WELFARE MATTERS

JULY 2023

STATE OF **ANIMAL FARMING** IN SOUTHEAST ASIA

By:

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Glossary

ALTERNATIVE PROTEIN: Plant-based and food-technology alternatives to animal protein. They include food products made from plants (for example, grains, legumes and nuts), fungus (mushrooms), algae, insects and even cultured (lab-grown) meat

ANIMAL WELFARE: means the physical and mental state of an animal in relation to the conditions in which it lives and dies.

ANTIMICROBIAL: A substance that kills microorganisms such as bacteria or mold, or stops them from growing and causing disease.

AMR: Antimicrobial Resistance (AMR) occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death

AVIAN INFLUENZA (AI): a disease primarily affecting birds and is caused by a virus of the Orthomyxoviridae family

BIOSECURITY: means a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population.

BROILER BREEDERS: birds who are the parents of broiler chickens

BROILER CHICKENS: chickens reared for meat production

CATTLE: bovine animals, especially domesticated members of the genus Bos

COMMERCIAL FARMING: the production of crops and farm animals for sale, usually with the use of modern technology

CRATE (GESTATION/FARROWING): is a metal enclosure in which a farmed sow used for breeding may be kept during pregnancy (gestation) and to give birth (farrowing).

DRESSED BIRD/POULTRY: market poultry which has been slaughtered, bled, and the feathers removed

DRESSING PLANT: premises in which poultry are dressed for human consumption

FACTORY FARM: An intensive agricultural operation that prioritizes large volume animal product production using strict production methods, typically away from the public eye.

FAO: Food and Agriculture Organisation of the United Nations

FARM ANIMALS: Domesticated animals that are used by humans either for their body or what comes from their body. Farmed animals have fewer regulations governing their welfare than other species in many countries.

FARROWING: The process of giving birth in swine.

FEEDLOT: A confined area where animals are kept and fed (typically high protein diets) in order for them to gain weight as quickly as possible.

FOOD SAFETY: the proper food handling procedures applied during food preparation, processing, storage, and distribution

GESTATION: Time elapsing from conception until birth.

HUSBANDRY: The ongoing care of an animal.

Sometimes husbandry practices include references to breeding animals.

IMPROVED CHICKEN/POULTRY: offspring of a "native" (i.e. kampung) chicken and a "hybrid" (i.e. trait selected) chicken. The breed shows increased productivity as compared to native breed

INDUSTRIAL ANIMAL AGRICULTURE: the large-scale, intensive production of animals, often involving the routine, harmful use of antibiotics in animals. This compensates for low welfare conditions, even when the animals are not sick.

INDUSTRIAL FARMS: farm where industrial animal agriculture practices take place.

INDIGENOUS or NATIVE CHICKEN/POULTRY: Chickens have lived in rural villages throughout the region for centuries and have adapted to the local environment and conditions.

LIVESTOCK: Another term for farmed animals; different regions of the world specify different species of farmed animals as “livestock”

POULTRY: means all birds reared or kept in captivity for the production of any commercial animal products or for breeding for this purpose, fighting cocks used for any purpose, and all birds used for restocking supplies of game or for breeding for this purpose, until they are released from captivity. Birds that are kept in a single household, the products of which are used within the same household exclusively, are not considered poultry, provided that they have no direct or indirect contact with poultry or poultry facilities. Birds that are kept in captivity for other reasons, including those that are kept for shows, racing, exhibitions, zoological collections and competitions, and for breeding or selling for these purposes, as well as pet birds, are not considered poultry, provided that they have no direct or indirect contact with poultry or poultry facilities.

PULLETS: a young hen, especially one less than one year old.

RUMINANTS: hoofed herbivorous grazing or browsing mammals that are able to acquire nutrients from plant-based food by fermenting it in a specialized stomach prior to digestion, principally through microbial actions. Including cattle, sheep and goats

SEA-6: The 6 countries that are the focus of this report. Namely Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam

SLAUGHTER: means any procedure that causes the death of an animal by bleeding.

SLAUGHTERHOUSE/ABATTOIR: means premises, including facilities for moving or lairaging animals, used for the slaughter of animals to produce animal products and approved by the Veterinary Services or other Competent Authority.

SMALLHOLDER FARMERS: a producer who rears livestock on a limited scale

SPACE ALLOWANCE: means the measure of the floor area and height allocated per individual or body weight of animals.

STALL: an enclosure housing one or a few animals.

STOCKING DENSITY: means the number or body weight of animals per unit area

STUNNING: means any mechanical, electrical,

chemical or other procedure that causes immediate loss of consciousness; when used before slaughter, the loss of consciousness lasts until death from the slaughter process; in the absence of slaughter, the procedure would allow the animal to recover consciousness.

SWINE: the domestic hog, Sus scrofa.

VETERINARIAN: means a person with appropriate education, registered or licensed by the relevant veterinary statutory body of a country to practice veterinary medicine/science in that country

WET MARKET: a market where fresh meat, fish, fruit, vegetables, and sometimes live animals are sold to the public

ZOONOSIS: Animal disease (bacterial, fungal, parasitic, viral, or prion) transmissible to humans. Examples include tuberculosis and rabies.

State of Animal Farming in Southeast Asia

Author Contribution
The project was led by Wanyi Zeng. Lefteris Statharas led the literature review and manuscript writing. Rong-Hui Kan contributed to the trade analyses and the corporate activities in this region. The main authors reviewed and approved the final manuscript.

Acknowledgment
The authors would like to acknowledge the financial support provided by Humane America Animal Foundation (HAAF). This report has received funding from the Food Systems Innovation Fund (https://www.fsrfund.org/about) under agreement FSRF 2021-1-001.

For advice and expertise, we are grateful to Jayasimha Nuggehalli, Dawn Neo and Kate Blaszak. We are also grateful to Gwenisha J Liaw and Amy Corrigan for their support in the editing process of the report, and Doli Rizki Praja Rambe for the interpretation help of some literature. Any mistakes are our own. We would also like to thank GlobalData for the consumer behavior data. The images in the report are taken from We Animals Media (except otherwise stated).

Disclosure of Potential Conflicts of Interest
Data collection and compilation of the report for this study was undertaken while the authors, Lefteris Statharas and Wanyi Zeng, are affiliated with Welfare Matters.

At the point of publication, Welfare Matters is registered as Effective Altruism Singapore Ltd., which is a Company Limited by Guarantee (UEN: 202017909K) non-profit organisation.

The authors declare that they have no competing interests.

We will continue to update this report based on readers' feedback and updated information on the state of animal agriculture in Southeast Asia.

Version 1.2, July 2023

Introduction

Southeast Asia is home to a burgeoning and rapidly evolving landscape of industrial animal agriculture. Over the past few decades, the region has witnessed a significant shift towards intensified production systems to meet the growing demand for animal-based protein. The expansion of industrial animal agriculture and consumption has been driven by factors such as urbanisation, population growth, rising incomes, and higher consumption power.

Large-scale intensive farms are replacing small-scale backyard operations. The scale of industrial animal agriculture in Southeast Asia is huge. This subregion is the world's third largest producer of farmed animals for food – at around 9 billion land animals in 2021. Poultry, including chickens and ducks, is the most farmed, followed by pigs, cattle, sheep, and goats.

In the backdrop of this growth, there are also rising concerns of this industry's impact, such as on climate change, public health and animal welfare. According to a 2021 study in Nature Food, global greenhouse gas emissions for the production of food is close to 19% with the majority coming from the production of animal-based food.[283] Biosecurity is also a critical issue – the concentration of animals in close proximity increases the risk of disease outbreaks; and the use of antibiotics as growth promoters and preventive measures could lead to antimicrobial resistance (AMR). Animal welfare concerns arise from the intensive confinement and production practices, leading to challenges in providing animals with adequate space, enrichment, and access to natural behaviours.

There is scientific evidence that animals are sentient — they are aware of their perceptions, experiences, and emotions. Sentient beings have the ability to suffer and also to experience pleasure. Animal agriculture operations have developed with modern technologies and management practices that maximise efficiency and productivity. It is pertinent to take into consideration how these sentient beings are being treated in the food production system.

This research is a landscape study that aims to offer insights into the scale, distribution, and trends within the animal agriculture industry. We have scoped the focus on six Southeast Asian countries: Indonesia, Malaysia, The Philippines, Singapore, Thailand and Vietnam. They are referred to collectively as SEA-6 in this report. These countries are the largest animal agriculture producers in this region. Singapore is an exception but is relevant to consider for understanding the implications on the food system. As a country that is a high income economy with little local agricultural production, this highly urbanised state is almost entirely dependent upon imports for their food sources.*

* https://www.trade.gov/country-commercial-guides/singapore-agriculture

1 In Chapter 1, we first share some global benchmarks on farm animal welfare for some animals, namely beef cattles, dairy cattles, pigs and broiler chickens. This is based on the latest standards and guidelines by the World Organization of Animal Health (WOAH, founded as OIE). We have also included the welfare considerations for transportation and slaughter processes. This helps us set some reference points for comparing the regional landscape.

2 In Chapter 2, we focus on the state of animal farming in SEA-6. We first outline the legislations relating to farmed animals that exist in each country. Next, through a literature review of country-level reports, company reports, academic research papers, and media articles, we paint a picture of the industrialisation levels of each country for different animals. We then examine the trade dynamics of both live animals and animal products in the region, before discussing some Free Trade Agreements (FTAs) and the impact that they can have on animal welfare.

3 Chapter 3 looks into the public health issues relating to animal agriculture. We provide an overview of the zoonotic disease outbreaks that the region has experienced in the last 15 years. We also share how animal welfare practices are linked to zoonotic diseases and antimicrobial resistance (AMR). Recognising that providing better welfare to farmed animals can be challenging, we highlight some of the barriers such as costs and implementation that need to be addressed.

4 Chapter 4 explores a few stakeholders connected to animal agriculture. First, corporate strategies have a big influence on animal welfare through their policies. We briefly highlight companies that operate in this region, including a few that have made public pledges to commit to addressing animal welfare in their supply chains. Second, we share some insights on this region’s consumer trends, to understand their behaviours, preferences, and cultural factors. Through secondary consumer survey results, we identify the trends in both animal product consumption and of factors that influence consumers’ buying habits. The last section deals with labelling practices in each country. This is an area to learn about because consumers rely on labels to identify the animal welfare standards linked to the animal products that they purchase.

The state of industrial animal agriculture in Southeast Asia is a complex and multifaceted issue, with implications on food security. Understanding the magnitude and dynamics of industrial animal agriculture is essential for addressing these challenges and striving for a more sustainable and compassionate future for the region's food production system.

FARMED ANIMAL STATISTICS

The first step to understanding the industrial animal agriculture industry in each country would be to understand the number of animals that are farmed in each country. However, we did not find direct data on the number of farmed animals. Instead, the Food and Agriculture Organization of the United Nations (FAO) provides the statistics of animals that are slaughtered within national boundaries, irrespective of their origin. [3] We are using these numbers as an indicator of the scale of animal farming in Southeast Asia. Table 1 shows the number of animals that are slaughtered in each of the SEA-6 countries, in the year 2021.

As can be observed, broiler chickens (raised for meat) were by far the most farmed animals. A total of 8.4 billion chickens, which constitutes 96% of all the farmed animals in this table, were raised and slaughtered in the SEA-6 countries. Indonesia was by far the biggest producer, accounting for more than 50% of chickens slaughtered in the region. Thailand and The Philippines were the second and third largest producers of chickens.

Table 1. FAO statistics of animals slaughtered in the SEA-6 countries in 2021 (# of animals)

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam	Total
Broilers	4,573,210,000	622,830,000	1,123,702,000	48,026,000	1,293,884,000	802,354,000	8,464,006,000
Ducks	50,984,000	22,113,000	15,619,000	4,823,000	25,160,000	128,245,000	246,944,000
Swine	5,900,000	1,850,305	20,885,008	484,860	12,371,488	47,176,129	88,667,790
Goats	7,187,010	54,866	3,207,459	572	126,938	1,422,954	11,999,799
Sheep	6,162,866	38,745	8,971	851	12,614	-	6,224,047
Cattle	975,581	120,809	871,363	78	922,308	1,910,582	4,797,991
Geese	-	-	253,000	-	321,000	-	574,000
Turkeys	-	-	404,000	-	-	-	404,000

Ducks were the second most farmed animals in this region. 246 million ducks were raised and slaughtered but there is limited information available regarding how ducks are raised. As a waterfowl, ducks are a very special type of farmed animal that requires both land and water access. This could make the welfare needs of ducks even more complex, but nevertheless very important to address – given the quantity of ducks that are farmed in this region.

Most of the animals in Table 1 are farmed for meat. Besides meat, animals are also farmed for the production of dairy milk and eggs for human consumption. Table 2 above shows the number of hens that were raised in the SEA-6 countries and the total number of eggs (in 1000s) that were produced in 2021.

In total, there were 767 million layer hens in 2021. Layer hens are fewer than broiler chickens but significantly more numerous than farmed ducks. Once again, Indonesia is the largest producer of eggs amongst the SEA-6 countries.

Finally, table 3 shows the number of dairy cows in this region in 2021. While Indonesia is reported to have the highest number of milk producing cattle, Thailand and Vietnam each produced more milk than Indonesia.

Table 2. FAO statistics of layer hens (in # of animals) and eggs laid in SEA-6 countries in 2021

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam	Total
Laying Hens	368,192,000	105,333,000	119,056,000	2,874,000	95,833,000	76,586,000	767,874,000
Eggs(1000s)	114,577,733	13,548,705	13,778,979	546,887	13,132,735	8,220,645	163,805,684

Table 3. FAO statistics of dairy cattle farmed(in # of animals) and milk produced in SEA-6 countries in 2021

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam	Total
Cattle for Milk	578,579	38,754	5,553	-	220,000	313,568	1,156,454
Milk (Tonnes)	962,676	43,797	16,080	-	1,200,000	1,070,800	3,293,353

Chapter 1

WHAT IS ANIMAL WELFARE?

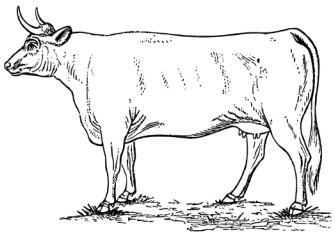
In this first chapter, we try to establish a baseline for the welfare of farmed animals. The concept of animal welfare has evolved over time. Various frameworks and domains have been developed to assess and improve the well-being of animals.

The Routledge's Handbook of Animal Welfare published in 2023 gives an overview of some efforts to find a single indicator that could measure animal welfare. [5] However, each metric suggested has some drawback that makes it inadequate as a single indicator for animal welfare.

Generally, we can view welfare of animals in these three dimensions: biological functioning, affective state, and natural living.[4] By biological functioning, we're describing the satisfaction of the biological needs of the animal. The affective state deals with what the animal experiences as being pleasant or unpleasant while natural living deals with the farm environment and the extent to which it deviates from life in the natural environment for the species.

The Five Freedoms, which is an early framework that was originally proposed by the Brambell Committee in the United Kingdom in 1965, outlines fundamental principles for animal welfare. [6]

"ADEQUATE WELFARE IS ONE WITH MINIMAL SUFFERING. GOOD WELFARE WILL BE A LIFE WORTH LIVING — ONE THAT IS MAINLY WITH POSITIVE EXPERIENCES AND EMOTIONS IN THEIR LIFETIME."



