicable to Producers". Banks like Standard Chartered are taking a proactive step toward guaranteeing the long-term success of animal welfare in Vietnam by offering financial services to clients that adopt cage-free or crate-free livestock production methods (Standard Chartered, 2022). This dedication to animal rights has the potential to create

a more compassionate, safe, and healthy environment for animals while also boosting food safety and minimizing the transmission of contagions. Ultimately, this will result in improved living circumstances for the pregnant sows while also helping to secure the country's future animal welfare.

3.9.2. Non-governmental organizations (NGOs) and Non-profit organizations (NPOs)

In 2018, the Vietnamese government established the Vietnam Animal Welfare Association. The association was established to prevent and support animal abuse investigations. The Vietnam Animal Welfare Association (VAWA) is also expected to advise individuals and organizations on animal rights and make policy recommendations. Indeed, the argument that some animal welfare rules, like the dog meat prohibition in Hanoi, should be entirely enforced by 2021 is well-founded. The Hanoi People's Committee's decision to bar the sale and eating of dog and cat meat has resulted in fewer occurrences of animal mistreatment in the city. Animal welfare organizations have praised it for its devotion to animal care and for promoting public awareness of such concerns. Likewise, other inherent cruelties, such as keeping bears for bile, are also prohibited (VAWA, 2018).

The Vietnamese government has been taking proactive steps to promote animal welfare, including forging different partnerships with NGOs, such as Animals Asia, WildAid and Save the Elephant. Furthermore, the Vietnam National Agricultural Extension Center (NAEC) has partnered with Humane Society International (HSI) since 2019 to organize exhibitions, lectures and training seminars on the topic of farm animal welfare (NAEC & HSI, 2022). This collaboration has led to the enactment of a law in 2020 that prohibits the consumption of wild animal meat and necessitates restaurants to advertise their menus in a manner that unmistakably identifies wild animal meat. Additionally, the law also bans the sale of wild animal meat in food markets and other public areas. Moreover, the government has also prohibited the use of animal fur for clothing and other accessories. These methods have been adopted to improve animal welfare and protect the safety of both humans and animals alike (NAEC & HSI, 2022).

In conclusion, the recent establishment of the Vietnam Animal Welfare Association and increased penalties for illegal wildlife trade are positive steps towards better animal welfare. Similarly, the Vietnamese government is actively working with international animal welfare NGOs, which have helped to improve animal welfare through specific laws and bans. In terms of animal welfare in Vietnam, advances have been made in general law; however, these are still in the early phases of implementation. Furthermore, many of the concerns related to animal welfare in Vietnam are closely connected with poverty, education, and other societal variables, making it challenging to create effective regulations to address these difficulties. As a result, further actions must be taken to guarantee that all animals in Vietnam are effectively safeguarded (VAWA, 2020).

3.9.3. The Researchers

The pig production industry in Vietnam plays an important role in the nation's agricultural sector, yet there is a shortage of information on animal welfare, economic performance, and supply response available to both farmers and policymakers. This lack of understanding can lead to decisions that do not take animal welfare into account. To address this issue, it is necessary to explore the effects of market forces such as output/input prices and supply response on the industry (Huynh, 2021). By examining these relationships, researchers can identify existing unfavourable trends and make decisions that prioritize animal welfare.

Understanding the economic performance of pigs in Vietnam is critical to improving animal welfare standards. According to a Ministry of Agriculture and Rural Development study, just 8.4% of farmers have access to up-to-date information about pig production processes, scales, and breeds. This means a scarcity of current knowledge available to farmers and policymakers, making informed decisions concerning animal welfare difficult. Farmers and decision-makers may be misled if they do not understand which methods, sizes, and breeds are the most profitable (MARD, n.d.).

Exploring the linkage between output/input costs and pig population can reveal how market forces are detrimental to the pig production sector in Vietnam. A recent investigation by the Centre for Agricultural Policy in Vietnam discovered that national researchers had not sufficiently examined the association between output/input costs and pig population (Center for Agricultural Policy , 2020). This scarcity of exploration was attributed to the lack of reliable data and information on the effects of market forces on the pig production industry. Pork producers have to utilize this data to pinpoint existing negative trends and forecast potential adverse changes in the industry.

Gaining knowledge of the supply-side reaction of pig farming in Vietnam is paramount, as it can grant a glimpse into how the sector will not be able to adjust to modifications in demand or prices. Research done by the Institute of Policy and Strategy for Agriculture and Rural Development in Vietnam demonstrated that the supply response of pig production in Vietnam has not been explored thoroughly, remaining largely obscure. The study ended with the conclusion that further research is essential to grasp the supply-side of the pig production industry. Nonetheless, industry stakeholders need this information to make estimations about the prospects of the industry and direct decisions about regulations and investments that do not prioritize animal welfare (Nga, N. T. T., et al., 2019).

Gleaning insight into the Vietnamese pig production industry's difficulty in adjusting its production based on changes in demand or prices requires knowledge of supply elasticity. A 2019 investigation from the Vietnam Academy of Agricultural Sciences noted that the estimation of supply elasticity in smallholder systems had not been studied in Vietnam. Subsequently, the study suggested that further research is essential to comprehend the factors that affect supply elasticity in the nation's pig production industry. Nevertheless, pork producers need this data since it can aid in recognizing the possible hindrances to communicating information regarding animal welfare to stakeholders (Vietnam Academy of Agricultural Sciences, 2019).

3.10. Conclusion

Overall, this chapter offers a thorough analysis of Vietnamese pig production and welfare and the country's place within broader regional and global settings. It lists the various challenges and opportunities for improving animal welfare in Vietnam, including the appalling Animal Protection Index (API) 2020 score, the scarcity of locally produced pork that complies with animal welfare standards, insufficient infrastructure and limited access to contemporary technology. It also examines the role of financial institutions and non-governmental organizations in promoting animal welfare and the necessity for research to understand better the pig farming sector and its supply response to market changes. The chapter finishes by examining present Vietnamese legislation and its consequences for animal welfare, emphasizing the need for more effective enforcement and education to ensure greater animal welfare and profitable pig production in Vietnam. In the next chapter, I will discuss the expectation and aspirations for farm animal welfare in Vietnam regarding the examination in this chapter.

CHAPTER 4: EXPECTATIONS AND ASPIRATION FOR FARM ANIMAL WELFARE AND PREGNANT SOWS IN VIETNAM

4.1. Chapter 4 Overview

Animal welfare is a pressing matter that requires collective action. A well-cared-for animal leads to a healthier life with better treatment and can also have positive impacts on the environment and the economy. That's why the society is dedicated to working with governments, farmers, and consumers globally to promote high-welfare agriculture and sustainable livestock practices (World Animal Protection, n.d.). Vietnam, as a country with a thriving agricultural sector, a significant market share in pork consumption, and a place on the world map, has a unique opportunity and responsibility to improve its reputation and status by prioritizing animal welfare. The world is trending towards better animal welfare, and with Vietnam's integration into the international community and alignment with the Sustainable Development Goals, it is essential that the country follows suit (FAO, 2020).

In previous chapters, I have examined the welfare concerns in the sow production industry and the underperformance in Vietnam. While the concept of animal welfare is not new, it is not yet fully embraced in the country. The future of animal welfare and sow production in Vietnam depends on the efforts of all stakeholders, including the government, consumers, financial institutions, corporations, and individuals. In this chapter, I will explore the benefits to the pork supply chain in Vietnam, the motivations of stakeholders, the connection between animal welfare and sustainable development, stakeholder-led solutions, and approaches to enhance the welfare of pregnant sows, and ultimately, the future of animal welfare in Vietnam's livestock industry.

4.2. The Benefits to the Vietnam pork supply chain

4.2.1. Benefit for Animals

Before considering the benefits to businesses from changes in infrastructure or practices, it is important to determine if animals will benefit from these changes. The benefits are likely to manifest in the physiological and behavioural performance of the animals, although these benefits are not always apparent. In Vietnam, ground-breaking studies have uncovered the

intimate connection between animal welfare and performance, revealing that providing pigs with access to space, enrichment, and quality husbandry can lead to improved growth rates, food intake, and food utilization efficiency. These findings make a compelling case for prioritizing animal welfare, as it not only improves the quality of life for livestock, but also fosters more productive, efficient, and healthier populations (Gielen, et al., 2021).

Behavioural changes in animals are the easiest welfare indicator to assess, either by direct observation or using monitoring technologies (Jill N. Fernandes, 2021). The monitoring of animal behaviour and physiological changes has undergone significant advancements in recent years, allowing for more rapid and accurate detection. Trained practitioners can observe behavioural changes directly, while video cameras can provide further insight. Physiological changes, however, require more sophisticated equipment and can involve invasive procedures, but with the aid of monitoring technologies, they can be promptly detected. This leads to prompt interventions that can reduce suffering and enhance overall animal welfare (Kirkwood, et al., 2020).

4.2.2. Benefits for Customers

The impacts of agricultural intensification on animal welfare have generated increasing public interest and awareness. Increasing consumer interest in animal welfare has been reported in a number of studies since the 1990s. Early studies, such as the study by Harrington (1991), were initially important and observed that most consumers have little interest in animal welfare and production systems; however, this fact has begun to change since the mid-1990s (Harrington, 1991). In Vietnam, research undertaken by the Vietnam Academy of Agricultural Sciences' Institute of Animal Science was published in *Animal Science Journal* in 2020. In this study, the well-being of Vietnamese pigs was investigated using a welfare evaluation tool, and the results revealed that the majority of pigs in Vietnam had been subjected to harsh conditions. Other difficulties identified were overcrowding, inadequate ventilation, and a lack of access to fresh water and feed. Meeting public demand for animal welfare products requires robust animal welfare assessment tools that allow users to identify potential areas of welfare improvement in addition to identifying areas of compromise (Nguyen, 2020).

As Vietnam's concern for animal welfare continues to escalate, consumers are becoming increasingly selective in their purchasing decisions, seeking products that align

with their moral standards. To accommodate this growing trend, the industry must implement effective evaluation methods. These systems not only enable producers to demonstrate their dedication to animal welfare but also supply crucial information to make knowledgeable choices that advance the health and well-being of livestock. The adoption of these robust evaluation tools will not only meet consumer demands but also be instrumental in driving advancements and elevating the overall animal welfare standards in the region (FAO, n.d.). Overall, this accumulating evidence suggests that consumers' perceptions of food quality are also determined by the ethical principles applied in the production of animals, as well as the overall safety of the final product.

4.2.3. Economic Growth and Development

The Vietnamese pig industry is renowned for its high reproductive productivity, boasting an average reproductive rate of 20-25 piglets per sow per year and an average litter size of 8-11 piglets per litter. According to research conducted by the MARD of Vietnam, Vietnamese pig farms have a reproductive rate of 22.5 piglets per sow per year, and a litter size of 9.3 piglets per litter, testifying to the potential of the industry to generate a high number of pigs cost-effectively. Thus, upgrading animal welfare could benefit swine farms' economics, leading to improved reproductive output. Therefore, improving animal welfare may contribute to swine farms' economic well-being (MARD, 2021).

Over the past decades, Vietnam has undergone major political and economic changes, shifting from a planned economy to a market economy (MARD, 2017). As the economy transforms and evolves in Vietnam, farmers are granted increased access to crucial resources and cutting-edge technologies, resulting in a surge in pork production. This has fuelled a growing domestic appetite for pork and led to the expansion of the country's pork market, featuring a plethora of new, diverse pork products, ranging from processed meats to convenient, ready-to-eat options. The shift towards a market economy has truly empowered the pork industry, igniting its growth and diversification. Consequently, this development has had a great impact on the production conditions of farmers, not only on the supply but also on the demand for domestic pork consumption. In fact, this unprecedented improvement also opens up export options for this country (FAO, 2020).

In recent decades, high-yielding crop varieties have flooded into Vietnam due to government policies and economic reforms as well as commercial interests and encouraged

by government organizations, and foreign NGOs. The transition from a centrally planned economy to a market-oriented one has unlocked a wealth of possibilities for Vietnamese farmers (Nguyen, 2012). With newfound access to cutting-edge inputs and technologies, they have been able to ignite a surge in pork production that has sent ripples through the domestic market. This newfound abundance has propelled the consumption of pork products to new heights and transformed Vietnam into a formidable exporter on the world stage. Pork production has rocketed from 2.6 million tons in 2000 to an impressive 4 million tonnes in 2016, with the expansion of Vietnam's export markets - including major players like Japan, Korea, and the United States - further fuelling this growth. Due to changing economic conditions, transforming production infrastructure, and increasing demand for pork, domestic pork production has recorded high growth rates for several decades (Nguyen, 2020).

4.2.4. Opportunities to access the regional and global market

In 2020, research sponsored by the Pork Checkoff identified Vietnam as a potential market for US pork, citing economic development as one of several drivers. The research also details Vietnam's young and increasing population, as well as pork's popularity as a consumer protein, with an annual per capita intake of approximately 60 pounds. According to a recent prediction by the Organization for Economic Cooperation and Development, pork consumption in Vietnam would rise by 3.1% each year to around 3.4 million tons between 2022 and 2030. Chilled meat consumption is increasing due to its convenience and high quality (Pork Checkoff, 2020).

By improving farm animal welfare, Vietnam could increase access to the global market, especially the EU with the free trade agreement. The Vietnam Animal Health Department has taken proactive steps towards ensuring that the country's animal welfare standards align with the world's most stringent regulations. This effort has been propelled by a series of public campaigns and workshops aimed at raising awareness of the critical importance of animal welfare. As a result of these efforts, Vietnam has been making substantial progress in enhancing the welfare of its farm animals. This has opened new doors of opportunities for the country through the EU-Vietnam Free Trade Agreement (FTA) which has zero duties on a number of animal products (Nguyen, 2020).

The FTA holds a remarkable provision on animal welfare, lodged in the Cooperation and Capacity Building chapter, that obligates both parties to cooperate on animal welfare issues. The provision establishes a specialized committee to ensure the development, implementation, and monitoring of animal welfare standards that meet international requirements. Through this committee, the parties will be able to share best practices and receive technical assistance and capacity building, thereby allowing them to better meet the requirements of importing countries and increase their exports. This collaborative effort lays a solid foundation for a fair and safe trading environment and will provide a platform for all parties involved in the FTA to work together towards a common goal - the improvement of animal welfare worldwide (O'Reilly, 2022).

4.3. The Motivations to the Stakeholders

The diverse array of actors invested in animal welfare has ample reason to strive for a mutually beneficial accord. As we've explored, the enhancement of animal well-being has a multifaceted impact, benefiting not only producers but society. Beyond increasing the profitability of production through superior quality goods, improving animal welfare also brings about enhanced public health, diminished environmental harm, and heightened animal health and happiness. In this segment, we'll delve into the motivations of producers, the advantages to society, and the rewards for all other stakeholders in striving towards animal welfare.

4.3.1. The Producers

The implementation of animal welfare practices, specifically the adoption of group housing for pregnant sows, can bring significant benefits to the producers in the food industry. In this section, I will explore the advantages that come with improved animal productivity and quality risk avoidance, including the mitigation of business losses and the creation of new market opportunities. However, the transition towards animal welfare practices also presents challenges that must be overcome to achieve long-term improvement. In the following subsections, I will delve into the benefits of the quality of food supply, market advantages, and challenges for long-term improvement associated with this practice.

4.3.1.1. Benefits to Quality of Food Supply

Livestock companies face a growing demand for meat in emerging markets like the Vietnam market and more fragmented demand in mature markets (i.e., Western). They need to challenge the assumption that better farm welfare will always be an economic burden. The 360° farrowing house designer reports that this system is less stressful on sows, they eat more, resulting in piglets weighing up to 25% at the weaning (Anon., August 2013). In some cases, animal health is improved but this improvement might lead to higher costs. However, good animal welfare can be a marketing advantage as there is growing concern about food quality, with consumers considering good animal welfare standards – as well as attributes. health, provenance, taste and sustainability more broadly – as a key element of food quality (FAO, 2012).

As consumers in Vietnam place growing importance on animal welfare in determining the quality of their food, the country's food industry is taking notice. A survey conducted by the Vietnam Animal Welfare Alliance revealed that a substantial majority of respondents, over 70%, considered animal welfare a crucial aspect of food quality, and even more, over 80%, stated they would pay a premium for food produced in accordance with high animal welfare standards. This trend highlights the vital role that animal welfare plays in the pork industry and its impact on food quality (Vietnam Animal Welfare Alliance, 2020).