They are:

- Freedom from hunger and thirst: Animals should have access to a suitable diet and fresh water to maintain good health and well-being.
- Freedom from discomfort: Animals should be provided with an appropriate environment that

protects them from physical discomfort.

- Freedom from pain, injury, or disease: Measures should be taken to prevent and alleviate pain, injury, and disease.
- Freedom to express normal behaviour: Animals should have enough space, proper facilities, and the opportunity to engage in natural behaviours.
- Freedom from fear and distress: Animals should not experience fear or distress due to their living conditions, handling, or any other factors.

The Five Freedoms focused mainly on the prevention of animal suffering. Only the freedom to express normal behaviour describes an aspect of "positive welfare" states, but these are mostly absent in this framework. These states include comfort, pleasure, satiation, play, learning, calm, confidence, choice, and interest, which can be linked to inputs such as good space, temperature, air quality, enrichment, and more.

In 2007, the Welfare Quality project had grouped 12 independent criteria into four principles to describe animal welfare[7]:

- Feeding: that includes the criteria of (1) the absence of prolonged hunger and (2) the absence of prolonged thirst
- Housing: that includes the criteria of (3) comfort around resting, (4) thermal comfort and (5) ease of movement
- Health: that includes the criteria of the (6) absence of injuries, (7) disease(7) and (8) pain
- Behaviour: that includes the criteria of the (9) expression of social behaviours, (10) expression of other normal behaviours, (11) good human-animal relationship and (12) positive emotional state

Over time, the Five Domains model started to replace the Five Freedoms as a more comprehensive framework for assessing and understanding animal welfare. The four principles above correspond to the first four domains of the Five Domains of Animal Welfare. Developed by Professor David Mellor (2017), who highlighted that this "is not a definition of animal welfare" but a way "to facilitate systematic, structured, comprehensive and coherent assessment of animal welfare", the five interconnected domains are:

1. **Nutrition:** This domain considers the animal's access to a suitable diet that meets its nutritional needs.
2. **Environment**: The environment domain focuses on the physical and social conditions in which animals are housed or live, including aspects such as space, housing, temperature, and social interactions.
3. **Health:** The health domain encompasses the absence of disease, injury, and pain, as well as the provision of appropriate veterinary care.
4. **Behaviour:** This domain emphasises the expression of natural behaviours and the avoidance of abnormal or stereotypic behaviours.
5. **Mental State**: The mental state domain addresses the emotional well-being and subjective experiences of animals, including factors such as fear, stress, and the ability to experience positive emotions.

As can be seen in Figure 1, the first four

domains need to be fulfilled before leading to the fifth domain – mental state. The Five Domains recognise the interplay between physical health, environmental factors, behaviour, and emotional well-being, providing a framework to assess animal welfare across multiple dimensions.

An ideal approach for farmed animals' welfare will be the Quality of Life (QoL) spectrum. When we talk about the welfare of animals, we need to consider the severity, duration and number of animals affected – whether they are having poor, adequate or good welfare. Poor welfare is considered a life not worth living – one that is full of suffering from birth till death. Adequate welfare is one with minimal suffering. Good welfare will be a life worth living — one that is mainly with positive experiences and emotions in their lifetime.

While these frameworks are helpful to conceptualise animal welfare, it is not sufficient for the purpose of establishing farm animal welfare standards in this region. Thus, we have referred to the World Organisation for Animal Health (WOAH, founded as OIE) for the guidelines on farmed animal welfare. The WOAH is an intergovernmental organisation that aims to disseminate information on animal diseases, improve animal health, and build a safer, healthier, and more sustainable future.[9] The WOAH issues and updates the Terrestrial Animal Health Code (TAHC) with the aim to provide a standard for the improvement of the health and welfare of animals worldwide. While the code serves more as a recommendation, it is meant to ensure the safety of international trade in animals and animal products.

We'd like to highlight that at the time of writing, the WOAH has not released any specific recommendations for the welfare of layer hens. Although some drafts have been written over the years[10], a final version has not yet been published. This is possibly due to the complexity of the issue and the ongoing scientific discourse about the welfare of layer hens. Furthermore, there are no specific guidelines mentioned for duck systems, goat systems and sheep farming systems.

In the following sections, you will find WOAH's recommendations about animal welfare in the production systems for beef cattle, dairy cattle, pigs and broiler chickens. We will also learn about the recommendations for transportation and slaughter of these animals.

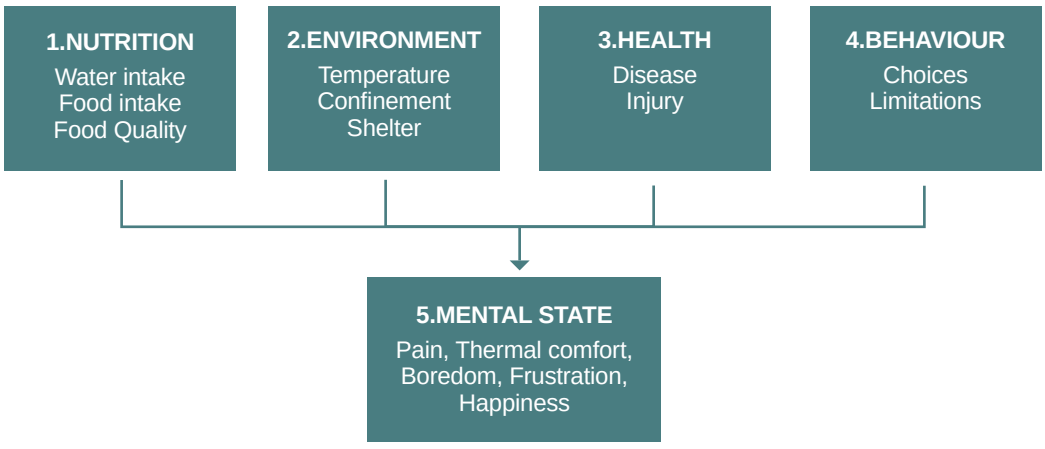


Figure 1. The Five Domains Model of measuring animal Welfare[7]

1.1 WELFARE OF BEEF PRODUCTION SYSTEMS

The WOAH guidelines for beef cattle production systems include intensive, extensive and semi-intensive systems.

Intensive systems are defined as the ones that have cattle in confinement and are fully dependent on humans to provide basic animal needs such as food, shelter and water on a daily basis.

Extensive systems are defined as the ones that have the cattle free to roam outdoors and where the cattle have some autonomy over diet selection (through grazing), water consumption, and access to shelter.

Semi-Intensive systems are defined as the ones where the cattle are exposed to both intensive and extensive husbandry methods either at the same time or varied in accordance with changes in climatic conditions or the physiological state of the cattle.

The outcome-based measurables that indicate the levels of animal welfare include the behaviour of the animals, morbidity and mortality rates, changes in the weight and body condition of the animal, reproductive efficiency, physical appearance, handling responses, and complications due to routine procedure management. Consideration of all of the above measurables should be taken into account when designing and implementing a farming system.

- Behaviour: Some behaviours that might be indicative of an animal welfare problem are decreased feed intake, increased respiratory rate of panting and the demonstration of stereotypic, aggressive, depressive, or other abnormal behaviours.
- Morbidity rates: Disease, lameness, post-procedural complication and injury rates may be direct indicators of the animal welfare status of the whole herd.
- Mortality rates: Depending on the production systems, the determination and estimation of mortality rates can be obtained by analysing causes of death and the rate of the temporospatial pattern of mortality.
- Changes in weight and body condition: Poor body condition and significant weight loss may be an indicator of compromised welfare
- Reproductive efficiency: Low conception rates, high abortion rates, high rates of dystocia, anoestrus, or extended post-partum interval can all be indicators of animal welfare issues.
- Physical appearance: Attributes of physical

Figure 2. Examples of (a) Intensive, (b) Extensive and (c) Semi-Intensive* Beef Production Systems

*Picture taken from Agric4Profits.com

appearance that can indicate poor animal welfare conditions include the presence of ectoparasites, abnormal coat colour, dehydration, emaciation and more.

- Handling responses: Improper handling can cause distress in cattle. Things like a chute or race exit speed, behaviour score, animals slipping or falling, moving with an electric goad, animals striving fences or gates, and more.
- Complications due to routine procedure management: Poorly performed procedures can cause animal welfare problems. Some indicators of poorly performed procedures could be post-procedure infection and swelling, myiasis, mortality, and more.

Other than indicators of poor animal welfare, the WOAH guide offers some recommendations for good animal husbandry practices. Importantly, each farming system should have biosecurity and animal health plans to address the control of the major sources and pathways for the spread of pathogenic agents. The system should be designed to optimize the physical and behavioural health of the cattle herd. In addition, the system needs to include practices for preventing, treating and controlling diseases

1.2 WELFARE FOR DAIRY CATTLE SYSTEMS

Commercial production of dairy cattle can happen in housed systems, pastured systems, or a combination of both.

Housed systems are defined as those in which cattle are kept in a formed surface, indoors or outdoors, and are fully dependent on humans to provide basic animal needs such as food, shelter and water.

Figure 3. Examples of (a) Housed, (b) Pastured and (c) Combination Dairy Cattle systems

Pastured systems are defined as those in which cattle live outdoors and have some autonomy over diet selection, water consumption and access to shelter. The only housing involved in these systems is the building required for milking.

Combination systems are defined as those in which cattle are managed in any combination of housed and pastured production systems. This could happen either simultaneously or be dependent on the weather or physiological conditions of the cattle.

The criteria for the welfare of beef production cattle as mentioned in Chapter 1.1 also apply to dairy cattle. The recommendations made in the following sections will also apply to both types of cattle unless otherwise stated (i.e.,recommendations specific to dairy cattle).

The flooring for all production systems should be well-drained and allow the cattle to lie down and rest at the same time. Special attention should be placed on the areas used for calves. In housed systems, the areas for calving should be cleaned thoroughly and

supplied with fresh bedding between each calving. When pens are used for a group of calves they should be managed in the “all in – all out” principle, and the pens should be cleaned between each group. Outdoor calving pens/fields should be clean and comfortable. Bedding should be provided to all animals that are housed on concrete. The bedding should be suitable (hygienic, non-toxic) and maintained to provide cattle with a clean, dry and comfortable place to lie. No matter the housing, or if the cattle need to be tethered, they should be allowed to stand, lie, maintain normal body posture and groom themselves unimpeded.

Facilities and any pieces of equipment that are maintained and operated for dairy cattle should minimise the risk to the welfare of the cattle. Special care should be given to the nutrition of dairy cattle in the last month of pregnancy in order to minimise calving and post-calving diseases and body condition loss. Liquid milk (or milk replacer) is essential for the healthy growth of calves. As they grow older, an all-milk diet is not sufficient for the physiological growth of the calves. A carefully planned ration of fibrous feed and a starter ration should be implemented after two weeks to promote the healthy development of the rumen.

Semen collection and artificial insemination must be carried out by a trained operator who always tries to minimise the pain and distress of the animal. The birthing process should not be artificially accelerated and only assisted in cases of dystocia. The newborn calves should be taken care of since they are very susceptible to hypothermia. Animal handlers should make sure that the calves are receiving colostrum of satisfactory quality within 24 hours of birth. Colostrum is most beneficial when given 6 hours after birth.

Lastly, milking (hand or machine) should be a calm procedure and should not cause any pain or distress to the animal. A milking routine should be established relative to the stage of lactation and the capacity of the system. Prior to being milked for the first time, animals should be familiarised with the milking facility.

1.3 WELFARE FOR PIG PRODUCTION SYSTEMS

The WOAH guidelines define commercial pig production systems as those that have the purpose of operation, breeding, rearing and management of pigs for the production and sale of pigs or pig meat. These commercial pig production systems could be:

Figure 4. Examples of (a) Indoor, (b) Outdoor pig production systems

Indoor systems where the pigs are kept individually or in groups indoors, and are fully dependent on humans to provide their basic needs such as food and water.

Outdoor systems where the pigs live outdoors in groups or individually, with shelter or shade provided, and they have some autonomy over their access to shelter or shade. They might still be fully dependent on humans for their basic needs of food and water.

Combination systems where the pigs are managed in a combination of indoor and outdoor production systems.

The criteria for the welfare of the pigs are the same as mentioned in Chapter 1.1 In the following sections, special mention will be made only in relation to the recommendations that are more specific to pig production systems.

Procedures that are likely to cause pain or stress to the animal should be performed by trained personnel and, when possible, they should be either replaced, reduced or refined in order to create the minimum amount of stress and pain for the pig. This could include procedures such as surgical castration, tail docking, teeth clipping or grinding, tusk trimming, identification tagging, and nose ringing.

The WOAH guidelines include a provision for pigs to be provided with sufficient environmental enrichment in order to improve their welfare. This includes:

- Suitable materials for the pigs to seek out materials and forage for food rather than simply being handed feed. Novelty is important to maintain the interest of the animals and stimulate their senses.
- Social enrichment involves keeping pigs in groups or individually with visual, olfactory and auditory contact with other pigs.
- Positive human contact such as feeding, pats, rubs, scratching, and talking when the opportunity arises.

The prevention of abnormal behaviours in pig production systems includes a holistic approach to examining the system in order to minimise those behaviours. Some specific examples of abnormal behaviours and their corresponding management solutions are presented in Table 4.

The space allocated for the pigs should allow them to lie, stand and feed. The stocking density should not adversely affect the normal behaviour of the pigs. When it comes to group housing, the space might be affected by different factors such as temperature, humidity, floor type and feeding systems. Individual pens should be used only if necessary and should be large enough to allow the pig to stand, lie and turn around without a problem. Special stalls for feeding, insemination, gestation and farrowing should be sized appropriately to allow pigs to:

Figure 5. Examples of conditions like bar biting and tail biting in pig welfare systems

- stand up in their natural stance without contact with any sides of the stall (left, right, back, front or top);
- lie comfortably on their sides without bothering neighbouring pigs or at risk of being injured by other pigs;

Ventilation is important to maintain good air quality, and the ammonia concentration in enclosed housing should not exceed 25 ppm. A good rule of thumb is that if the air quality is a problem for humans, it is also unpleasant for pigs.

Heat stress is a major problem in pig production, especially since pigs have a limited number of sweat glands[17]. If there is a risk of heat stress, animal handlers should make provisions to provide additional water, shade, wallows, fans, and stocking density should be reduced. Larger pigs are especially at risk of heat stress. In case of cold stress, piglets are physiologically compromised. At times when cold stress poses a danger, the animal handlers should provide insulation, extra bedding, heat maps and shelters.

When it comes to farrowing and lactation, sows need to have time to adjust to their farrowing accommodation before they give birth. The farrowing accommodation should provide comfort, warmth and protection to the piglets.

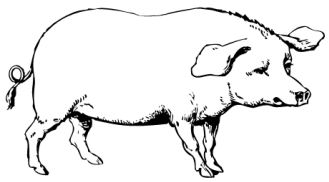


Table 4. Abnormal behaviours and their corresponding management strategies for the welfare of pigs

Abnormal Behaviour	Management Solution
Bar Biting, sham chewing, excessive drinking	1. Providing environmental enrichment 2. Increasing the fibre content in the diet to increase feeding time and satiety
Tail Biting	1. Providing an adequate diet (sufficient in minerals, fibre and essential amino acids) 2. Reducing stocking density 3. Reducing competition for resources 4. Ensuring thermal comfort and air quality 5. Providing Enrichment material
Belly nosing and ear sucking	1. Increasing the weaning age 2. Providing feed to piglets prior to weaning to avoid the abrupt change of feed
Vulva biting	1. Minimising competition for resources 2. Reducing group size

1.4 WELFARE FOR BROILER CHICKEN PRODUCTION SYSTEMS

Broiler birds are of the species Gallus gallus and are kept in commercial meat production systems. These systems include:

Completely housed systems where the broilers are completely confined in a poultry house, with or without environmental control.

Partially housed systems where the broilers are kept in a poultry house with access to a restricted outdoor area.

Completely outdoor systems where the broilers are not confined inside a poultry house at any time during the production period, but are confined in a dedicated outdoor area.

There are different measurables that can and should be used to assess the welfare of the broilers that are in those systems. These measurables are:

- Mortality, culling, and morbidity. These indicators should always be within the expected ranges. A welfare issue could be reflected in an unexpected increase in these indicators.
- Gait. Broilers are prone to developing different infectious and non-infectious musculoskeletal disorders. These disorders might be due to genetics, nutrition, sanitation, lighting, litter quality and other environmental factors. The broiler production systems should adopt a gait scoring system and monitor it closely.

Figure 6. Examples of (a) Housed and (b) Completely outdoor systems

- Contact dermatitis. This condition presents itself when the broilers are in prolonged contact with wet litter or other wet flooring surfaces. Contact dermatitis manifests as blackened skin progressing to erosions and fibrosis of the lower surface of the foot pad. Severe foot conditions may lead to other infections.
- Feather condition. Plumage dirtiness is correlated with contact dermatitis and lameness for individual birds.
- Incidence of diseases, metabolic disorders and parasitic infestations. Poor health of the bird, no matter the cause, could be exacerbated by poor environmental conditions or bad husbandry management.
- Behaviour. Care should be taken by farm workers to walk slowly when interacting with broilers, as walking quickly can startle the birds and lead to a fearful flock. In broiler breeder stocks, this can lead to birds piling on top of one another and suffocation. Furthermore, fearful broilers may be

less productive. If the flock tends to avoid a specific space, this may indicate thermal discomfort, wet litter, or uneven provision of light, food or water. Panting and wing spreading are signs of heat stress or poor air quality. Dust bathing is a normal body maintenance behaviour by which birds work loose material through their feathers. If there is a reduced dust bathing behaviour in the flock, this may indicate problems with litter or range quality such as wet ground. When a reduced feeding or drinking behaviour is observed, this can indicate inadequate feeder/drinker space or placement, dietary imbalance, poor water quality, or feed contamination. The broilers tend to eat and drink less when they are ill or they are experiencing heat/cold stress. Reduced foraging can also suggest problems with litter quality, or conditions that impede the birds' movement. In extreme conditions, the birds may start feather pecking and cannibalising. Methods to reduce these instances include reducing the light intensity, providing foraging materials, nutritional modification, and reducing stocking density.

- Water and feed consumption. The daily intake of water and feed is a good indicator of the welfare of the broilers.
- Performance. There are various indicators to measure the performance of a broiler.
    - Growth rate: the daily weight gain per average broiler in a flock.
    - Feed conversion: expressed as the weight of feed required to produce 1 kg of broiler body weight.
    - Liveability: The percentage of broilers still alive at the end of production.
- Injury rate. Injuries include scratches, feather loss due to pecking and cannibalism, skin lesions, and injuries inflicted during human intervention such as bruises, broken limbs, dislocated hips, and damaged wings.
- Eye conditions. Conjunctivitis is an indicator of dust or ammonia.
- Vocalisation. This can be an indicator of emotional states (positive or negative). Vocalisations can be recognised and interpreted by experienced animal handlers.

When the WOAH guidelines provide suggestions and recommendations, they always include the above measurables as factors that indicate the level of welfare of the broilers. These recommendations also include biosecurity and disease prevention of the flock, whereby the animal handlers and managers of the systems should have programmes in place to ensure the best possible flock health status and control the major routes of transmission of diseases and pathogenic agents.

Thermal environment, lighting, air quality, and noise should be appropriate for the stage of development of the broilers. Extremes of heat, humidity and loud noises should be avoided. Furthermore, the air quality should be monitored with the ammonia concentration not routinely exceeding 25 ppm.

The feed diet should be appropriate to the age and genetics of the broilers. It should provide adequate nutrients to meet their requirements for good health and welfare, and be free from contaminants at a hazardous concentration. Water should always be available to the broilers, with the system being regularly cleaned to avoid the growth of hazardous microorganisms.

Appropriate stocking density for broilers ensures that the birds can access their feed and water, and they can move and adjust their posture normally. The ambient conditions, housing system, production system, ventilation, biosecurity strategy, and genetic stock are some factors that affect stocking density. Access to outdoor areas can be given as soon as the broilers have enough feather cover and the chickens can range safely.

The chickens should be inspected daily with the aim of identifying sick or injured birds (to treat or cull them), detecting and correcting any welfare issues, and removing dead broilers. Other issues like lameness and sudden death syndrome have also been reported as welfare concerns.[284] The inspection should not be too invasive to the flock, with the birds not being injured, frightened, or stressed.

Before slaughter, the birds should not be subject to a prolonged period of feed withdrawal. Catching should happen under dim or blue light to calm broilers, and the process should be designed as such to minimise stress and injury to the birds. The time from catching to slaughter should be minimised as well. The stocking density during transportation should be suitable to climatic conditions to maintain comfort.

1.5 TRANSPORTATION OF ANIMALS

Transportation over the sea, air, or land is a stressful experience for the animal. The WOAH guidelines for animal transportation include 3 different chapters for the 3 different modes of transportation (land, air, and sea). The guidelines are meant to be followed for live domesticated animals: cattle, buffaloes, camels, sheep, goats, pigs, poultry, and equines. [11–13] The welfare of the animal is the paramount consideration and it is the joint responsibility of everyone involved before, during, or after the process.

The guide provides information about the competence in animal welfare that the handlers need to possess in order to ensure the safe trip of the animals. The areas that competence must be shown include:

- Planning of the journey (including space allowance, feed, water and ventilation requirements);
- Responsibilities for the welfare of the animals before, during and after the journey;
- Sources of advice and assistance;
- They should be knowledgeable about the signs of distress, disease and general signs of poor animal welfare such as stress, pain and fatigue;
- If the animal is unfit to travel it should be examined by a veterinarian;
- The handler should be informed about the regulatory requirements;
- The handler should be familiar with general disease prevention including cleaning and disinfection;
- Appropriate methods of animal handling during transport and associated activities such as

assembling, loading and unloading;

- The handler should be familiar in dealing with emergency situations like adverse weather conditions, and extreme situations that might require the euthanasia of the animal;
- Species and age-specific aspects of animal handling and care, including feeding, watering and inspection;
- Maintaining a journey log and other records.

The duration of the journey should be such that the welfare of the animals isn't compromised in any way. With regard to space, each animal should be able to assume its natural position for transport (including during loading and unloading) without coming into contact with the roof or upper deck of the vessel. When animals lie down, there should be enough space for every animal to adopt a normal lying posture. Additionally, during the trip, the animals should be easily accessible and a person should be responsible to check on their safety.

The vessels used for the transportation of animals should be designed, constructed, and fitted as appropriate to the species, size, and weight of the animals. Additionally, they should be safe for both the animals and handlers with minimal protrusions, sharp edges, and sufficient illumination. Ventilation, feeding, and watering systems should be designed to permit access to feed and water to the appropriate species of animals, and in case of a power outage, there should be a backup power supply to maintain ventilation and feed the animals. The guides include more details about the paperwork required for the animals to travel, the procedures to be followed before the trip, during the loading and unloading of the animals, and during the trip. Lastly, there are details about the need for the animal to quarantine in the event that during its import to another country, its entry is rejected.

The guidelines for the air travel of animals also include Table 5, with recommendations for stocking densities of different animals during transport. For land and sea transport, the guidelines mention that the stocking density should be documented but there are no specific numbers provided.

Table 5. Stocking density recommendations for animals traveling by air[10]

Species	Weight (kg)	Density (kg/m2)	Space/ Animal (m2)	No. Animals per 10 m2	Animals per single tier pallet		
					214x264 cm	214x308 cm	234x308 cm
Calves	50	220	0.23	43	24	28	31
	70	246	0.28	35/6	20	23	25
	80	266	0.30	33	18	21	24
	90	280	0.32	31	17	20	22
Cattle	300	344	0.84	11-12	6	7	8
	500	393	1.27	8	4	5	5
	600	408	1.45	6-7	3-4	4	4-5
	700	400	1.63	6	3	3-4	4
Sheep	25	147	0.17	59	32	37	42
	70	196	0.36	27/8	15	18	20
Pigs	25	172	0.15	67	37	44	48
	100	196	0.51	20	10	12	14

1.6 SLAUGHTERING

The WOAH guidelines for the slaughtering of animals are there to ensure the welfare of animals before and during the slaughter process. The slaughterhouses should have a dedicated plan for animal welfare at all stages of the handling of animals until they are killed.[14] Furthermore, the guidelines that should be followed during transport are laid out in the relevant chapters of the guidelines and are summarised in section 1.5 of this report.

The stocking density needs to take into account the climatic conditions in order to maintain the thermal comfort of the animals inside the containers. During the loading and unloading of the birds, it is important to avoid injuries, and any poultry that arrives at the processing plant with an injury should be recorded. The number of birds with broken or dislocated wings should be less than 2% of the animals with less than 1% being the goal. The guide provides information about the different containers the animals should be kept in, the preferred method of constructing a lairage,

Table 6. Minimum current levels for head-only stunning

Species	Amperes (A)
Cattle	1.5
Calves	1
Pigs	1.25
Sheep & Goats	1
Lambs	0.7
Ostriches	0.4

Figure 7. Electrode position for pigs for head only stunning [Image from: Humane Slaughter Association]

and practices during the restraining of the animals. A very exhaustive table of handling and restraining methods and the associated animal welfare issues can be found in article 7.5.6 of the WOAH guidelines.

Stunning before slaughter is recommended, and there are different provisions so that the person carrying out the stunning is properly trained and competent. The animals should be restrained and stunned as soon as possible There are 3 methods of stunning mentioned namely, mechanical, electrical, and gas.

Mechanical stunning means that the device is applied in the front of the head and perpendicular to the bone surface. The verification that the animal stunning was successful is made when the below observations are made:

1. The animal collapses immediately and doesn't attempt to stand up;
2. The muscles become rigid immediately after the shot;
3. Normal rhythmic breathing stops;
4. The eyelids remain open with the eyes of the animal facing straight ahead.

Electrical stunning is another form commonly used for stunning animals before slaughter. Electrical stunning uses electrodes that are placed in a way so that they span the brain. The stunning equipment should only be used for the actual stunning or killing. The minimum levels of current for head-only stunning are presented in Table 6.

Poultry is not included in the list above because they are usually stunned in a water bath. The birds are hung on shackles by both legs with the duration between hanging and stunning being kept to a minimum. The head of each bird is immersed in the bath up to the base of their wings. The birds are stunned in groups but different birds have different electrical impedances. This means that the voltage applied in the water bath is adjusted so that the total current is enough to adequately stun the bird with the current lasting for at least 4 seconds. In Table 7 the current for stunning poultry when using a 50Hz alternating current is presented.

The last method discussed in the WOAH guidelines is **gas stunning**, which is still under study. For stunning pigs, the concentration of CO_2 should be preferably 90% by volume. The gas concentration should reach those levels as rapidly as possible and either be kept there until they are dead or until they are unconscious and are then killed by bleeding. Emergency stunning equipment should be available at the point of exit from the stunning chamber and used on animals that appear to not be stunned. Other gas mixtures have been studied in order to cause as little distress to animals as possible.

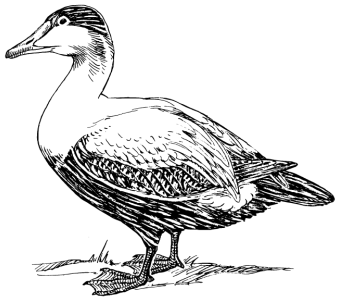
Gas stunning of poultry aims to reduce the pain and suffering associated with hanging conscious poultry under water bath stunning. Live poultry that are being transferred in crates or other appropriate transport modules can be exposed to gradually increasing concentrations of CO_2 until they are stunned. Other gas mixtures for stunning poultry have been studied as well.

The last step for slaughtering is the bleeding of the animal which should occur as soon as the animal is stunned. The maximum time interval between the initial stunning of the animal and the slaughter is 20 seconds for electrical stunning methods or 60 seconds after leaving the gas chamber. The animals should be bled by cutting both carotid arteries or the vessels from which they arise.

As a reminder, all the above information in this chapter does not reflect the real world practices but are guidelines that are suggested by the World Organization of Animal Health(WOAH).

Table 7. Minimum current that needs to be applied per bird for stunning

Species	Current (mA/Bird)
Broilers	100
Layers	100
Turkeys	150
Ducks and geese	130



Chapter 2

LEGISLATION, STATE OF ANIMAL WELFARE & TRADE IN SEA-6

In this chapter, we delve into the current state of animal agriculture in the SEA-6 countries. We will first examine the legal systems, including a summary of the laws pertaining to each aspect of animal welfare across the SEA-6, which is presented in Table 8. Thereafter, the legislation specific to each country is described in more detail. We will then describe the state of animal welfare, in terms of their treatment, transport, and slaughter for poultry, pigs, cattle, sheep, and goats. Additionally, we explore the data on the trade of these animals, shedding light on the regional dynamics. We will also briefly share about the Free Trade Agreements (FTAs) between countries and their impact on animal welfare. By analysing these critical aspects, we aim to gain insights into the progress made and the areas that require further attention in promoting farmed animals' welfare throughout their entire life cycle.