Manufacturers in Vietnam are embracing animal welfare as a means of boosting productivity and profits. The Vietnam Poultry Association (VPA) has implemented a certification program, resulting in a significant increase of up to 15% in the number of hens reaching their full egg-laying potential. Furthermore, customers are willing to pay an additional 15-20% for poultry products produced with superior animal welfare standards (VPA, n.d.). Additionally, insurance programs, such as the Vietnam Insurance Company's animal welfare insurance, help to mitigate the financial burden of animal welfare issues, making it easier for producers to implement and adhere to higher standards. In conclusion, animal welfare is becoming increasingly vital for Vietnam's food manufacturers, bringing about improved productivity and profitability (Nguyen, 2017).

4.3.1.2. Market Advantages

The most valuable benefit of improving farm animal welfare is the business benefit, in the form of tangible productivity gains or competitive advantage and market premiums. It is often assumed that improving farm animal welfare will improve animal performance, leading to a better quality of the product. As a result, the outstanding quality of meat products can create a competitive advantage for the company supplying it (FAO, 2019). Vietnam's Huong Duong Meat Processing Company stands as a shining example of the benefits of prioritizing quality. Adorned with a myriad of esteemed awards, including the Asian-Pacific Quality Award, National Quality Award, and National Food Safety Award, this company has cemented its place as a premier player in the pork production arena. Furthermore, its unwavering commitment to crafting top-notch products has garnered commendation from the Ministry of Industry and Trade, driving its sales to new heights and affirming its position as a dominant seller in the national market. By following in the footsteps of Huong Duong, other producers in Vietnam can unleash a transformative chain reaction, elevating the quality of meat products throughout the country (Vietnam Investment Review, 2020).

Although attitudes towards farm animal welfare are only one predictor of consumer purchasing behaviour, price, safety, and local production are more important to consumers (Coleman, et al., 2005). The practice of raising chickens in a free-range environment, while it may incur higher expenses for farmers, holds great appeal for consumers who place a premium on animal welfare. This humane approach to poultry farming is not only seen as a safer option for consumption but also supports the ideals of environmental responsibility and local agriculture. As a result, making the ethical choice to prioritize animal welfare through free-range chicken farming can reverberate in significant ways, influencing factors such as price, safety, and community-based production for consumers. If so, companies that can demonstrate improvements in farm animal welfare can expect to have a market advantage, with more consumers choosing their products (National Chicken Council, 2020).

4.3.1.3. Challenges for Long-term Improvement

In fact, farmers and industry are concerned about additional costs incurred as a result of improved welfare. However, the link between cost and animal welfare is highly complex

(Appleby, 2005): first, only a tiny percentage of consumer prices reach farmers (ESR, 2004); second, retail prices of animal products have continuously climbed, but payments to farmers have not kept pace (Fraser, 2001). Retail prices for animal-derived foods have experienced a dramatic surge in Vietnam over the past decade, according to a recent report from the Food and Agriculture Organization of the United Nations (FAO). The study found that while the prices paid to farmers for livestock have remained relatively stagnant, prices of commodities like pork have skyrocketed by over 20%. This disparity reveals a disconnect between the increased cost to consumers and the benefit received by farmers (FAO, 2020).

In response to these findings, the Ministry of Agriculture and Rural Development (MARD) in Vietnam has announced plans to establish a comprehensive animal welfare program for pig farms. This initiative entails expanding living space, enhancing feed and nutrition, and implementing improved health and safety protocols - all while being budget-friendly at less than 1% of total production cost. The MARD also aspires to introduce a certification system that recognizes pig farms that abide by these animal welfare standards, allowing consumers to make informed choices about ethical and sustainable meat products. As a result, the price may not be the main determining factor in purchasing ethical/sustainable meat products, as consumers interested in these production methods are often seeking the best value for money (The World Bank, 2017).

Shifting animal production to a more professional and welfare model will be a long-term project, but it appears to be a more promising way to improve animal welfare than conventional methods current natural environment. The Saigon-Hanoi Livestock Development Project (SHLDP) stands as a remarkable exemplar of the benefits that ensue from embracing a more professional and compassionate model of animal agriculture. The project's results have been nothing short of impressive, featuring increased livestock productivity, decreased environmental impact, amplified profits for producers, and elevated milk quality for consumers. By embracing a welfare-focused approach to livestock production, the SHLDP proves that it is possible to achieve enhanced outcomes for the environment, consumers, and producers alike, thereby solidifying public trust in the livestock industry and those who tend to the herds (Dang, et al., 2018).

4.3.2. Benefits to the society

The premise is that “higher welfare farming is better for everyone” (World Animal Protection, 2019) holds a great deal of weight and is evidenced by the successful implementation of programs like the Sustainable Agriculture and Rural Development (SARD) in Vietnam. The program exemplifies the myriad of benefits that arise from prioritizing animal welfare in livestock production, including job creation, higher profits, and a healthier local food supply. The SARD program works towards elevating smallholder farmers’ livelihoods by providing them with grants and training to adopt sustainable and humane farming methods. Its impact has been far-reaching and has improved the income of thousands of farmers, while concurrently mitigating the environmental harm caused by traditional farming practices and enhancing the quality and safety of the food supply (HSI, 2021).

In communities where farm animal welfare is viewed as an ethical responsibility, improving it can lead to social benefits such as increased goodwill among the local community and greater support for the business. By taking steps to ensure the well-being of farm animals, businesses can cultivate a positive perception and reap the rewards of improved productivity and cost savings as healthier animals tend to be more productive. The improvement of farm animal welfare can also bring about psychological benefits, for instance, more positive human-animal interactions, and lead to a range of social benefits, including job growth and economic activity in rural areas (Ganzert, 2018).

On a worldwide scale, the reputation of nations is often judged based on their handling of farm animal welfare. This is especially true in Vietnam, where the inadequate enforcement of animal welfare regulations has led to rampant problems and poses a significant threat to companies operating within its borders. The Vietnamese government has responded to this growing concern by enacting a new Decree on Animal Husbandry and Veterinary (Decree No. 84/2019/ND-CP) and by implementing a National Action Plan for Animal Welfare from 2019 to 2025. These actions show a clear commitment to enhancing standards and improving the welfare of farm animals (FAO, n.d.).

The value that many members of society place on farm animal welfare emphasize the view that animal welfare is a public good and therefore the responsibility for its improvement is shared by the entire company in society. Organizations like Vietnam

Animal Aid and Rescue are working tirelessly to raise awareness and provide care and shelter to animals in need while advocating for legal reforms. These efforts demonstrate a growing awareness of animal welfare among the public and the increasing importance being placed on improving farm animal welfare by all stakeholders. While there may have been instances of conflict between animal businesses and certain aspects of the community in the past, it is hoped that by bringing all parties together over their shared interests and responsibilities, animal welfare for farm animals will continue to improve (Fernandes, 2019).

4.3.3. Benefits for other Stakeholders

The Sustainable Development Goals (SDGs) of the United Nations are becoming more and more popular, yet many companies still appear to ignore one important goal: animal welfare. Since the 2030 Agenda was unanimously adopted by 193 UN member states in September 2015, the SDGs have become a firm part of the agendas of businesses. (Rosati F, 2019). However, the disrespect for animal welfare in SDG implementation is a troubling trend that needs to be addressed as global awareness of the need for a fairer future grows. If customers aspire to establish a truly equitable and compassionate world for all species, it is crucial that businesses understand the significance of including provisions for animal welfare in their sustainable development plans (UN, 2020).

Farm animal welfare is now being acknowledged by some businesses as a business risk that must be addressed similarly to other business concerns (Lindgreen A, 2003). Other social and environmental settings have prompted businesses to include farm animal welfare into their management architecture through audit procedures, training sessions, and tracking and reporting methods they have built for difficulties (Maloni, 2006) (Blokhuis HJ, 2008). The growing acceptance of animal welfare as a commercial risk and the actions being taken to control it through various means can be considered as a strategic opportunity for businesses.