Table 8. Summary of the legislation found with the relevant animal welfare provisions

Animal Welfare	Indonesia	Malaysia	Philippines	Thailand	Singapore	Vietnam
Slaughter (inc. stunning)	Laws 18 2009 (Slaughterhouse methods) Regulation 95 2012 (No stress to the animal) Stunning not mentioned	Animal Welfare Act 2015 (Slaughterhouse License) Codes of veterinary Service (Stunning required) Abattoirs Fees (For Rules)	Department of Agriculture has Administrative orders 12, 41 and 21 Stunning is required	Prevention of Cruelty to Animals and provision of Animal Welfare Act Stunning not mentioned	Wholesome Meat And Fish Act (slaughter practices) Stunning not mentioned	Law on Animal Husbandry 2018 (Slaughter practices) Stunning is required
Transport	Law 18 2009 and Regulation 95 2012	Animal Welfare Act 2015	Animal Welfare Act 1998	Cruelty Prevention and Welfare of Animals Act	Animals and Birds Act 1965 (No cruelty during transportation)	Law on Animal Husbandry (2018)
(Confinement) Stocking density		Animal Welfare Act 2015 (Cage should permit natural position of the animal)	Administrative orders 12 and 41 (minimum space allowance in m^2/animal)			
Ventilation & air quality			Administrative orders 12 and 41 (Specific conditions)	Regulations of the Department of Livestock Development (For poultry)	Singapore Standard 676:2021 (For Layer farms)	
Body mutilation		Animal Welfare Act 2015 (Mutilation as a cruelty offense)	Administrative order 41(no mutilation of pigs)	Animal welfare act		
Antibiotics	Law 18 of 2009 (Medication for Animal Welfare)	Malaysian Veterinary Antimicrobials Guidelines (2021)	Republic Act No. 9711 (Definition of Drugs	Department of Livestock Development	SFA Regulates antibiotics use for animals	Law on Animal Husbandry 2018
Cruelty practices	Article 302 and 303 of the penal code	Animal Welfare Act 2015 (Lists all cruelty offences)	Good Animal Husbandry Practices of 2019	Prevention of Cruelty to Animals and Provision of Animal Welfare Act	Animals and Birds Act	Law on Animal Health 2015 and Animal Husbandry 2018
Fast growth genetics	Law 18 of 2009 (Banned)	Law of Malaysia Act 698 (Feed Act 2009)		2015 Animal Feed Quality Control Act (Banned)	SFA has banned them	Law on Animal Husbandry 2018 (Banned)
Barren conditions	Law no.18 of 2009 (Husbandry and Animal Health)	Animal Welfare Act of 2015 (Animals need to exhibit normal behaviour patterns)	Good Animal Husbandry Practices of 2019			
Killing of animals for disease control purposes		Animal Welfare Act of 2015 (Killing of animals for disease control)	Animal Welfare Act of 1998	Cruelty Prevention and Welfare of Animals Act	The Animals and Birds Act	Law 79 of 2015 Law on Animal Health

2.1 LAWS ON ANIMAL HUSBANDRY IN SOUTHEAST ASIA

INDONESIA

There is also no law that explicitly recognises the sentience of animals in Indonesia. Law No.18 of 2009 on Husbandry and Animal Health defines animal welfare as “all matters relating to animal physical and mental conditions based on the natural behaviour of [the] animal that needs to be applied and enforced for animal protection from any unreasonable action of any person against the animal that is beneficial to human being.”[26]

The Law on Husbandry and Animal Health outlines many practices on animal husbandry that are people-oriented and focuses the resources to be managed for the maximum welfare of the people. Chapter V of the law includes some rules about animal health, with Article 39 mentioning that animal health matters like health improvement, prevention of disease, cure of disease, and health rehabilitation, should be conducted fully, in an integrated manner and continuously. Furthermore, the use of antibiotic growth promoters is banned in Indonesia based on Article 22 Paragraph 4c which states “every person is prohibited from using feed ingredients mixed with certain hormones or antibiotics as supplements”. The word “certain” in the law, implies that some could be allowed.

Article 66 mentions that all measures shall be taken in relation to the catching and handling, placement and multiplication, care, transportation, slaughtering, and killing, as well as reasonable treatment and tender care of any animal that has a backbone or can feel pain.

i. Placement and putting into a stable shall be conducted properly to allow the animal to express its own natural manner.
ii. The animal must be free from hunger, thirst, pain, torture, and misuse, as well as from fear and pressure.
iii. Animal transportation shall be conducted in a manner that ensures the animal isn’t tortured, afraid, or under pressure.
iv. The slaughtering of the animal shall be conducted in a way that the animal is free of pain, fear, torture, and misuse.
v. Torture and misuse of the animal must be avoided.

Regulation 95 of 2012 was implemented to provide further regulation on animal welfare concerning husbandry and animal health. In the regulation, animal welfare is defined as matters related to the physical and mental condition of the animal by its natural behaviour that needs to be applied and enforced to protect the animal from any person's action who is not worthy of the Animal that is exploited by humans.[27]

The regulation also has comprehensive practice guidelines for different systems. When it comes to animal husbandry, the Five Freedoms of the animal are mentioned in article 83 of the regulation. The principle of the Five Freedoms applies to all activities of animal husbandry including catching, handling, placement and caging, maintenance and keep-on, transportation, usage and utilisation, fair treatment and protection of animals, slaughtering and

killing, and comparison medical practice. The good practices guidelines for some of the systems, in brief, are as follows:

1. Good practices in farms include:
    a. Separation of new animals from old animals and the sick from the healthy.
    b. Guarantee cleanliness of the house, equipment, and environment.
    c. Prevent nuisance of animal breeding.
    d. Providing animal drugs under the supervision of a veterinarian.
    e. Feeding safely according to the physiological needs of the animal.
2. Good practices of milking animals include
    a. Guarantee cleanliness of the house, equipment, and environment.
    b. Animal health and hygiene guarantee.
    c. Health and hygiene of the person doing the milking.
    d. Separation of new animals from old animals and the sick from the healthy.
    e. Prevent nuisance of animal breeding.
    f. Providing animal drugs under veterinarian supervision.
    g. Feeding safely according to the physiological needs of the animal
3. Good practices for layer birds (mentioned as “egging poultry” in the text)
    a. Guarantee cleanliness of the house, equipment, and environment.
    b. Animal health and hygiene guarantee.
    c. Health and hygiene of personnel.
    d. Prevention of contamination of eggs by other dangerous biological chemical and physical substances.
    e. Separation of new poultry from old poultry and healthy from sick.
    f. Prevent nuisance of animal breeding.
    g. Providing animal drugs under veterinarian supervision.
    h. Feeding safely according to the physiological needs of the animal.
4. Good practices in the transportation of animals include
    a. Cleanliness of the transportation means.
    b. Animal health and hygiene.
    c. Personnel health and hygiene.

For the slaughtering of animals, Paragraph 5 of Regulation 95 has the requirements for slaughterhouses in the country. The good practices are described as follows:[27]

- check animal’s health before being slaughtered.
- guarantee the cleanliness of facilities, infrastructure, equipment, and environment.
- ensuring the adequacy of the water supply.
- health and hygiene personnel guarantee.

- reduce animal's suffering when being slaughtered.
- Halal slaughter guarantee for the required and clean.
- offal and carcasses health checking after the animal has been slaughtered.
- prevention of contamination of carcasses, meat, and offal from biological, chemical, and physical hazards.

The necessary checks for the animal's health before being slaughtered and for the state of the carcass afterward must be done by a veterinarian. Article 66 of Law 18 stipulates that the animals shall be free from pain, fear pressure, torture, and misuse during the slaughtering process[26]. However, stunning the animal prior to slaughter is not mentioned in the law.

To Summarise

Law 18 of 2009 provides general protections to animals and provides a good starting point that aligns with the Five Freedoms. Furthermore, Regulation 95 of 2012 has some additional examples and proposes animal welfare guidelines that take into consideration both the physical and mental state of the animal. However, no specific enforcement mechanisms of the regulations could be found at the time of writing.

MALAYSIA

There is no law in Malaysia that recognises animal sentience. However, the Animal Welfare Act of 2015, which is applied to all farm animals, recognises that animals feel pain.[21] Any person who commits acts of cruelty to an animal will either be subject to a fine of not less than twenty thousand ringgit (~$4,500 USD) and not more than one hundred thousand ringgit (~$22,614 USD), or to imprisonment for a term not more than three years or both. Cruelty to animals is defined as:

a. Beating, kicking, overloading, overriding, overdriving, torturing, or terrorising any animal.
b. If the owner allows the animals to be used as stated in (a).
c. Failing, as the owner, to provide sufficient food, drink, or shelter.
d. Deliberately or by omission, causing unnecessary pain and suffering, or by allowing the pain and suffering as the owner.
e. The confinement, transportation, lifting, or carrying of an animal in such a way that causes unnecessary pain and suffering.
f. Making an animal work if the animal is so sick, or wounded which makes the animal unfit for work.
g. The mutilation of animals including ear cropping, tail docking, defanging, declawing, branding, piercing, or debarking unless in the manner as determined and certified by a veterinary authority.
h. Skinning, roasting, or killing of a live animal for superstitious belief through a procedure that causes pain and suffering.
i. The extraction of any parts of any live animals through a procedure that causes pain and

suffering to the animals for the purpose of getting skins, oils, or other animal products.

j. Using dynamite, electricity, or poison in any streams, rivers, or other water bodies with the purpose of killing, harvesting, or catching animals.
k. The use of a heavy or short chain or cord or hobbles to tether an animal.
l. The confinement of an animal in a cage or other receptacles that is not sufficient in height, width or length to permit the natural movement of the animal.
m. The sale of an animal that is suffering in pain by reason of mutilation, starvation, thirst, overcrowding, or other ill-treatment.
n. The possession without reasonable cause of an animal that is suffering from all the above.
o. The abandonment of any animal in circumstances that may cause trauma, suffering, and pain due to relocation, starvation, thirst, injury, or illness.
p. To allow an animal to roam free willfully or negligently while the animal is infected with an infectious disease.
q. To allow an animal to die due to neglect of an injury or illness.
r. Organising or participating in animal fighting.
s. Participating, organising, or promoting an animal shooting competition.
t. Organising, participating, or promoting any activity that subjects the animals to cruelty during a sporting activity or during training.

The owner of a license from the government of Malaysia shall take steps to ensure the needs of the animal are fulfilled. Needs include a suitable environment, a suitable diet, exhibition of normal behavioural patterns, being housed with or apart from other animals, and the need for it to be protected from **pain, suffering, injury, and disease.** An animal welfare officer is responsible to check and provide improvement notes to the owners.

For Transportation, the owner is responsible for providing adequate, clean, and sanitary facilities. Additionally, the owner is responsible for providing sufficient food and water for the animals transported. Lastly, no person shall confine or restrain animals in a cruel way.

The killing of animals for religious and customary purposes does not require a license from the government of Malaysia. Abattoirs in Malaysia are separated into different categories based on the system of slaughter, however, all of them are required to have an electrical or mechanical stunner on the premises. [22] Overall, the killing of animals is prohibited unless it is for the following reasons:

For the purpose of human consumption.

a. The animal is incurably ill.
b. The killing is deemed necessary to end the suffering of the animal.
c. The killing is to prevent an imminent danger to the life or limb of humans.
d. For animal population control.

e. Approved killing by an ethics board for research, testing, or teaching procedures.
f. For any other reason approved by a veterinary authority.

The Department of Veterinary Services has issued a document known as the Codes of Veterinary Practices as a guideline for abattoirs in Malaysia. The codes for ruminants, which refer tohoofed herbivorous grazing mammals that acquire nutrients from plant-based food by fermenting it in a specialised stomach prior to digestion (i.e., sheep and goats), mentions that there should be a wall separating the area for stunning andthe animal holding area.[23]. The code for poultry mentions that the suggested method of stunning is an electrical water bath.[24]

The Law of Malaysia Act 698 (Feed Act 2009) defines an antibiotic as a "substance produced by a micro-organism or any other product produced wholly or partially by chemical synthesis, and which in low concentration inhibits the growth of or kills micro-organisms and is used for the purpose of growth stimulation and prevention of diseases". [25] Based on this, antibiotics for the purpose of growth stimulation are still allowed in Malaysia.

To Summarise

While the Animal Welfare Act of 2015 provides general protection to animals, there are no specific protections for farm animals in relation to husbandry, transportation and slaughter. The sentience of animals is not explicitly recognised although the phrasing of "prevention of trauma, pain and suffering" indicates that animals can feel both physical and mental pain. It is hopeful that the National Strategic Plans that the government is forming might put in place more protections to farm animals.

THE PHILIPPINES

Animal sentience is not explicitly recognised by law in The Philippines. However, the Republic Act 8458 entitled "An act to promote animal welfare in the Philippines", otherwise known as "The Animal Welfare Act of 1998" and its amendment Act No. 10631, relates to animal welfare as it pertains to the physical and psychological well-being of animals. According to the Act, animals have the right to be free from fear, distress, harassment, and unnecessary discomfort and pain, and they should be allowed to express normal behaviour. Furthermore, the Act deems it unlawful for any person to torture any animal, to neglect the provision of adequate care, sustenance, or shelter, or maltreat any animal or to subject any dog or horse to dogfights or horse fights, or use the same in research or experiments.[44,45] The government has also issued a pursuant to outline the methods of implementing the rules and regulations of Act 8485. Several task forces have been created to formulate various rules and regulations for the registration, inspection, and monitoring of places that house animals including but not limited to stock farms.[46]

The initial Animal Welfare Act does not mention the Five Freedoms of animals. However, Administrative Orders 2 of 2003 and 19 of 2006 discussing the rules and regulations on the transport of animals by sea and land, respectively clearly mention the Five Freedoms of animals

as the basis of the policy. [47,48] Based on these orders, cruelty in the transportation of animals includes but is not limited to:

1. Unclean, unsanitary, unsafe facilities.
2. Failure to provide sufficient food and water.
3. Overcrowding.
4. Undue exposure of the animal to extreme transport stowage, painful and unnecessary restrain.
5. Lack of ventilation, and exposure to extreme weather.
6. Other analogous situations.

For the slaughter of animals, the Republic Act 8485 mentions that animals shall be killed with the most humane procedures possible. Humane is defined as the most scientific method available as may be determined and approved committee. In 1999 the Department of Agriculture issued Administrative Order No. 21 with the subject: “Code of Conduct in the: A) Euthanasia for Pets/companion Animals and B) Slaughter of Animals for Food”. The order mentions that animals must be stunned prior to slaughter except in the cases of religious rituals. Effective stunning shall be performed by means of:

1. An electric stunner.
2. A firearm in case of cattle, carabao, and matured boars.
3. A mechanical stunner including cartridge and pneumatic captive bolt types.
4. A firearm when stunning any animal not covered in 3.
5. Any other device which effectively stuns an animal in a humane manner.

On April 1st, 2002 the Department of Agriculture released Administrative Order No. 12 entitled “Code of Practice and Minimum Standards for the Welfare of Chickens”. In it, the code takes into account the five basic freedoms of animals as mentioned above.[49]

Furthermore, the Act establishes that all farms with a minimum stocking density of at least 40,000 broilers or 30,000 layers, or 2,000 breeders shall be required to have an attending vet. Section 4 of the Administrative Order mentions that chickens shall be provided with houses and cages that are designed, constructed, and maintained to provide good ventilation and protection from drafts and strong winds to minimise injuries and disease.

In terms of stocking density, Appendices I and II mention:

1. For female broiler breeders from 0 to 20 weeks: 5 pullets/available square meter, 1 brooder

for 500 chicks

2. For female broiler breeders in production: 3.5 to 4 hens/ square meter
3. For male broiler breeders: 4 males/square meter

Chickens shall not be exposed to sharp objects and equipment to avoid injury or pain, and automatic feeders must be checked at least once per day. The minimum light intensity for day-old chicks is 40 lumens, so that the chicks can find food and drink. At night, 10 lumens may be used to reduce agitation and excitement. Appendix III has specific light programmes for different stages of farming.

Ventilation shall be adequate at all times to avoid discomfort. 80% humidity and 30 degrees Celcius temperature shall be provided in an ideal situation. Ammonia levels shall not exceed 20 ppm at the bird level.

Newly hatched chickens have poor abilities to regulate body temperature so an extra heat source shall be available to bring the environment temperature to a comfortable level. This might be required for up to 4-5 weeks. Chickens shall be protected from predators, stray animals, and other birds that may inflict harm, food competition, or disease transmission. The sites of the poultry houses shall be chosen properly to avoid flooding, typhoons, and fires.

For feeds, newly hatched chickens shall have access to food at least 24 to no more than 48 hours after hatching. Growing and adult poultry shall have access to food at least once per day. The diet of the chickens shall contain adequate nutrients to meet their requirements for growth, maintenance of health, and vitality. There shall be enough feeding space per bird and the breeder company's recommendation shall be followed. Water shall be available at all times.

The chickens shall be inspected at least once per day. The same goes for any automatic feeders or water systems. Artificial insemination is a highly skilled procedure and it shall only be carried out by competent and trained professionals. Devoicing is an unacceptable practice and shall not be undertaken. The same goes for any form of flight restriction, and forced moulting.

For slaughtering of chickens, the following rules must be followed

1. Dim or blue lights shall be used when catching the chicken to reduce the struggle of the bird
2. The hauling crate shall contain only the maximum recommended number of chickens
3. No rough handling of the chickens.
4. There must be sufficient ventilation in transport vehicles
5. Stacks of hauling crates shall be well-spaced to provide ample air movement.

6. Stunning machines shall be set appropriately to avoid prolonged struggling and injury of the chickens
7. Chickens shall be immediately bled after stunning and shall no longer be alive by the time they reach the scalding machine.

The Department of Agriculture also issued Administrative Order 41 on September 4th, 2000 entitled “Code of Practice and Minimum Standards for the Welfare of Pigs”. This code also takes into consideration the five basic freedoms of animals as mentioned above. Additionally, a farm that has a stocking level of 300 sows and above would require a resident veterinarian on the premises. Farms with more than 20 sow levels shall be registered at the Bureau of Animal Industry. Based on the Act, no person shall[50]

1. Cruelly treat any pig.
2. Omit to supply the pig with proper and sufficient food, water, and shelter.
3. Willfully or wantonly neglect the pig resulting in unnecessary pain, suffering, or distress.
4. Slaughter, brand, mutilate, confine or carry the animal in a way that will cause unnecessary pain or suffering.
5. Keep any pig alive which is in a condition that is cruel to keep it alive.

Limitations are also introduced for some painful husbandry procedures. For example, castration for pigs is only allowed up to14 days of age, tail docking is allowed during the first 3 days of the pig's life and only up to half the tail can be removed. Tethering is allowed with a minimum of 2.5 meters of rope, with the use of a harness that goes around the neck and chest of the pig. Clipping of milk teeth can be done within 2 days of birth provided that no more than one-third of the tooth is removed.

The construction of the housing systems shall be according to the recommendations of either the Bureau of Animal Industry, the International Training Center on Pig Husbandry, or the Philippine College of Swine Practitioners. Walls, ceilings, fittings, and floors shall be made of materials that are easily cleaned. The stocking density is outlined in Tables 2 and 3 with a specific minimum space allowance in m2 /pig according to the weight of the pigs (from 0.11-7.50 m2 /pig). Farrowing (nursing) quarters shall have some means of protecting the piglet from being overlayed by the sow. Sows must be introduced to clean farrowing quarters at least 3-5 days before giving birth. Bottom rails or prongs need to be positioned in a way to allow adequate access for all the piglets to suckle freely at one time.

In regards to temperature requirements, pigs older than 8-10 weeks old can tolerate wide temperature ranges with no abrupt changes. Table 4 has a range of temperatures for comfort (i.e.,

between 15-30 degrees). Newborn piglets, however, are prone to hypothermia. Their rest area shall remain at 32 degrees up to three weeks of age. Ammonia presence shall not exceed 20 ppm in an enclosed pig house. Good air quality is necessary.

Table 6 of the Administrative Order provides some guidelines on the amount of feed required for the different stages of growth of the pig. Importantly, the farm needs to have an adequate inventory of feeds. Only drugs and their proper usage as approved by the Department of Agriculture Bureau of the Animal Industry and the Department of Health bureau of Food and Drugs shall be used.

To Summarise

Animal sentience is not explicitly recognised in the country, but the Animal Welfare Act of 1998 describes animal welfare in terms of both the physical and psychological well-being of animals. Although the regulations for farmed animals in The Philippines were very detailed, these regulations were more than 10 years old which suggests that some regulations might not follow the latest scientific knowledge.In addition, while the regulations discuss the formation of committees to ensure enforcement of the rules, no specific details on the enforcement practices could be found at the time of writing. details on the enforcement practices.

SINGAPORE

In Singapore, there is also no law that recognises animal sentience. However, there are three acts concerning animal welfar: (1) the Animals and Birds Act of 1965 (revised in 2020)[30], (2) the Wholesome Meat and Fish act which was revised in 2001[31], and (3) the Slaughterhouses and Meat Processing Factories Act of 1992[32]. Paragraph 41C of the Animals and Birds Act states that every owner of an animal must ensure that the animal has adequate food, water, shelter and is not treated in a manner that causes unreasonable or unnecessary pain or suffering. [30] The law is intended to be applied to any establishment that holds animals for display, sport, entertainment, sale, breeding, conservation, care, boarding, grooming, treatment, vaccination, inoculation, training, or destruction.

The slaughterhouse rules specify conditions that must be present in order for a slaughterhouse to operate. The rules are as follows:

1. Premises and equipment shall be clean and sanitary.
2. Premises must be well-ventilated. No bad smell or overheating.
3. Interior walls, partitions, and doors shall be smooth and impervious to moisture.
4. Floors should be easily cleaned.
5. Drains of adequate size and of sufficient grade to prevent stagnation of water.

6. The premises shall be well lit, whether naturally or artificially.
7. Toilets and washing facilities shall be adequate for the workers.
8. Outer garments shall be clean and made of a material that is easily cleansed.
9. The materials shall all be of non-corrodible materials.
10. The refuse shall be covered and disposed of daily.
11. Means of exclusion of rats, cockroaches, and other pests.
12. No pets.
13. Supply of water shall be adequate.
14. First aid for the workers.
15. No smoking.

To Summarise

There are no specific laws on farm animal husbandry in the country, which highlights the relatively small industry in the country. The Animals and Birds Act of 1965 (revised in 2020) describes that the owner of any animal should ensure its well-being but it does not describe what unnecessary pain or suffering is. Animal sentience is not explicitly recognised and most of the regulations around the slaughtering of animals has to do with the cleanliness of the premises rather than the welfare of the animals.

THAILAND

Thailand does not explicitly recognise animal sentience, however, the Cruelty Prevention and Welfare of Animal Act of 2014 recognises the capacity of animals to suffer and recognises animal cruelty as any action or inaction that can cause physical or mental suffering, pain, illness, disability or death to an animal. [33] In the same Act, Section 21 mentions some aspects that are not considered cruelty to animals such as killing an animal for food, and some husbandry practices like cutting an ear, the tail, fur, horn, or tusk with reasonable justification and is harmless to an animal or the life of an animal. Furthermore, any person who maltreats an animal or, without necessity, kills an animal by subjecting it to a painful state shall be liable to imprisonment for not more than one month, or a fine of not more than one thousand baht(~$30 USD) or both.[34]

Any other semantics when it comes to the transportation of animals or being an owner of an animal is vague, simply mentioning that proper welfare should be provided to the animal. The Agricultural Standards Act B.E. 2551 of 2008 and B.E. 2561 of 2018 mention the creation of an Agricultural Standards Committee that, among other things, has the authority to create policies, plans, and measures pertaining to the promotion of agricultural standards. Specifically, Section 15 mentions that a technical committee shall be appointed to prepare draft standards for each

“agricultural commodity”. Additionally, it is responsible for establishing good practices for the use of veterinary drugs for food-producing animals. [35,36] Most of the standards, though, deal with production quality rather than animal welfare.

The National Bureau of Agricultural Commodity and Food Standards has issued some standards, known as Good Agricultural Practices, for dairy cattle farms, pig farms, broiler farms, layer farms, and poultry hatcheries to follow. These standards cover environmental management, the mandate to avoid painful procedures, early weaning, breeding, stock density, as well as slaughtering. However, based on our current understanding, adhering to these standards is not compulsory. The main aim of the standards is to produce quality products that will be safe for the consumers, and there is thus less emphasis on the welfare of the animals. Nevertheless, there are some suggestions that focus on animal welfare, and sets standards and indicators for farmers to notice and follow.

The Standard for Dairy Cattle Farms specifically mentions:[37]

1. The farm shall have sufficient space and be of a suitable size for dairy cattle rearing, and not pose any problem to the environment.
2. Farm layout shall be set up in a manner that facilitates hygienic operation, and separated according to the farm activities such as dairy cattle rearing, feed storage, and carcass destruction.
3. The space shall be adequate for hygienic cattle rearing.
4. There are quality standards in place for the feed of the animals.
5. Water shall be sufficient and contamination free.
6. The animals should be effectively surveyed for disease.
7. Care shall be taken for the welfare of dairy cattle. In case of injury, sickness, or deformity, cattle shall be appropriately treated to avoid suffering.
8. Before milking, dairy cows shall be cleaned and free of stress. The raw milk shall be tested for abnormality before milking.

The Standard for Pig Farms mentions that:[38]

1. Pigs should be healthy and grow according to their typical breed.
2. Pigs should have adequate space and stress should not be caused due to overdensity.
3. Injured pigs should be treated immediately. Humane euthanasia shall be performed if the injuries are not sustainable.

4. The animals should be checked for welfare at least once per day.
5. The feed should be of appropriate nutrition to the animals.
6. An adequate number of feed and water containers should be present for the number of pigs
7. A licensed veterinarian with a farm veterinarian supervisor license should be present on-site. Each veterinarian could either be assigned:
    a. 10,000 boars and sows, in addition to 100,000 nursery to growing pigs, or
    b. Up to 20,000 boars and sows, or
    c. Up to 200,000 nursery to growing pigs.
8. Each animal husbandman who graduated in the area of animal husbandry or animal sciences would be responsible for either (1) 3,000 mated/ pregnant/ laboured sows, or (2) 25,000 nursery pigs, or (3) 10,000 growing pigs.
9. Each trained worker must be responsible for up to 200 sows or 2,000 growing to finishing pigs.

The Standard for Broiler Farms mentions that:[39]

1. Broilers should be reared in comfortable conditions without stress.
2. Chickens should be healthy and grow according to their typical breed.
3. Biosecurity rules include limiting visitors, disinfecting vehicles, and any equipment that comes in contact with the chickens.
4. A vaccination programme for chickens should be in place to make sure that they will not be infected or get sick.
5. Feed quality should be compliant with the Feed Quality Control Act.
6. The medicated feed should be kept separate from normal feed and administered with veterinary supervision.
7. Broiler houses should be large enough to allow natural movement without injury.
8. For open systems, the maximum stocking density is 20 kg/m2 and for closed systems, the maximum stocking density is 33kg/m2.
9. The air quality for closed systems should be controlled with ammonia not exceeding 20 ppm at the bird level and carbon dioxide not exceeding 3000 ppm.

The Standard for Layer hen farms mentions that: [40]

1. Layers should be in comfortable conditions with good airflow.

2. Layers should receive the appropriate amount of feed according to their need.
3. Eggs are to be collected at least 3 times a day.
4. Biosecurity rules include limiting visitors, disinfecting vehicles, and any equipment that comes in contact with the chickens.
5. A vaccination programme for chickens should be in place to make sure that they will not be infected or get sick.
6. Housing should be big enough according to the flock size to allow natural movement without the danger of injury.
7. For open systems, the maximum stocking density is 10 heads/m2 for pullets and 5 heads/m^2 for laying hens. For closed systems, the maximum stocking density is 14 heads/m2 for pullets and 7 heads/m^2 for laying hens. For a battery-caged system, the maximum stocking density is 15 heads/m^2 for pullets and for laying hens an area of at least 450 cm^2 per layer, the height above the lowest level of the cage not less than 35 cm or as specified by the trading partners.
8. The air quality for closed systems should be controlled with ammonia not exceeding 20 ppm at the bird level and carbon dioxide not exceeding 5000 ppm.
9. Feed quality should be compliant with the Feed Quality Control Act.
10. The feeders should be placed in the appropriate position so that all pullets and hens have access to them.

The Standard for Poultry Hatchery mentions that: [41]

1. Day-old chicks or ducklings should be handled with care.
2. No sharp equipment should be allowed.
3. Table A2 in the Standard presents the appropriate temperature and relative humidity for egg hatching which varies between 36^{o}C to 38^{o}C abd 60-90% relative humidity

To regulate the slaughtering of animals and the operation of slaughterhouses in Thailand, the Control of Animal Slaughter for the Distribution of Meat Act (B.E. 2559) of 2016 outlines the requirements to obtain a license for a slaughterhouse.[42] This Act, however, does not specify any guidelines about the slaughtering process that needs to be followed. For broiler chickens, the Thai government issued Regulations on the Protection of Poultry at the Time of Killing or Slaughtering in 2011. In those regulations, it is mentioned that the poultry needs to be free to move and to be fed according to physiological needs. Also, they should have sufficient space and ventilation and

to be devoid of pain and distress during transport, as well as during electrical water-bath stunning before slaughter.[43]

To Summarise

The Cruelty Prevention and Welfare of Animal Act of 2014 does not explicitly recognise animal sentience. However, it recognises that animals can experience both physical and mental pain. The country has issued good practices for animal husbandry but it is unclear at the moment if these standards are mandatory or not. Furthermore, slaughter practices are not very well defined and the law offers no protection to animals in many different slaughter conditions.

VIETNAM

To date, there is no law that recognises the sentience of animals in Vietnam. Nevertheless, the 2015 Law on Animal Health stipulates that individuals and organisations have a duty to care for, rear, and nurture animals, treat them humanely and minimise pain and fear.[28] Similarly, the 2018 Law on Animal Husbandry prohibits the ill-treatment of livestock in rearing, transport, slaughter, and scientific research.[29]

The language of the 2018 Law on Animal Husbandry is not very specific and does not provide guidelines for the practice of raising animals. However, it mentions that it is forbidden to use prohibited substances and antibiotics other than veterinary drugs permitted for circulation in Vietnam, and the use of antibiotics to stimulate growth is prohibited.

For farming practices, article 69 states that organisations and individuals engaged in livestock production activities must

1. Have cages, sheds, farms, and general livestock production space suitable for the livestock.
2. Provide enough food and water for assurance of hygiene.
3. Provide disease prevention treatment in accordance with the law on veterinary drugs.
4. Not beat or ill-treat the animals.

For the transport of animals, there must be suitable equipment to transport the livestock, ensuring airy space and restricting any trauma and fear for the animal. Individuals in charge of transporting the livestock should also not beat the animal.

For the slaughtering of animals individuals or organisations in charge of the slaughter process must comply with the below:

1. Provide enough water while the animal is pending slaughter and ensure hygiene.

2. Restrict fear and pain to livestock. No beating or ill-treatment of the animal.
3. Ensure that the livestock is unconscious before slaughter, and do not let other animals witness the slaughter of another.