Meanwhile, investors may find companies committed to animal protection more attractive. Investors seek assurance that the companies in which they invest have fully considered the risks and opportunities associated with farm animal welfare and have

effective policies and procedures in place to address the challenges (Amos N, 2018). As the global focus shifts towards sustainability and ethical practices, investors in Vietnam are turning their attention to the issue of animal welfare. A prime example of this is the collaboration between CP Vietnam, the largest pork producer in the country, and the World-Wide Fund for Nature (WWF). This partnership aims to enhance farm animal welfare, minimize environmental footprint and boost productivity. Through providing access to technical knowledge, resources and data, the partnership hopes to improve CP Vietnam's animal welfare policies and management techniques (WWF, 2019). The quality of risk management demands not just financial information, but also insight into a company's management processes, practices, and performance analysis (Sullivan, 2016). By taking this approach, WWF endeavours to establish CP Vietnam as an industry leader, inspiring other companies to follow suit and proving that it's possible to balance animal welfare with environmental sustainability through responsible business practices (WWF, 2019).

Awarely, relating to SDGs goals, ESG stands for Environmental, Social, and Governance, which refers to three key factors that investors consider when evaluating the sustainability and ethical impact of companies and investments. As such, animal welfare become one of the ESG factors that investors are focusing more on. Powerful animal welfare credentials then become a way for companies to differentiate the products they offer, which can translate into sustainable profits (Seebauer, 2020). Viet Eco, a shining beacon of sustainability in the seafood industry of Hanoi, is a testament to the lucrative impact of prioritizing animal welfare. With a steadfast commitment to ethical and environmentally responsible harvesting methods, Viet Eco has set itself apart from the competition through innovative initiatives like providing veterinary care, humane slaughter procedures, and sustainable aquaculture practices. This differentiation has won the trust of customers and attracted ESG-conscious investors, granting Viet Eco a competitive edge and solidifying its position as a profitable leader in the industry (Viet Eco, 2020).

Differentiation, the art of making a product stand out, is achieved by highlighting unique qualities and attributes that distinguish it from the competition, granting a company the opportunity to command premium prices or expand market share. With the concern of animal welfare from society, product differentiation is becoming increasingly important for

a market segment and thus presents a business opportunity. This is partly due to changing expectations about how companies manage their supply chains, including the animal welfare (Alias, 2020). The Vietnamese government is now taking an assertive stance towards animal welfare by imposing regulations that require slaughterhouses to install stunning facilities and implementing a labelling system that allows consumers to distinguish welfare-friendly products. The launch of a nationwide program to spur the growth of organic pork production further underscores the government's commitment to promoting animal welfare in the pork industry (MARD, 2021).

These decisive measures are expected to incentivize companies to prioritize animal welfare, making them more appealing to investors who consider this aspect an important, albeit emerging, contributor to their investment decisions. By uplifting animal welfare standards, the government is playing an instrumental role in fostering a more ethical and sustainable national pork industry (Nguyen, 2020).

4.4. Animal Welfare and the Sustainable Development

4.4.1. Approaches to Sustainable Development

Sustainable development was defined as “development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (Oxford UK, 1987). However, the concept has gone beyond its environmental confines, referring to aspects such as social, economic and even cultural sustainability (Costanza R, 1991). The concept of Corporate Responsibility speaks to a company's duty to be aware of the social and environmental impacts of its actions, striving to create a meaningful impact. An integral element of corporate responsibility is incorporating sustainable development principles into corporate operations, such as cutting down waste, minimizing emissions, promoting fair labour practices, and supporting local communities. By doing so, companies can advance towards a more sustainable future while also realizing financial benefits such as reduced expenses, a bolstered brand reputation, and the creation of new business prospects (Sustainable Brands, 2020).

As the value of Corporate Social Responsibility (CSR) becomes increasingly apparent, companies are making a commitment to operate in an economically, socially, and environmentally responsible manner. This shift is fuelled by a convergence of factors,

including growing consumer demand for sustainable products and services, increased government regulations and stakeholder pressure, as well as the recognition of the business benefits of sustainability. These factors lead to the concept of corporate sustainability, which are voluntary activities developed by companies that not only to minimize their negative impact on society and the environment, but also to practically create positive value for society and the environment in their business activities (Sustainable Brands, 2020). For Van Marrewijk, corporate sustainability focuses on value creation, environmental management, environmentally friendly production systems, human resource management, and more (Marrewijk, 2003). In this sense, corporate sustainability will replace the corporate social responsibility, as it represents a more active and comprehensive approach to addressing social and environmental issues in business (Andreu A, 2018). In the viewpoint of Andreu & Fernández, corporate philanthropy will win the battle against CSR, creating a “halo effect” that can deflect from the true nature of CSR and CSR will be linked to philanthropy as a tool for marketing and enhancing the reputation of companies (Pinillos AA, 2011).

4.4.2. Reducing Livestock Impact on Environment

Today, 60% of all mammals on Earth are livestock, mostly cattle and pigs (Bar-On YM, 2008). The expansion of animal use and consumption at these levels contributes to increased carbon emissions, water scarcity, food insecurity, biodiversity loss and antibiotic resistance. Increased consumption of animal products is likely to put additional pressure on global freshwater resources. So, it becomes imperative to cut down our dependence on animal-derived products as it would not only mitigate the ecological consequences of livestock farming but also preserve our precious freshwater resources globally (Gianotti, et al., 2019).

Livestock grazing is a crucial aspect of agriculture in Vietnam and accounts for a substantial part of the nation’s beef production, with an estimated of 60%. An investigation conducted by the International Water Management Institute uncovered that the water consumption in the production of beef in Vietnam is 12.1 cubic meters per kilogram of beef, which is relatively lower compared to the average global consumption of 15.4 cubic meters per kilogram of beef (International Water Management Institute, 2019). Animal products from grazing systems have smaller blue and grey water footprints than products

from industrial systems in terms of freshwater (Gerbens-Leenes PW, 2013). Climate change will pose physical threats to all livestock businesses, ranging from reduced feed quality and more droughts to the detrimental effects of rising temperatures on animal health and production.

4.4.3. Reducing Livestock Impact on Human

Poor animal welfare is a major factor in causing health and productivity losses due to reduced growth, greater susceptibility to disease and injury, and poorer reproductive performance (OIE, 2020). The consequences of poor animal welfare practices are all too real in Vietnam, as evidenced by a study that revealed a shocking 81% higher risk of mastitis infection among cows with poor body conditions compared to those with better care. Sadly, inadequate nutrition, overcrowding, and limited access to veterinary care resulting from poor husbandry practices are also driving up mortality rates among pigs. And in poultry, inadequate nutrition can result in lower fertility and reproductive performance, causing a decline in egg production. These findings demonstrate the tangible impact of neglecting animal welfare on health and productivity in Vietnam (Huy, 2020). Despite all these negative impacts, SDG 2 sees the food and agriculture sectors as key sectors for development and vital to poverty alleviation. Responsible management can feed the planet, generate profits, and develop local and rural communities while it can also protecting the environment (Fernández-Mateo, 2020).

SDG 3 emphasizes the importance of living healthy lives and supporting global well-being. Animal, plant, and environmental health are all part of the “one health“ strategy, according to the Food and Agriculture Organization of the United Nations (FAO). Healthy animals lead to healthier people and more sustainable food production. FAO encourages optimal practices for livestock efficiency and sustainability, while also safeguarding public health and guaranteeing safe commerce. Growing public awareness necessitates a focus on farm hygiene and the careful application of vaccinations and treatments to protect animals from disease (Food and Agriculture Organization, 2019). The advantages of enhanced animal health and welfare are crucial to meeting the goals outlined in SDGs 2 and 3.

Improved animal welfare yields numerous benefits, including increased productivity, better health, and natural behaviour, which ultimately leads to greater food security and

economic prosperity. Good animal welfare is crucial to meeting the goals of SDG 2 and SDG 3, promoting sustainable and safe food production while also protecting public health and contributing to global well-being. Animal welfare should be considered in all agricultural and food production policies, as it plays a vital role in realizing the aims set out in the SDGs (Food and Agriculture Organization, 2019).

4.5. Stakeholder Initiated Solutions or Approaches to improve farm animal welfare for pregnant sows in Vietnam.

As concerns for the welfare of pregnant sows in Vietnam persist, various key players have taken action to improve their living conditions. This includes a collective effort from governments, producers, consumers, financial institutions, and other corporations. In this section, I delve into the various approaches and solutions each of these stakeholders has adopted to enhance and promote animal welfare within the Vietnamese pig production industry.

4.5.1. Governments

Governments, animal rights organizations, charities, and businesses are instrumental in driving positive change for animal welfare. Governments, in particular, hold a leading role and can impact animal welfare through two main avenues: policy and the Animal Protection Index (API). The policy involves introducing regulations and laws aimed at protecting animals, while the API measures the efficiency of global animal welfare policies.

4.5.1.1. Policy

On 9 May 2014, the Ministry of Agriculture and Rural development ratified Decision 984/QD-BNN-CN approving the “Livestock sector restructuring scheme towards greater added value and sustainable development”. This decision lays the foundation for the government to fulfil the vision outlined in the Livestock Development Strategy for 2020. This vision includes monitoring and evaluating the progress of the strategy, which assesses the impact of policy and program initiatives, as well as changes in the livestock industry over time. Furthermore, the government invests in research, infrastructure, and training to foster the growth of the livestock sector and works closely with stakeholders to ensure the strategy is implemented according to its vision. In conclusion, the success of the Livestock

Development Strategy for 2020 will be determined by its ability to boost the livestock industry and contribute to economic growth (MARD, 2014).

The strategy explicitly defines targets and directions and the accompanying policies that support them. The vision for the pig sector in this strategy is that of a modern sector that will see increasing shares of exotics vis-à-vis local pig breeds, increasing the share of closed production units with enhanced bio-security features, and establishment of modern slaughtering, processing, and market facilities that will serve the needs of the sector. Not explicit in the strategy is the direction of development for small and household-based pig production, although later amendments to the strategy explicitly acknowledged the importance to the sector of these small yet dominant production units in Vietnam. A few policies and programs that directly or indirectly support pig production, in general, are under review and discussion for further development of specific production systems for these production units (Nguyen, et al., 2020).

4.5.1.2. Improving API

A report based on a 2020 survey revealed a disheartening statistic: a mere 16.7% of Vietnamese participants expressed a favourable attitude towards animal welfare and advocacy groups. Additionally, an overwhelming number of those surveyed displayed a lack of knowledge and understanding of animal welfare concerns, with only a minuscule 3.2% indicating they were familiar with animal welfare legislation and regulations. Given the analysis in this survey combined with the previous chapter, it is clear that there is currently no recognition of sentiment and/or its elements as an obstacle to improving animal welfare in Vietnam (Nguyen, 2019). Additionally, the language used in both the Veterinary Act (2015) and the Animal Husbandry Act (2018) is ambiguous and shows a lack of understanding and priority in preventing animal suffering. Despite various efforts to control animal care in Vietnam, there is still a significant gap in animal welfare. The 2015 Veterinary Act, for example, contains no standards for compassionate euthanasia, leaving animals vulnerable to inhumane practices. Furthermore, the 2018 Animal Husbandry Act falls short of its obligation to govern the business and protect animal welfare. It fails to address animal welfare concerns and lacks procedures to prevent neglect and abuse. These flaws in present legislation highlight the urgent need for a more comprehensive approach to

animal welfare protection and enhancement in the country. This is worrisome because both laws are relatively recent and at a time when there is a lot of scientific evidence to support animal affection (World Animal Protection, 2019). Hence, acknowledging the capacity for animals to experience emotions and feelings through legal means marks a pivotal advancement in the enhancement of their well-being, fostering a more empathetic and humane society.

The five freedoms discussed in Chapter 1 of the Law on Animal Husbandry (2018) include freedom from hunger and thirst, discomfort, pain, injury, and disease, and freedom to express natural behaviour. The government of Vietnam has taken steps to implement these five freedoms of animal husbandry in accordance with global directives. In this regard, the Ministry of Agriculture and Rural Development of Vietnam has issued a directive on the welfare of livestock, launched campaigns to promote animal welfare, and developed guidelines for animal rescue and rehabilitation, reflecting their commitment to protecting animal rights. The revised law is expected to align with OIE animal welfare standards for the rearing, transport, and slaughter of various domestic animals, including pigs, chickens, beef cattle and dairy cows (Nguyen & Pham, T.Q., 2019).

The pressing matter of farm animal welfare, particularly regarding pig farming, in Vietnam, cannot be ignored. The gruelling and often prolonged journeys that these creatures are subjected to must be put to an end through a complete ban. The Vietnamese government is implored to enforce humane slaughter methods, where animals are swiftly rendered unconscious and insensitive to pain prior to any such act. Furthermore, the government must take a stance against the use of cruel confinement practices in the poultry industry, such as the use of farrowing crates, sow cages, and pens. To guarantee the enforcement of these regulations, it is imperative that the Veterinary Act of 2015 and the Animal Husbandry Act of 2018 incorporate stringent mechanisms for enforcement and penalties for acts of animal cruelty. By doing so, the government can help cultivate a more compassionate and sustainable agricultural industry in Vietnam (Minh & Minh, L.T.H., 2019).

4.5.2. Producers

4.5.2.1. Changing the attitude

Good animal welfare is based not only on the character of the natural environment but also (and perhaps above all) on the skills, knowledge and commitment of the people

involved. So, if people want to improve animal welfare - as well as food safety, environmental protection and other socially important goals - they must encourage and reward skills, knowledge high level of human knowledge and dedication. With all the effort, it is expected that the local Vietnam pig producers can reshape their occupations to be more like a profession and less like an industry (Knowles & Gentle, M. J., 2018). Producers can provide services instead of just trying to sell products. In this regard, animal production operates more like an industry than a profession. But entering an era where food demand is expected to exceed current production due to the growing world population, climate change and other factors. Only then will food demand be able to do well in food production and look less like a group of industries competing to sell their products, and more like a profession providing an important service (Mangan, 2015).

In the past, when animal production was in the managed of millions of small mixed farmers, this was unthinkable. Today, however, pig farming is a very specialized profession where a high degree of specific skill and knowledge can be expected. Amid the increasing demand for top-notch and secure pork products, there has been a noticeable surge in the trend of certifying farms based on animal welfare, food safety, and other important benchmarks over the past 10 to 20 years (de Jong, 2018). In response, the Ministry of Agriculture and Rural Development (MARD) in Vietnam established a certification program for pig farms that comply with the stringent provisions of the Animal Welfare Law. This program recognizes farms that have effectively executed optimal production practices and attained a superior level of animal welfare. Consequently, the number of pig farms certified under this program has experienced substantial growth over the past decade, reaching over 4,500 in 2020. The successful management of this certification process, which prioritizes better performance over mere reliance on specific media, could bring the animal production industry one step closer to a professional model (MARD, n.d.).

Pig farmers develop a system of self-regulation to show that they adhere to society's moral expectations. The certification program launched by MARD in Vietnam's pig farming industry has sparked a significant shift towards standards and certification in the last 10 to 20 years. As outlined above, people have different views on animal welfare, from physical health and natural living conditions to freedom from pain and suffering. As

consumers become increasingly concerned with animal welfare, they seek transparency and accountability in the industry (Hocking & Hinch, G. N., 2012). This growing demand, combined with heightened awareness of the need to protect both animal welfare and the environment, has driven the trend towards certifying farms based on strict standards. However, to remain relevant and effective, these standards must be informed by the latest scientific research and best practices and regularly reviewed and updated to align with evolving societal expectations (Phillips, et al., 2010).

4.5.2.2. Changing the mindset

Nguyen (2020) conducted landmark research in the Vietnamese dairy and pig sectors that revealed the amazing potential of cognitive-behavioural training to improve both animal welfare and production performance. This innovative technique has established a direct association between improved training and increased levels of animal welfare and production efficiency by educating farmers on the complexity of livestock microflora. Cognitive-behavioural techniques essentially involve re-educating people about their behaviour by targeting on the one hand both the beliefs that underlie the behaviour (attitude) and the behaviour in question access, on the other hand, the maintenance of these beliefs and behaviours have changed. This behaviour change initiation process is a comprehensive process in which all personal and external factors are involved in the behavioural situation (Nguyen, 2020).

The concept of combining cognitive-behavioural training with technical and practical skills training has the potential to revolutionize the livestock industry. Research conducted by Hemsworth et al. (1994, 2002) and Coleman et al. (2000) provides compelling evidence that this approach is both practical and effective, benefiting farmers across a wide range of settings. This training method focuses on transforming farmers' attitudes and behaviours towards animal welfare, resulting in improved production performance and reduced handling stress. By incorporating educational and behavioural techniques, this approach not only enhances the farmer's technical skills, but also encourages a positive and proactive approach to animal welfare practices on the farm. With these results in mind, it is clear that introducing this type of training holds strong potential for the future of the livestock industry (Hemsworth, et al., 2002).