To Summarise

Vietnam has very little information in terms of the legislation protecting farm animals. The Law on Animal Husbandry of 2018 and the Law on Animal Health of 2015 state that it is prohibited to “ill-treat” animals. However, there are no further details to describe what constitutes ill-treatment. Furthermore, no information about enforcement mechanisms of the law could be found at the time of writing.

There are various levels of legislation in the countries with protections for farmed animals. The laws of the Philippines seem to include the most specific terms within the region, with Thailand also setting many regulations that dictate the recommended conditions in different production systems. Although the laws to protect farmed animals in Malaysia are not as strict, there are enforcement policies in place. Singapore and Vietnam were the countries with the least amount of information available. For Singapore, it is a reflection of the relatively small industry due to the small size of the country, while many of the laws only came into effect in the last five years for Vietnam, which suggests that the country will probably continue to evolve and adapt. Future work should entail following the trends for legislation in each country more closely, as well as further investigation into the enforcement policies for each law to identify areas for improvement.

2.2 CURRENT STATE OF LITERATURE ON ANIMAL AGRICULTURE IN SOUTHEAST ASIA

The ultimate task of the report is to understand the actual experience and the extent of industrial animal agriculture in the region. In Figures 8a and 8b two bar graph representations of the animals slaughtered in the year 2021 for the SEA-6 countries. The data are represented in two graphs since the scale of chickens slaughtered for the year is so much larger, the numbers for the rest of the animals wouldn't be visible in the same scale. Furthermore, in Figures 9 and 10 the numbers of animals used for dairy milk and egg laying are presented, as well as the total amount of milk (in tonnes) and total number of eggs (in 1000s of eggs).

Unfortunately, information about the conditions in commercial or backyard farms is not easy to acquire, especially since welfare is not routinely assessed: commercial farms are not required to disclose their exact practices and backyard farms may have varied levels of animal welfare practices depending on the owner of the farm, the type(s) of animals reared, and the purpose of farming the animals. As such, in order to get an overview of the current state of animal husbandry in Southeast Asia, animal farming systems of different scales in each country were looked at.

Country-level reports, company reports, academic research papers, and media exposés were referred to in order to paint a full picture of the industrialisation levels of each country. This included information regarding the different types of farms such as their size and geographical location, the size and costs of production, and supply chain information across production systems (poultry, pig, cattle, sheep/goat) wherever possible and available.

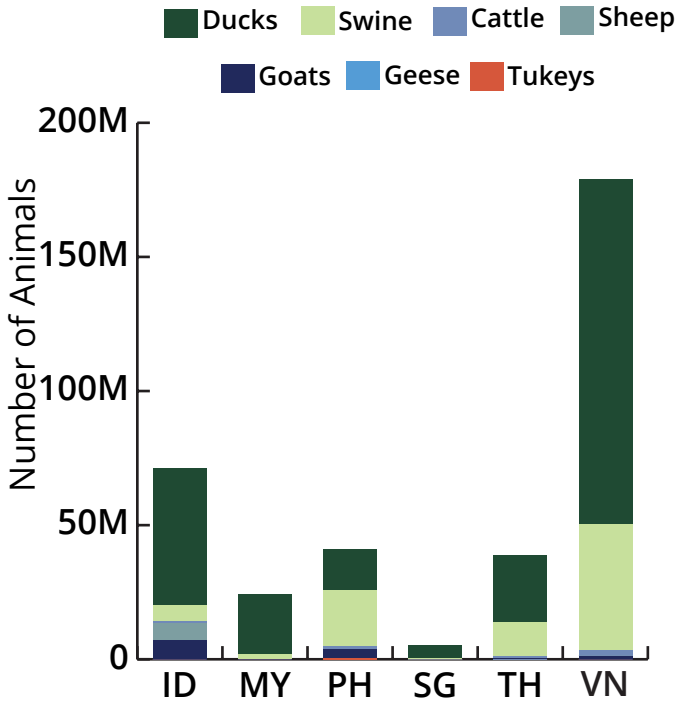


Figure 8a. FAO statistics for # of animals slaughtered in each country in 2021.

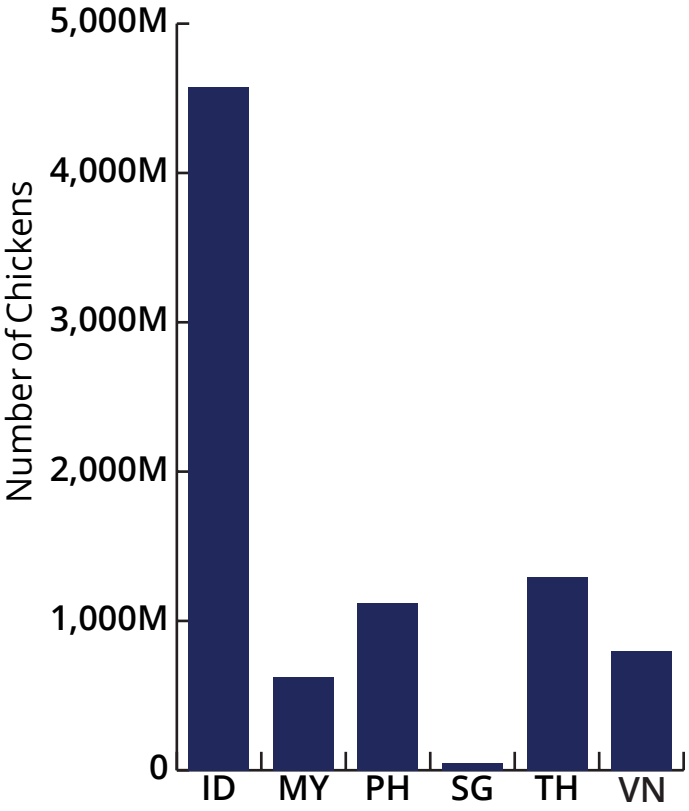


Figure 8b. FAO statistics for # of chickens slaughtered in each country in 2021

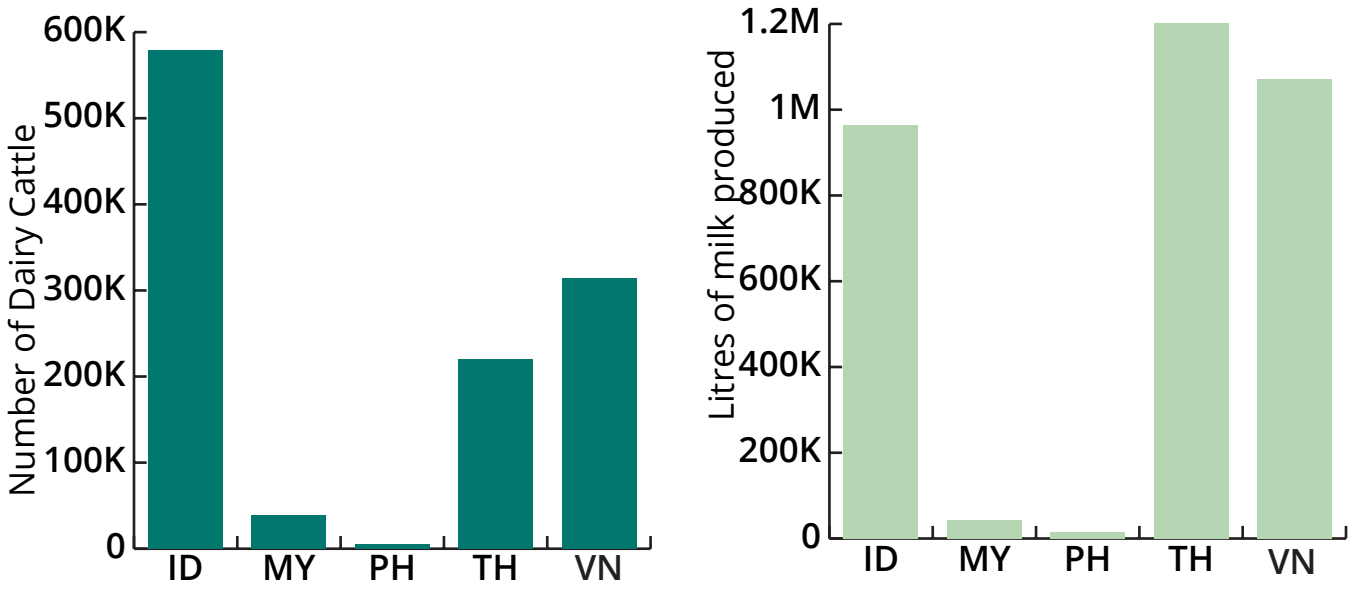


Figure 9. FAO statistics of dairy cattle farmed (in # of animals) and milk produced in SEA-6 countries in 2021

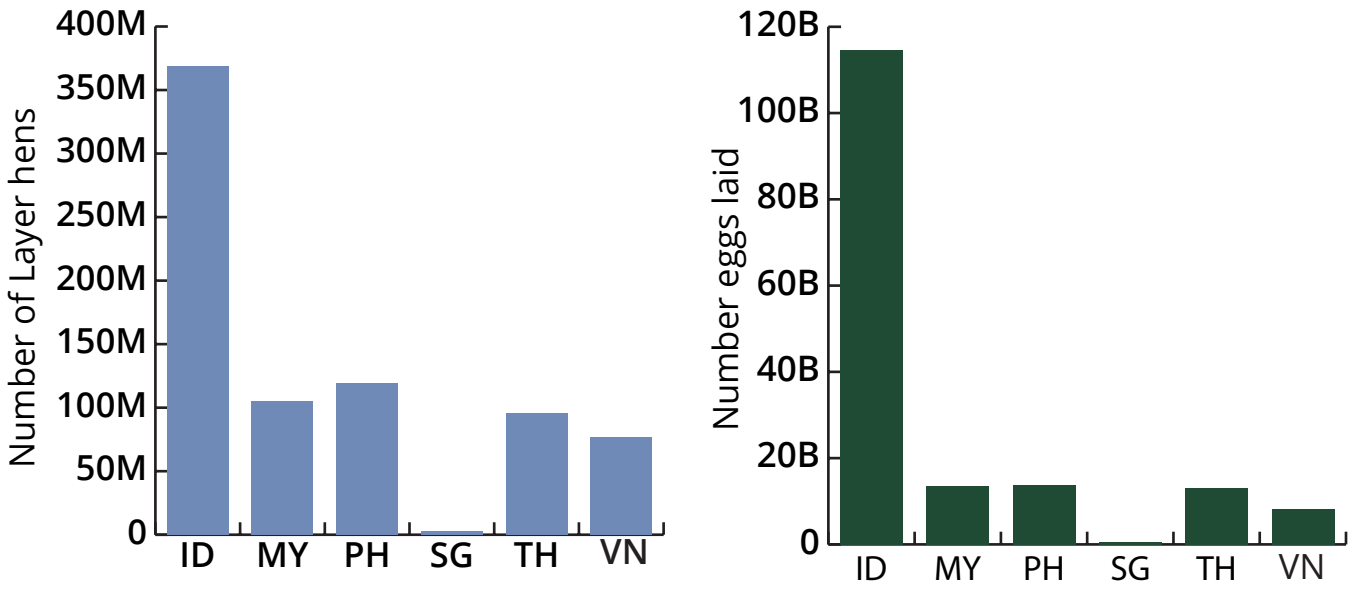
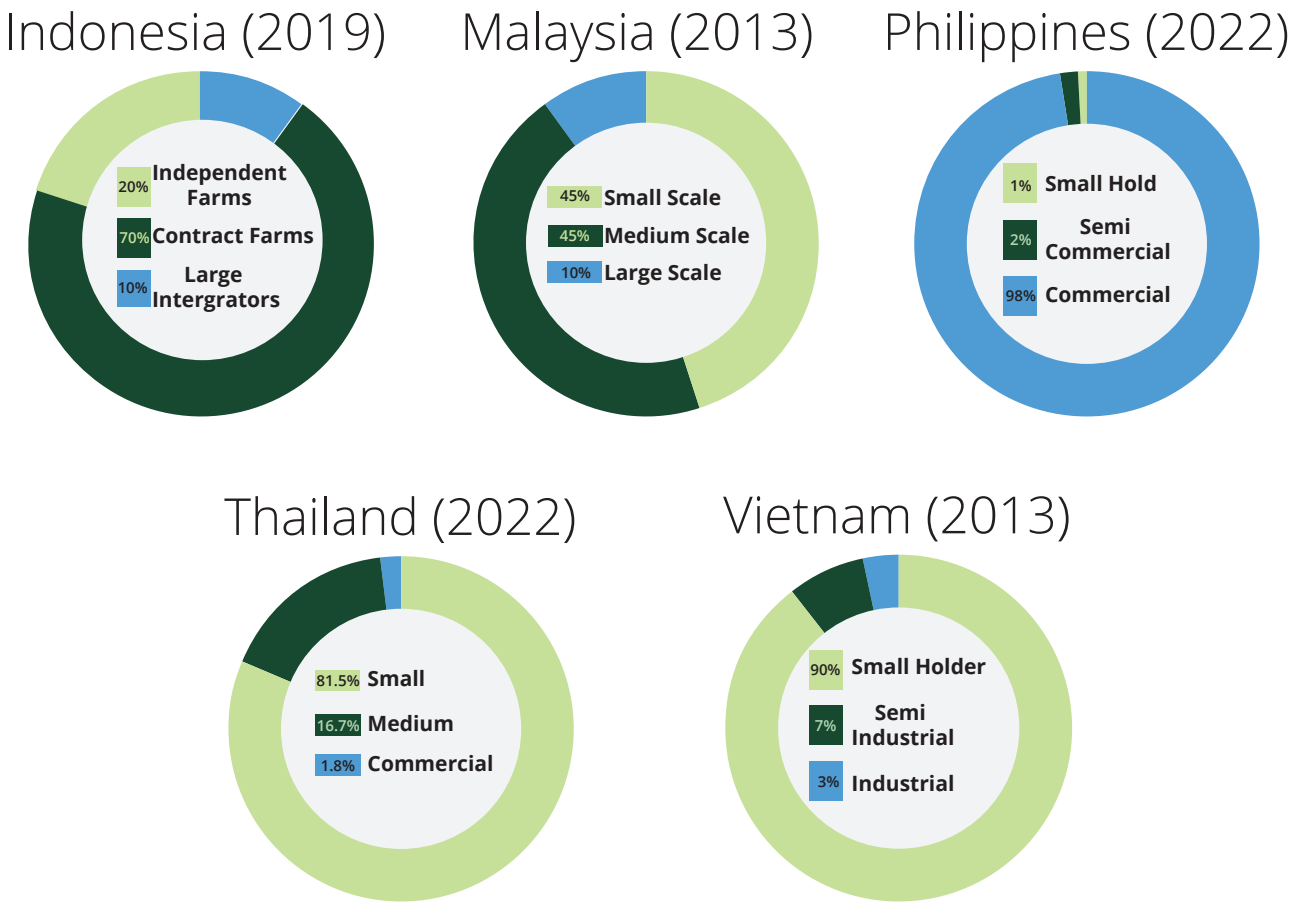


Figure 10. FAO statistics of layer hens (in # of animals) and eggs laid in SEA-6 countries in 2021

POULTRY FARMING

Chickens are the most farmed animals in the region by far. However, this does not come as a surprise since chickens are the most farmed animals globally.[51] Figure 11 presents a consolidated graphical representation for the different types of farms that are most prevalent in the region. Even though the data per country cannot be directly compared with each other, the results are enough to showcase the high level of industrialisation in the region.