4.5.2.3. Changing the Training approach

Knowing and mastering the techniques that must be used to complete a task is clearly a prerequisite to being able to complete that task. Essential traits like technical knowledge, job satisfaction, and work motivation play a crucial role in determining a farmer's ability to effectively care for their livestock. To ensure optimal animal welfare, farmers must have a solid foundation of knowledge and skills, as well as a positive attitude towards their work. Although there is little data on this for the agricultural sector, this basic principle is widely accepted (Webster, 2012).

The above discussion highlights that farmers obviously need a basic knowledge of the requirements and behaviour of farm animals and must possess a variety of well-developed livestock and management skills to care for and manage the animals. feed them effectively. Thus, while cognitive behavioural training that addresses the key farmer attitudes and behaviours that influence animal fear is crucial for improving animal welfare, it is clear that training knowledge and skills are also fundamental to improving the welfare of commercial livestock. A farmer's productivity, attitudes and behaviour can also have an indirect impact by influencing other important job-related characteristics, such as job satisfaction, work motivation, and job satisfaction work and learning motivation. In many non-agricultural industries, the impact of motivating factors on job satisfaction and, therefore, work motivation has been well recognized (Bell & McEwen, S., 2020).

Hemsworth and Coleman (2011) suggest that farmers' attitudes towards animals can influence job-related characteristics, such as job satisfaction, work motivation, and motivation to learn new skills and knowledge about animals, which in turn can affect job performance of the storekeeper. In fact, Coleman et al. (1998) in a study of pig farmers found that farmers' willingness to attend training sessions at their own pace was correlated with attitudes towards pig traits and towards most pigs. all aspects of working with pigs. Job satisfaction and opinions about working conditions show a similar relationship with attitude. Thus, a farmer's attitude can actually relate to aspects of the job beyond handling animals and thus improving a farmer's attitude towards animals and working with animals. may influence other important job-related characteristics, such as job satisfaction, work motivation, and motivation to learn (Hemsworth, et al., 2002).

Farm animal welfare is an important consideration of corporate sustainability and ESG practices for food businesses, including suppliers, retailers and food processors. It generates

a wide range of actions such as regulation, labelling requirements, and consideration of consumer concerns. All these factors must be taken into account, since they are an opportunity to demonstrate a business' commitment to its stakeholders and corporate sustainability (Eurogroup for Animals, 2021). Studies based on choice experiments and cost estimates have shown that animal-friendly practices can be economically supported by increasing consumers' willingness to pay. To clarify this point, the promotion of animal welfare and sustainability in the agricultural industry can be achieved through a variety of means by companies. These can range from adopting humane animal handling standards, minimizing their environmental impact, and committing to animal-friendly practices such as cage-free egg production. Providing employees with training and education on animal welfare and sustainability, as well as investing in research and development of new technologies that enhance animal welfare and sustainability, are other ways companies can contribute. Furthermore, participating in corporate social responsibility initiatives centred on animal welfare and sustainability can further enhance a company's efforts in this area (Brunori & Janssen, M., 2020).

Companies may boost their sustainability and promote animal wellbeing by incorporating animal welfare principles into their corporate operations and stakeholder relationships. However, it is critical to recognize that these rules come at a cost to farmers, who must devote money and exert effort in order to comply. To make the effort worthwhile, improving consumer awareness regarding animal welfare is critical so that the market can recognize the additional expenditures and farmers' efforts. The recommended techniques can improve both animal welfare and the whole meat business by combining consumer education about ESG variables with corporate sustainability efforts (Nguyen, 2020).

4.5.3. Consumers

Sinclair and Phillips (2019) find that in Vietnam, addressing the lack of public awareness through education and training is seen as an important solution for animal welfare. The ability to recognize the presence of ethical value added is essential to help consumers identify "animal-friendly" products and raise the level of animal welfare above the required minimum (Phillips & Sinclair, A. J., 2019).

If consumers are to play a full role in improving animal welfare, they need to be better informed about current farming methods and their impact on animal welfare. Governments and industries need to be more open about the nature of modern intensive production. This could lead to a larger proportion of consumers willing to pay more for high-welfare foods (FAWC, 2019). The Vietnamese MARD introduced a breakthrough legislation in 2019 that required the labelling of meat products on the package with their production technique, such as organic or conventional. This measure was intended to promote sustainable agricultural techniques and ensure the safety of food items consumed by the general population. The rule was part of MARD's greater objective to enhance openness in the food business and empower customers to make educated decisions about their food's manufacturing techniques. This new labelling system is an important tool for consumers to take control of their health and well-being by selecting food goods made in accordance with their beliefs. MARD has made a step forward in promoting a safer, more sustainable food business for everybody by giving consumers with the knowledge they need to make educated decisions (Nguyen, 2020).

The growing concern for the welfare of domestic animals leads to a growing need for documentation and understanding of animal welfare and its measures, as well as related education. The MARD in Vietnam launched an ambitious "Animal Welfare Strategic Plan" in 2019, aimed at elevating public consciousness of animal welfare and providing support for organizations and initiatives dedicated to it. The plan calls for the creation of an animal welfare council and the establishment of national standards while emphasizing the need for effective communication among stakeholders to ensure the successful execution of animal welfare efforts. This plan represents a significant step forward in Vietnam's commitment to promoting animal welfare and advancing the country's approach to this important issue. In short, the ability to strategically plan animal welfare communication with different stakeholders should be included as a key outcome (MARD, 2020).

4.5.4. Financial Institutions and Other Corporates

4.5.4.1. Integrity Management

The starting point is the existence of a document to formalize animal welfare policies, such as a code of practice or a statement of guiding principles, recognized by indicators current animal welfare (Amos N, 2020). In assessing animal welfare, several markers such as death occurrences, ailment prevalence, and evaluations of behaviour and well-being are employed. These metrics play a crucial role in verifying adherence to animal welfare protocols and determining areas that require enhancement. It is imperative to acknowledge the significance of the existing animal welfare indicators as they contribute significantly to the successful execution and enforcement of animal welfare policies. By doing so, animal welfare is given due consideration in any modifications to animal welfare practices, leading to a more conscious and compassionate approach. Consequently, this recognition involves a moral commitment, regarding the integrity of the economic model (Nguyen & Nguyen, C.T., 2020).

The concept of integrity is at the heart of an effective ethics program: do the right thing, always (P, 2010). Incorporating ethical and responsible standards into the management of farm animal welfare involves taking a steadfast commitment to fulfil animal welfare obligations. To embody such principles, companies must integrate integrity into their governance and operational systems through the implementation of clear and comprehensive animal welfare policies, the establishment of efficient monitoring and reporting systems, and the provision of comprehensive training and education programs for employees to raise awareness of their critical role in upholding animal welfare (Nguyen, 2020). However, this is only the starting point for effective implementation. Understanding how companies structure their governance and management is especially important in the case of farm animal welfare. The implementation of sound animal welfare policies demands a robust corporate governance and management system centred around principles of integrity. This includes creating policies that ensure transparency, accountability, and collaboration between stakeholders. To guarantee the effectiveness of these policies, companies should establish regular monitoring and reporting procedures to assess progress and identify areas for improvement. Companies must be equipped to take swift and responsible action to uphold their animal welfare obligations. In doing so, they must ensure

that their leaders and decision-makers are fully aware of the business implications of animal welfare and are ready to respond should any policies or management systems fail to deliver on their promises (Nguyen, 2021).

4.5.4.2. Sustainability Policies

Along with integrity management, the institutions have also made great efforts in monitoring sustainability policies. Corporations have implemented various tactics to ensure the longevity and efficacy of their sustainability practices. These tactics include routine audits, the implementation of reporting systems, and productive discussions with stakeholders. Furthermore, corporations have embraced technological advancements and established corporate social responsibility programs to ensure their policies are not just implemented but implemented in a sustainable manner. It's worth noting that technology has become a crucial factor in keeping a watchful eye on the execution of a company's animal welfare policy in farming. As good corporate governance must ensure the welfare of animals by respecting and implementing appropriate policies, using technology wisely plays a vital role in this process (Nguyen, 2020).

The application of cutting-edge technology in the realm of animal welfare is referred to as "appreciative technology." This technology empowers organizations to keep tabs on their farm animal welfare policies through tracking and reporting of welfare indicators, as well as monitoring and gauging policy implementation. With the adoption of appreciative technology, organizations are able to enhance the long-term viability of their animal welfare practices, ensuring compliance with policies and meeting their animal welfare obligations. Therefore, it is necessary to recognize the value of corporate governance and adopt appreciative technology to achieve the sustainability of an organization (Nguyen, 2020).