Note that the charts are only showing the number of **farms and are **not representative of the proportion of chickens** relative to the conditions that they are farmed in.*

Figure 11. Industrialisation numbers for poultry farms in SEA-6

As each reference used to learn about the scale of poultry farms in the region employed different definitions for small-, medium- and large-scale farms,Figure 12 was constructed to be a reference for the rest of this report and summarise the differences in terms of the number of animals across the different scales of farms in the SEA-6 countries.

The following sections contain short analyses of the poultry industry in each SEA-6 country. In general,

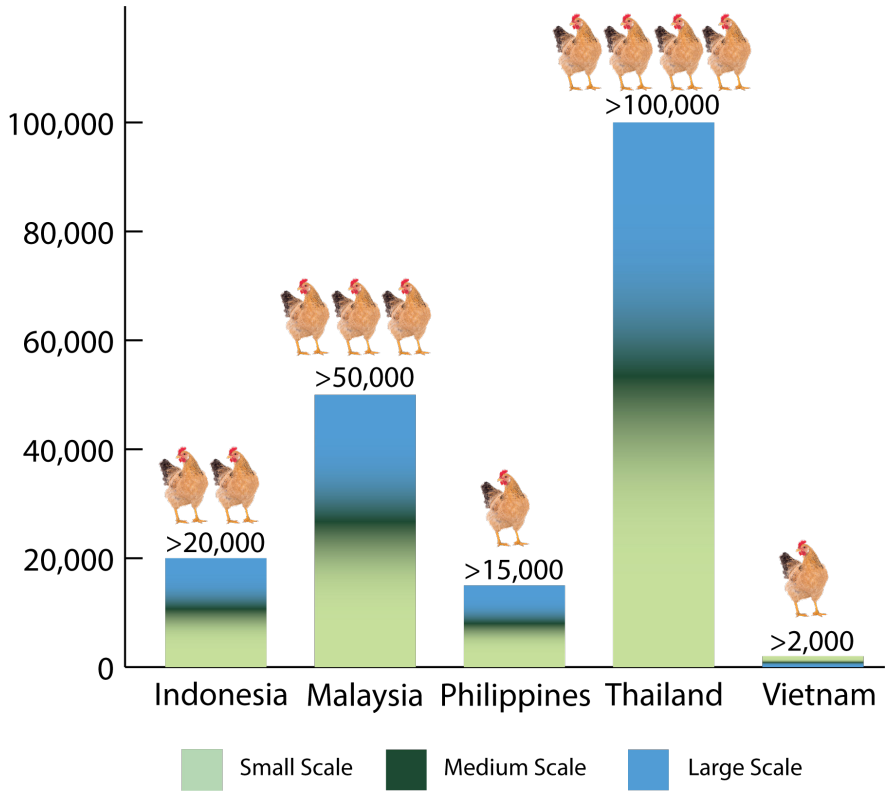


Figure 12. Different definitions of scales of broiler farms in SEA-6 countries

Thailand's poultry production industry is currently the largest in the region, with the Malaysian and Indonesian governments and industries pushing for modernisation in relation to production as well. In the Philippines and Vietnam, poultry farming still mostly occurs in smallholder farms. In most of the countries, it was observed that the highest cost for production is attributed to feed cost, which can amount to up to 70% of the cost with the remaining 30% being allocated to labour and running costs.

INDONESIA

In Indonesia, domestic chicken consumption has increased from 3.5 to 6 kilograms per person per year between 2010 and 2019[52]. Large corporations played a major role in enabling Indonesia to upgrade their existing technologies on a large scale, thereby enabling them to be self-sufficient in their supplies . 60% of poultry production is estimated to come from industrial farms (closed housing system), while 40% remain in the hands of small and mid-sized players (open housing system)[53]. Furthermore, 10% of the industrial farms are large conglomerates with mostly integrated process lines, from breeding to slaughter and transport. The other 70% are contractors, while 20% are independent farms.[52]

A 2022 study sheds a bit more light on the independent smallholder farms in Indonesia.

The study was conducted in Western Java specifically, and the three most common types of smallholder broiler farmers are:

A. Independent - farmers buy production inputs and sell chickens themselves.
B. Makloon-contract - farmers are paid by a large poultry company based on the number of day-old chicks at the start of the production cycle.
C. Price-contract - farmers have a contract with a larger poultry company to get production inputs and technical assistance on a credit basis and to sell their chickens to them at a predetermined price.[54]

The average farm size is small, with a capacity for 5,000-20,000 birds. Birds are grown to 1.0-2.0kg (average of around 1.4kg at 30 days of age).[55] Mortality on broiler farms is 6-7%. The average feed conversion ratio (FCR), which measures the efficiency of the feed required to produce the desired amount of body weight for meat production, is about 1.6-1.7:1, with significant variation throughout the country due to widely differing housing, animal health, and management practices.[55] .

For the costs of production, up to 70.62% of the costs incurred are for the purchase of poultry feed. Wage employees received a financing portion of 10.02%. Meanwhile, the establishments spent 19.36% of the funds on fuel, electricity, water, medicines, day-old chicks (DOC) purchase, and other expenses.[58] The supply chain of broiler chickens in Indonesia can be seen in Figure 13 below.

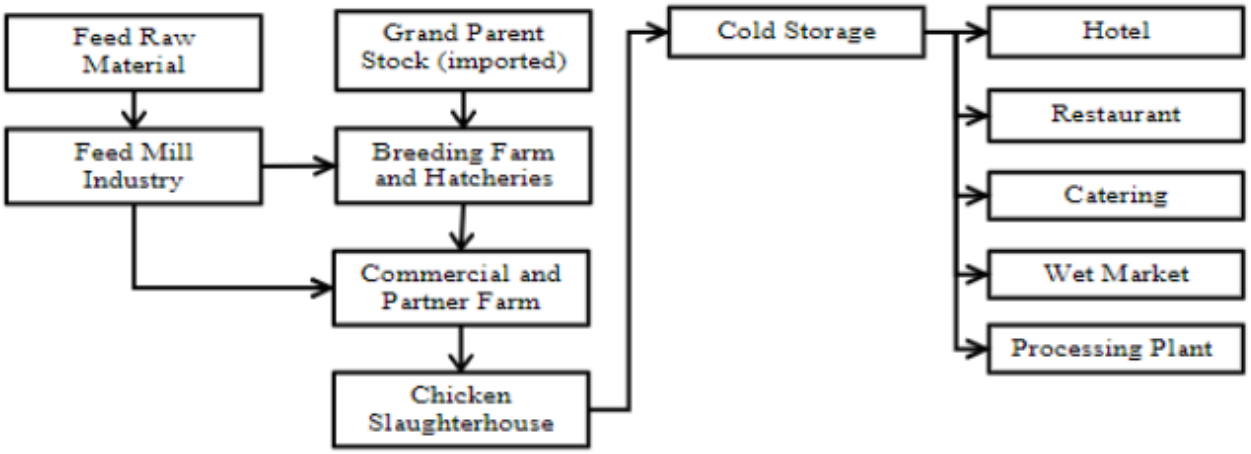


Figure 13. The supply chain of Broilers in Indonesia

Cage-free Innovation and Welfare Hub in Indonesia by Global Food Partners (GFP), the Faculty of Animal Science UGM and Aeres University of Applied Sciences

The Cage-free Innovation and Welfare Hub was jointly set up in Yogyakarta, Indonesia to support the local producers in cage-free production. Its aim is to allow egg farmers to achieve long-term success in their efforts for cage-free egg production. The cage-free system is a hybrid closed house system for 3,000 layer hens. The farm at this hub serves as a model farm for cage-free producers to learn from and as a research centre for producers in Asia. [56,57]

MALAYSIA

In Malaysia, there are 2,606 recognised broiler grower farms. About 30% of these broiler chickens are channelled through modern processing plants and are sold in supermarkets and fast-food outlets while the remainder is still sold as live or dressed birds in wet markets. There are tentative steps being taken by the government to stop the chicken slaughter in live bird markets for hygiene and environmental reasons. [59] As Malaysia aims to export at least 30% of their broiler chickens by 2030, the deputy prime minister in 2017 claimed that the level of sufficiency for poultry in Malaysia was 128% and contributed to 75% of the national livestock industry [60]. Technically speaking, this means that Malaysia has no need to import any poultry into the country.

In 2022, the Ministry of Agriculture and Food Industries had to extend production subsidies by RM0.80 (USD$0.17) per kilogram for chicken and RM0.08 (USD$0.017) per egg for the producers. This was intended to help ease the burden of the rising costs of production across the board, especially for imported chicken feed that accounts for 70% of broiler farms' operating costs.[61] In June 2022, the Malaysian government instituted a ban on chicken export from the country. As the government controls the price of chicken at retail (USD$2.03 per kilogram), some farmers could not bear the higher feed costs and could barely make any profit. As a result, some of these layer farms had to stop production or re-formulate their feeds to reduce cost and avoid losses, resulting in the slow growth of chicks.[62]

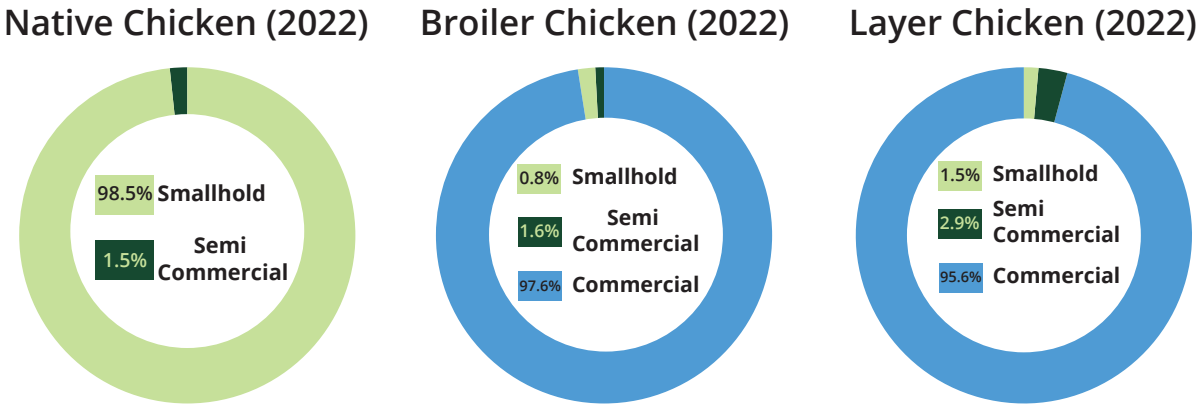
There are two types of producers in the poultry industry of Malaysia:

- Commercial farms that run a business on a contract farming basis with an integrator.
- Conventional farms that belong to independent entrepreneurs.[63]

Based on data surveyed in 2009, 22.9% of all farms in the country are large farms with more than 50,000 broilers per cycle (5-7 weeks[64]). 26.2% are medium-scale farms carrying 20,000-50,000 broilers per cycle, while the rest are small farms with up to 20,000 broilers per cycle. There also exists the practice of backyard farming of indigenous chicken, which involves about 120,000 farmers.. However this farming practice is mostly used for subsistence farming rather than for commercial purposes, and thus only contributed approximately 1% to the national

production of poultry meat. In general, the government is promoting the use of modern technology in line with good farming practices, such as a closed-house system and automation. This would imply that more smaller farmers would be contracted and the life of the animals would be significantly altered when they are farmed in more industrial closed-house systems.

THE PHILIPPINES



Note that the charts are only showing the number of **farms and are **not representative of the proportion of chickens** relative to the conditions that they are farmed in.*

Figure 14. Distribution of Native, Broiler and Layer Chickens in farm systems in the Philippines.

In the Philippines, small-scale food producers, farmers, forest producers, fishers and herders play a very important role in the country since they produce 80% of the region's food.[65] According to the Philippines Statistics Authority, the production of chicken increased in 2022 by 6.7% compared to 2021. In terms of the distribution by classification as seen in Figure 5, 98.5% of the total native/improved chicken were raised by smallholder farms (<500 birds for broilers and <250 birds for layers). In contrast, the bulk of broiler chickens (97.6%) and layer hens (95.6%) came from commercial farms (>10,000 birds for broilers and >5,000 birds for layers). [66]

Several government entities that are responsible for food safety and production exist in the Philippines. For example, the Department of Agriculture (DA) is responsible for food safety in the primary production and post-harvest stages of the supply chain. The Department of Health (DOH) is responsible for the safety of processed and pre-packaged foods, and the conduct of epidemiological studies. The Department of the Interior and Local Government (DILG), in collaboration with the DA and DOH, supervises the enforcement of food safety regulations. Local government units (LGUs) monitor compliance with food safety standards of food businesses such as slaughterhouses, dressing plants, wet markets, supermarkets, school canteens, restaurants, and catering establishments, as well as street food sales.

SINGAPORE

As there is very little local agricultural production, Singapore is highly dependent on imports for its food requirements. The largest producer of eggs in the country is Seng Choon Farm which currently uses cages.[67] Chew's Agriculture is another top producer of eggs in the country that has obtained the "Certified Humane" certification by the US-based Humane Farm Animal Care

(HFAC) organisation, as part of their sustainability work and the loan they got from DBS Bank, which suggests that local banks do support animal welfare initiatives and might be useful to note for similar organisations in the future[68]. Lastly, Toh Thye San Farms has a farm in the north east of the county that are completely corn fed.[69] KSB Distribution is one of the biggest providers of chilled chickens in the country and they report that they provide 25% of Singapore's daily chicken consumption.[70] The country expects its fourth egg farm to begin operations in 2024,which is expected to produce 360 million eggs and up to 5 million day-old chicks per year. This farm will be the first farm in the country to have a full ecosystem of egg production since current egg farms in the country import day-old chicks that lay eggs for consumption. The farm is advertised to use state-of-the-art technology to create a round-the-clock live remote monitoring system.[71] The People for the Ethical Treatment of Animals (PETA) have raised some concerns about animal welfare in these farms, since the production facility of the same company in Japan (ISE Food Holdings) has used wire cages and has had issues with animal welfare.[72]

THAILAND

Over the past four decades, Thailand's poultry sector has transformed itself, changing Thailand from a nation of backyard farmers to one of the world's biggest poultry exporters. One of the main factors for its success is the fact that poultry is the cheapest source of animal protein with a relatively short lifetime, thereby minimising costs. Today, the poultry sector occupies more than half of Thailand's total meat consumption. [73]

The poultry population and production are highly concentrated in central Thailand as

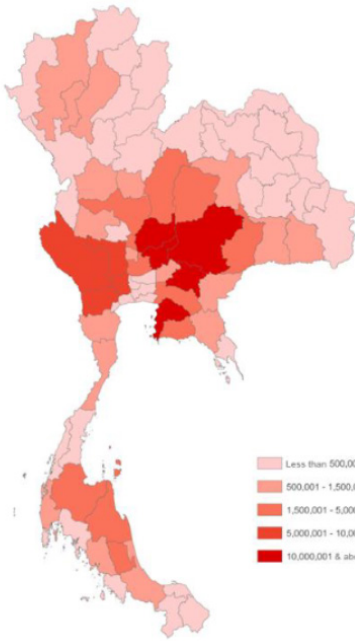


Figure 15. Chicken population density in Thailand for 2013[75]

Table 9. Classification system for poultry production systems as per FAO 2004[74]

	Sector 1	Sector 2	Sector 3	Sector 4
System	Industrial Integrated	Commercial	Commercial	Village or Backyard
Biosecurity	High	Moderate to High	Low to Minimal	Minimal
Bird and Product Marketing	Commerial	Usually Commercial	Birds usually sold in live bird markets	Birds and products consumed locally

broiler producers need to be located near certified slaughterhouses, feed mills and food processing plants. These facilities are also concentrated in central Thailand as can be seen in Figure 15.