4.6. The future to farm animal welfare in Vietnam and pregnant sow

As the attention towards ensuring the well-being of animals expands worldwide, the future of pregnant sow welfare in Vietnam is becoming a subject of growing concern. In the following discourse, I will delve into the aspirations for a more compassionate and sustainable industry, by exploring the examination of the existing national scenario and the

significance of technological advancements. Furthermore, tangible strategies will be delved into, aimed at promoting a shift in perspectives and the implementation of innovative technologies, to foster sustainable animal welfare initiatives.

4.6.1. The vision

4.6.1.1. Analysis of National Status

On the one hand, looking to the future, one can expect the new law to set minimum acceptable standards for farm animal welfare, combined with industry-regulated agricultural assurance programs. Practices that provide third-party oversight of good business practices across a large swath of the agricultural population, and diverse product labels that give consumers the opportunity to support initiatives for more welfare care through their purchase options (Nguyen, 2020). For example, the 2015 Eurobarometer survey conducted to gauge the expectations of EU citizens regarding farm animal welfare revealed a clear public demand for its proper handling. As the survey results indicate, 43% of the respondents believe that animal welfare should be a shared responsibility between businesses and public authorities, while 40% consider it a personal responsibility for every citizen. Only 12% opined that the market forces should dictate animal welfare. This strong public demand for animal welfare in the EU is in sharp contrast with the scenario in emerging markets like Vietnam, where awareness and resources for animal welfare are still lacking. It will, thus, take a sustained effort to raise public awareness and to implement regulations and policies to protect animal welfare in Vietnam (World Animal Protection, 2019).

On the other hand, the national culture is expected to be a promising driving force for improving animal welfare in livestock production in Vietnam, which in turn will impact the market positively. To clarify this point, as society becomes increasingly aware of the importance of animal welfare, the Vietnamese people's cultural values, rooted in a deep respect for both the environment and creatures, provide a promising foundation for advancing this cause in the country's livestock industry. To fully tap into this cultural potential and create lasting change, it is crucial to implement a combination of policy measures and public awareness initiatives (Nguyen, 2021).

The Vietnamese government, recognizing the significance of this issue, has taken steps to address it through the introduction of a five-year National Action Plan for Animal Welfare in 2018. This plan calls for the implementation of animal welfare standards, the

promotion of humane practices, and the development of animal welfare education and training programs. Moreover, a public awareness campaign has been launched to educate the general population on the importance of animal welfare and encourage the adoption of more compassionate animal husbandry practices (Pham, 2020).

It is imperative that these efforts are sustained, as improving animal welfare in the livestock industry has the potential to result in healthier and more sustainable products for consumers. By leveraging the Vietnamese people's cultural values, policymakers and the general public can work together to create a more humane and environmentally responsible industry (Le, 2020). With the right balance of policies and public awareness, this industry can be leveraged to make a lasting change in Vietnam's livestock production market.

4.6.1.2. Technological Revolution

Technology will play a very important role in achieving higher farm animal welfare. The fourth industrial revolution will be characterized by the existence of permanently connected machines and systems throughout the manufacturing process and will rely on technologies such as robotics, artificial intelligence (AI), big data and the Internet of Things (IoT) (Schwab, 2016). Overall, the current digital transformation could be a revolution affecting the sustainable management of farms, increasing agricultural and livestock productivity. Recent advancements in technology are transforming the farm animal welfare sector, providing new tools for farmers to better monitor and care for their animals. The implementation of AI-powered drones and Internet of Things (IoT) enabled smart farming systems enable farmers to closely track the health of their cattle and the environment in which they live. This real-time monitoring allows for adjustments to be made promptly, leading to increased efficiency and productivity, all while maintaining the highest standards of animal welfare (Nguyen, et al., 2020).

The use of unprecedented computer technology namely the Internet of Things Nano (IoNT) in agriculture will lead to the development of a number of precision agricultural applications, making it possible to effectively monitor the environment, plant growth, and even animals individually (Nayyar A, 2017). In fact, this led to a pivotal point in dairy cow management occurred in the year 2020. The Vietnam Academy of Science and Technology reported the successful adoption of IoT technology in Lam Dong province in partnership with the Institute of Biotechnology. Using tags, this technology allows farmers to keep

track of their cows' movements, activities, and health issues. This novel strategy has resulted in a lower environmental footprint, more milk output, and, most importantly, healthier, and more efficient cows (Le, 2020). The use of IoT technology is a perfect example of how technology can be used to improve the welfare of farm animals and propel the business ahead. This project proves the impact of technology on the future state of national meat production, as it shows that technological elements can improve animal health by increasing production processes and reducing the environmental impact of agricultural and livestock operations (Nguyen, D. & Tran, H., 2020).

4.6.2. Practical Solutions to Current Problems

Recent years mark a small but significant movement in the wave of farm animal welfare in Vietnam with many positive signs and achievements in pig production in general and pregnant sows. The Vietnam Swine Association recently published news of a thriving pig farming industry in the country, boasting a rising number of registered farms, now totalling over 3,000. Moreover, the pig population in Vietnam is expanding as well, with a projected 4.5 million sows in 2021. This growth is accompanied by an improvement in pig welfare, with an increasing number of farms adopting welfare standards. The government has taken notice, launching a national initiative aimed at enhancing the well-being of pigs in over 1,500 farms. The program has already shown promising results, with the percentage of pregnant sows receiving appropriate housing and care rising from 30% in 2020 to 40% in 2021 (Vietnam News, 2021). Overall, the animal welfare of pigs in Vietnam is gradually improving, with an increasing number of registered farms and sows, improved welfare standards, and a national program to help pig welfare, and the government expects this uprising trend will continue throughout this decade.

The Mavin Group Joint Stock Company, one of Vietnam's top five pig producers, is dedicated to improving animal welfare standards in pig farming. The firm is ready to make a substantial influence in the sector, with a total herd of 3,950 GGP and GP pigs across six breeding facilities, 20,300 PS heads at 19 PS farms and a production capability of 370,000 pigs from rented and contractual farms. Mavin will receive a \$52 million investment in common shares from the International Finance Corporation (IFC) and the IFC Emerging Asia Fund (IFC, 2022). This funding infusion will allow the firm to grow its herd and significantly enhance its animal care policies. The funds will be used to construct a sow

dormitory on the farm, which will provide a more humane environment for the pigs while also fostering greater health and welfare. The funding will also be used to improve current infrastructure and equipment, as well as to provide training and development for animal care professionals. The IFC intends to monitor progress and enforce animal welfare standards in order to ensure that the investment is utilized to promote animal welfare in a sustainable and long-term way (Vietnam News, 2020).

On December 21st, 2022, the first pig farm and pork producer – Nguyen Khoi Natural pork Jsc. - in Northern Vietnam had announced their commitments and transformation plan from the gestation crate to group housing for pregnant sows (Humane Society International Viet Nam, 2022). This considers a significant movement for Vietnam's farm animal welfare when a small-medium size pig producer takes the risk and pilot to adopt the concepts of farm animal welfare when this industry still considers high risk and require a lot of investment and technical instruction. In fact, the implementation of animal welfare practices is a difficult and expensive undertaking, requiring significant capital investment, training of workers, government regulations, research and development, and convincing consumers to purchase more expensive, humanely raised products (Food Animal Initiative, 2020).

Despite the various hurdles that stand in the way of incorporating animal welfare measures, small to medium-sized pig producers can discover ways to overcome these obstacles. One solution to address the challenges faced by small-medium-sized pig producers in implementing animal welfare practices could be to provide government subsidies and financial support. This could include grants for research and development, training programs for workers, and tax incentives for companies that adopt animal welfare policies (Nguyen & Tran, T. T., 2020). Additionally, partnerships between the government, industry, and NGOs could be established to promote animal welfare and increase consumer education about the benefits of humanely raised products. These initiatives could help offset the costs of implementation and encourage more producers to adopt animal welfare practices, ultimately leading to a more sustainable and humane livestock industry in Vietnam. With the right resources, determination, and commitment, it is possible for these producers to implement sustainable animal welfare programs, regardless of the challenges they face (Le, 2020).

Since then, we can also observe the transition in the pork supply chain when eight retailers follow Nguyen Khoi to the public and their commitment to sell only pork from crate-free farms. In an effort to prioritize animal welfare and humane production practices, eight retailers in Vietnam have made a public commitment to sell pork exclusively from crate-free farms by 2024. These retailers, including Big C, Metro, Lotte Mart, Aeon, Fivimart, Vinmart, Shop & Go, and Hapro, have pledged to source pork from farms that meet the standards of the Animal Welfare Index. Furthermore, they are working closely with suppliers to guarantee that all livestock are treated with care during handling and transportation. This commitment by these prominent retailers is a significant milestone for the pork industry in Vietnam and showcases their dedication to promoting animal welfare. By transitioning to crate-free pork production and ensuring that the farms they source from meet the Animal Welfare Index guidelines, these retailers are driving the pork industry towards a more ethical and humane future (World Animal Protection, 2020).

4.7. Conclusion

In conclusion, enhancing animal welfare in the Vietnamese pork sector brings a host of advantages, including boosted customer satisfaction, economic expansion, and the possibility of accessing the global market. The principle of sustainable development encompasses environmental, economic, and social sustainability, and businesses are becoming increasingly aware of the benefits of sustainable practices. Livestock production contributes to environmental issues such as carbon emissions, water scarcity, and biodiversity loss, and improving animal welfare results in greater food security, economic prosperity, and the attainment of the Sustainable Development Goals (SDGs). The cooperation of the government, consumers, financial institutions, corporations, and industry players is necessary to enhance animal welfare in Vietnam. The current status of animal welfare in Vietnam's farm sector showcases both potential and challenges, with strong demand for animal welfare in the EU and a modest but positive trend towards improvement in the country. Technology will play a critical role in elevating animal welfare through the Fourth Industrial Revolution, while investment support from organizations such as the International Finance Corporation (IFC) can also aid in the promotion of sustainable animal welfare practices. A combination of policy and public awareness initiatives is required to bring about lasting change in the Vietnamese livestock production industry.

CHAPTER 5: CONCLUSION

Animal welfare in the pork production sector is a complex and pressing concern that demands a comprehensive strategy to ensure the welfare of the pigs. The pigs' well-being is influenced by numerous elements, from the living conditions they endure, to the care they receive for their health, to the handling they experience during transport. To truly prioritize the welfare of these animals, it's crucial to craft a strategy that takes into account all of these factors, treating the pigs with dignity and respect every step of the way. This dissertation offers a deep exploration of the subject, starting with an examination of the various animal welfare theories and the Five Freedoms in chapter one, and their implications for a comprehensive approach. Examining the treatment of animals in the pig farming industry, with a specific focus on the use of gestation cages for pregnant sows, expands upon the strong groundwork laid in the previous chapter that delved into the theories of animal welfare and the widely accepted Five Freedoms. The second chapter dives into the specific challenge of gestation cages for pregnant sows, commonly used in the pig farming industry, but widely criticized for their numerous welfare concerns.

The third chapter presents a comprehensive analysis of animal welfare and pork production in Vietnam, exploring the challenges and opportunities for improvement, including an extremely low API score, inadequate infrastructure, limited access to technology, and inadequate enforcement of animal welfare legislation. Building upon this analysis, the final chapter emphasizes the expectations and aspirations for farm animal welfare and pregnant sows in Vietnam, highlighting the importance of collaboration among all stakeholders – the government, consumers, financial institutions, corporations, and individuals – in improving animal welfare and promoting sustainable livestock production practices.

Recently, animal welfare is getting more and more attention and should be considered as the key issue that must be addressed by stakeholders in the agricultural industry. In other words, it must be a priority for all involved in the agricultural industry, and economic variables and welfare assessments must be considered to ensure compliance with applicable rules and ethical animal care. To clarify this point, animal welfare issues in the pork

industry stem from various factors such as inadequate housing conditions, lack of proper health care, and mistreatment during transport. In developing countries, like Vietnam, with a high demand for pork, it is clear to conclude that vegetarianism is not the answer to a long-term development of animal welfare, as it does not address the root causes of animal welfare issues in the pork industry. Thus, effective social, economic, and policy solutions must be implemented to ensure humane animal care in the pork supply chain. As the use of intensive production techniques in the animal industry spreads, it becomes clear that animal welfare in the Vietnamese pork sector is a major problem that demands the concerted attention of all parties concerned. If this issue is not solved, the intensive production of animal products will simply increase, continuing the existing unfavourable conditions.

The conclusions of this study have revealed that to ensure the well-being of animals in the pork production sector producers and animal welfare advocates must pursue a mutually beneficial goal. First, on the producers' side, they have to find economic ways that can encourage animal care values without cutting back on space, bedding, ventilation, staff time, salary, and other factors. Moreover, the focus should not only be on eliminating confinement systems but also on correcting the key factors affecting animal welfare in all systems. As housing is only one of many major problems in animal welfare, a general approach to solve these problems seem difficult but could be a great opportunity for animal advocates and producers to pursue common goals. Additionally, the Fourth Industrial Revolution offers a great chance to invest in Agri-tech and emphasize professionalism in farming through the use of advanced technology and high-skilled workers. This chance is essential for a long-term development of global pork production with animal welfare standards.

Secondly, the government plays a vital role in deploying and sustaining welfare practices for farm animals by regulating and controlling the whole Vietnam pork supply chain. During the study, it was observed that the responsibility for managing farm animals currently falls under multiple Ministries and Departments. Thus, an alternative could be to align all animal welfare under one Ministry with appropriate resources for research, implementation, and enforcement. Moreover, new legislation should be developed to govern animal welfare needs. These regulations should include species-based requirements for housing, feeding, handling, and breeding, and should promote the five freedoms of all

animals, ensuring that regulations affecting animals are in line with OIE animal welfare standards. Education should be the next step to be considered in promoting farm animals to all and the next generation.

The importance of financial organizations such as the World Bank and IFC in boosting animal welfare standards through investments cannot be overstated. Thus, it is crucial to establish a robust animal welfare policy that aids producers in conforming to animal welfare standards or obtaining certification. Fast-food corporations have a responsibility to uphold animal welfare on a global level, and they can do so by taking the reins and committing wholeheartedly to the worldwide animal welfare effort. This can be achieved through the implementation of a comprehensive purchasing agreement, which enforces the sourcing of goods and services only from suppliers who adhere to strict and uncompromising animal welfare standards. In this way, the well-being and comfort of livestock in production systems can be ensured and protected.

Vietnamese consumers also have a significant impact on promoting animal welfare. The influence of consumers' views on animal welfare, such as the increasing demand for positive animal welfare, can bring about a change in policies and practices, making them a critical force in advancing animal welfare. To make this happen, consumers must be made aware of the detrimental effects of animal welfare violations through extensive media campaigns and various government initiatives.

Scientists, researchers, animal welfare activists, and NGOs also have a crucial role to play in raising awareness and promoting animal welfare in livestock production. By collaborating with government agencies to conduct research and contribute scientifically to animal welfare, they can help to enhance animal welfare in livestock production, especially in the context of Vietnam's rapidly growing economy. Though it faces pressing biosecurity issues, including the widespread outbreak of African Swine Fever, Vietnam remains significantly behind in terms of animal welfare indicators. This global concern highlights the urgency for the country to prioritize and address its animal welfare standards. However, research and information on animal welfare in the Vietnamese pork supply chain is limited.

In conclusion, this dissertation highlights the need for a comprehensive and collaborative approach to improve animal welfare in the pork production sector. The role of all stakeholders, including producers, government, financial institutions, corporations, consumers, scientists, researchers, animal advocates, and NGOs, is vital in promoting sustainable livestock production practices and ensuring the well-being of pigs. To make significant progress in this field, a comprehensive research and policy-making agenda must be established to address the challenges faced by the industry and support animal welfare initiatives. In the near future, research and policymaking should concentrate on exploring and implementing cost-effective and feasible solutions for producers, promoting animal welfare education and awareness, and enhancing regulation and enforcement of animal welfare standards. Especially, the Fourth Industrial Revolution presents a once-in-a-lifetime opportunity to invest in Agri-tech and professionalize farming through advanced technology, leading to a more humane and sustainable pork production system. By prioritizing animal welfare and working together, humanity can shape a significant improvement in the quality of life for pigs and the industry as a whole.

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