The FAO farm practice standard is one of the classifications used to describe poultry sectors based on biosecurity and it was used when the Avian Influenza (AI) outbreak was being studied. The classification system is shown in Table 9.

Large-size farms (i.e. with an average size of 70,000 broiler chickens per farm), which are categorised as Sectors 1 and 2 under the FAO's farm practice standards, account for 90% of the broiler chicken production in the central region.[72] The remaining 10% of production happens in semi-commercial or backyard farms with minimal biosecurity — these broiler chickens are mostly consumed locally at a province level.[76]

Even though 90% of the broiler chickens are produced through big commercial farms in Thailand, 98% of all the producers are backyard or semi-industrial farms. [76] The demand for feed in poultry and swine accounted for 90% of total feed demand. [77]

VIETNAM

In Vietnam, in 2013, smallholders (1–50 birds) accounted for 89.6% of farms; semi-industrial (50–99 birds) were 7.2% and industrial farms (>100 birds) were only 3.25% of all farms. [78] . The highest density of farmed chicken population was observed in the Red River Delta, the Mekong River Delta, and the southeast. Smallholder farms used an estimated 42% of semi-permanent stalls, while simple pens account for 11%.[78] Active antimicrobial ingredients per kilogram of animal are estimated to be 1.6 times higher in Vietnam than in European countries. [79]

Figure 16 was used by Bâtie et al. (2020) to describe the value chain in the chicken production systems. The main goal of the study was to identify the points at which antibiotic usage takes place in order to create communication strategies to reduce misuse. Family commercial farms should be targeted to emphasise the need to seek professional advice wherever possible, which is associated with better antibiotic usage. The other target population could be drugstores, private veterinary practitioners, or corporate veterinarians that provide direct advice to farmers and could act as information relays and provide leverage to foster better antibiotic use on chicken farms in Vietnam[80]

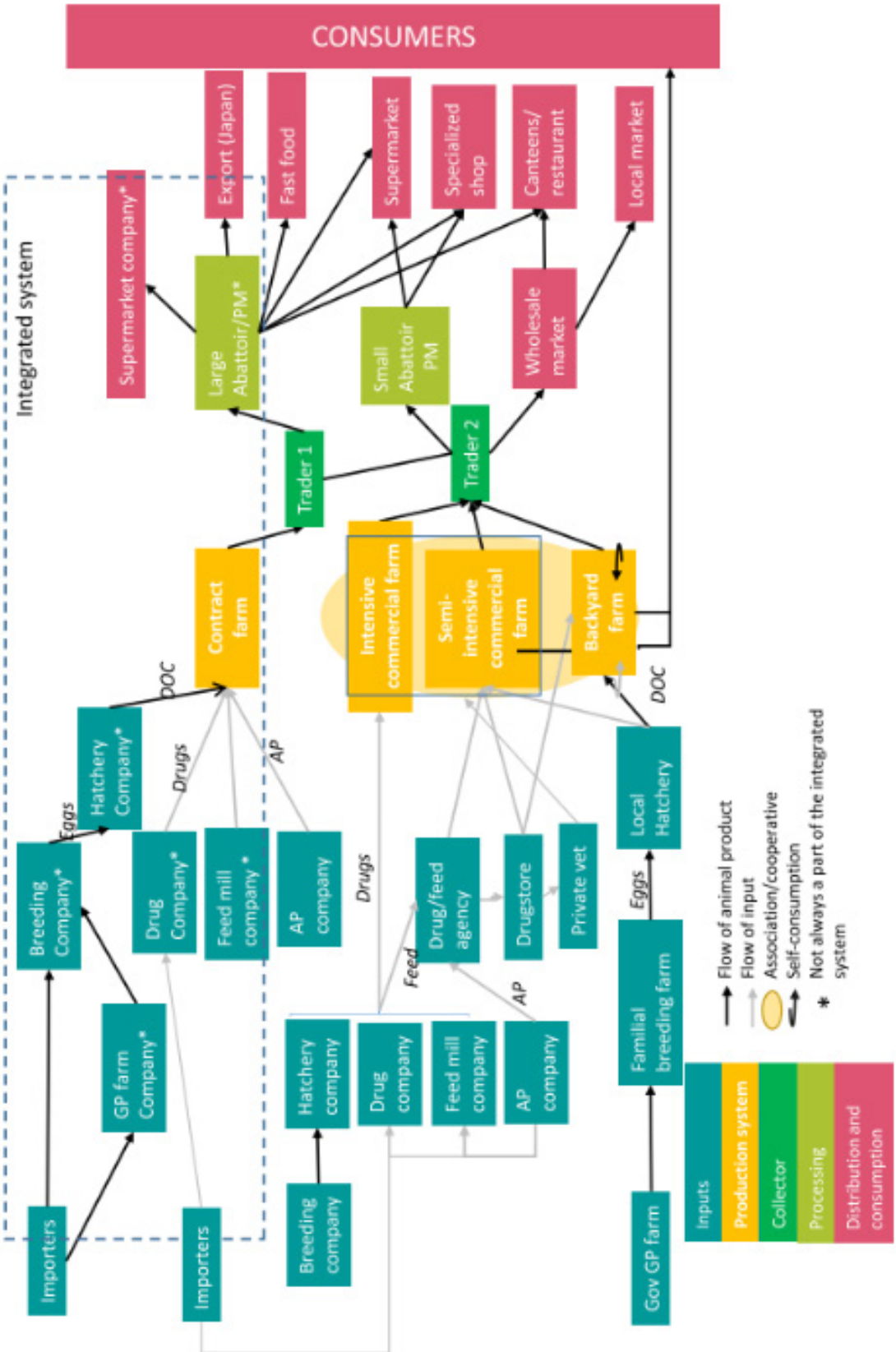
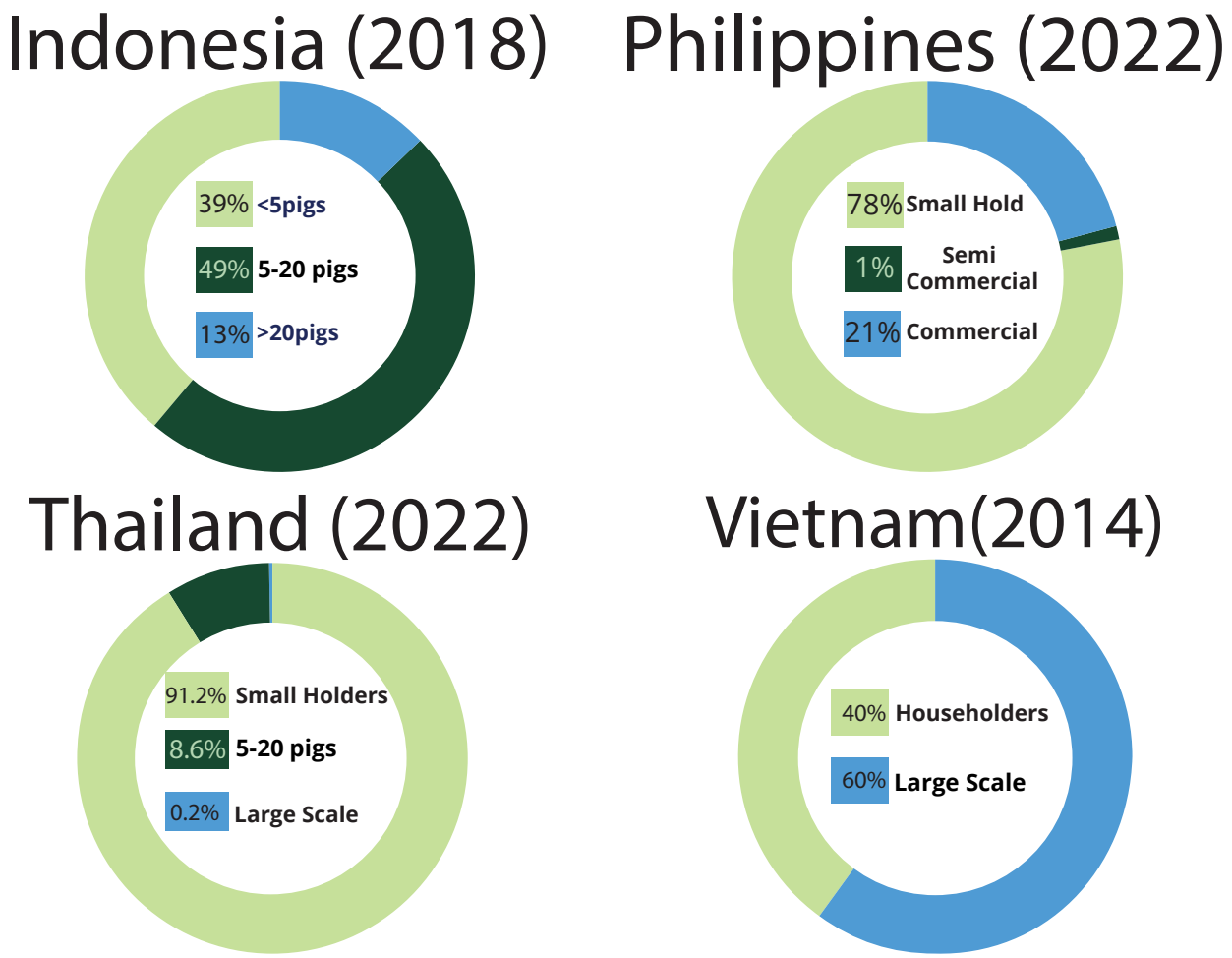


Figure 16. Description of the chicken production value chain in Vietnam from stakeholders' interviews in 2020. AP: Alternative products; GP: Grandparents; PM: Process manufactory; DOC: day-old chicks.[80]

PIG FARMING

The pig farming industry in the region relies more on smallholder farms rather than intensified production systems. The exception to this is Vietnam with a higher level of intensification. Available information regarding the different levels of industrialisation for some of the SEA-6 countries can be seen in Figure 17.

The following sections will contain short analyses of the pig farming industry in each SEA-6 country. In



Note that the charts are only showing the number of **farms and are **not representative of the proportion of pigs** relative to the conditions that they are farmed in.*

Figure 17. Industrialisation numbers for pig farms in SEA-6

general, Vietnam has the largest pig industry in the region with more intensified systems. In contrast, most of the pig farmers are considered small in the other SEA-6 countries, with the governments trying to push for more modern production methods. The most common welfare issues identified have been associated with the lack of knowledge of the farmers, and the risks in biosecurity and waste management.

INDONESIA

In Indonesia, >95% of total farms in the country are smallholder farmers Involving approximately 368,000 households or 2.1 million people. Out of those households, 38.56% own less than 5 pigs, 48.84% own 5-20 pigs and 12.6% own more than 20 pigs. [81,82] Gestation crates are used for pigs as well as artificial insemination due to their productivity and control. [83] The intensive pig farms can hold up to 1,250 pigs at a time. Indonesia has a number of indigenous pig breeds (such as the Bali, Nias, Papua and the Sumba pigs) that are raised by smallholder farmers in their places of origin. The Government has shown its interest in developing R&D for indigenous pigs and gives priority to learning more about the characteristics of the native pig and its possible contribution to production within low – intensity systems[84] In most small house farms that have pigs, the animals are tied in the gardens to find tubers and they are put in very simple housing. Pigs search and scour for food around households and are sometimes given table or kitchen leftovers and crop residues. The main problems for the local pig population and the death rate of young pigs are mainly associated with the low availability of suitable feed, lack of skilled farmers and adequate facilities, as well as poor management. [85] For pigs that are raised intensively, they are kept in housing with flooring that is either made of bamboo or cement, and the roof is constructed either from zinc or coconut midrib. The feed is dependent on the availability of foodstuffs with the general pattern being green leaves in addition to bran and tubers. Figure 18 shows an example of the housing conditions of two local pigs.

Figure 18. Boar and Sow of local Indonesian Pigs[84]

MALAYSIA

In Malaysia, almost all pig farms are licensed for operation. The Department of Veterinary Services (DVS) encourages a Modern Pig Farming (MPF) system whereby pigs are kept in closed-house systems. The concept of zero discharge was also introduced such that all waste water is contained within the farm and there is no discharge of effluents from the farm into the public waterways. Farms that are considered well-managed are generally larger-scale farms that are regularly audited and have good animal husbandry practices in place. This includes being certified under the Livestock Farm Accreditation Scheme “SALT”, and following proper written Standard Operating Procedures (SOP).[86] Pig farming intensification have previously led to environmental pollution and sparked socio-religious as well as land development issues[87] In pig

farming areas, pig production activities were centralised in areas designated by the government to allow open- and closed-house pig farms to operate. These areas have the necessary infrastructure to ensure biosecurity and waste management along with additional facilities such as laboratories, abattoirs and incinerators. Modern pig farming requirements include a housing system where: (1) animals are raised in an enclosed building with zero discharge waste management or with effluent of Biological <Oxygen Demand (BOD) 50 ppm, (2) applies good farming practices and (3) has a 200m buffer zone from human habitation[88]. Currently, a large majority of pig farms in Peninsular Malaysia are still operating as open-house systems where pigs are housed in open-sided structures[86]. MPF and closed-house systems will enhance productivity, efficiency, and reduce risk of disease transmission between farms or herds and between pigs and wildlife [89]. However, due to various challenges, farmers are reluctant to switch to modern pig farming[90].

THE PHILIPPINES

In the Philippines, the swine industry is the second most important in the local meat industry and was thus greatly affected by the Asian Swine Flu. [91]. Calabarzon, Western Visayas, and Central Visayas are the three highest contributors to the country's total swine population supplying 11.8%, 11.6%, and 11.4% respectively. As of September 2022, the population of animals was estimated to be at 10.07 million heads, with 77.7% of the population coming from small-hold farms (with less than 20 pigs), 21.2% from commercial farms (with more than 50 pigs) and 1.1% from semi-commercial fams (with 20-50 pigs).[92] The graphic in Figure 19 showcases the supply chain of the Philippine swine industry starting from the input and services that are essential for feed as well as technologies that are imported into the country, going through to producers, butchers, and distributors and finally the end-users, such as the local consumers or the export market. [93] The increase in the cost of feed has caused a subsequent increase in the prices of meat in the Philippines and has made the livelihood of the producers' harder – the price of feed has been reported to have risen by 50% since 2019. In addition, swine production cost is now USD 2.76/kg while the farm price (i.e., the cost of the animal when sold directly by the producer) hovers between USD 2.80-3.20/kg.[94]

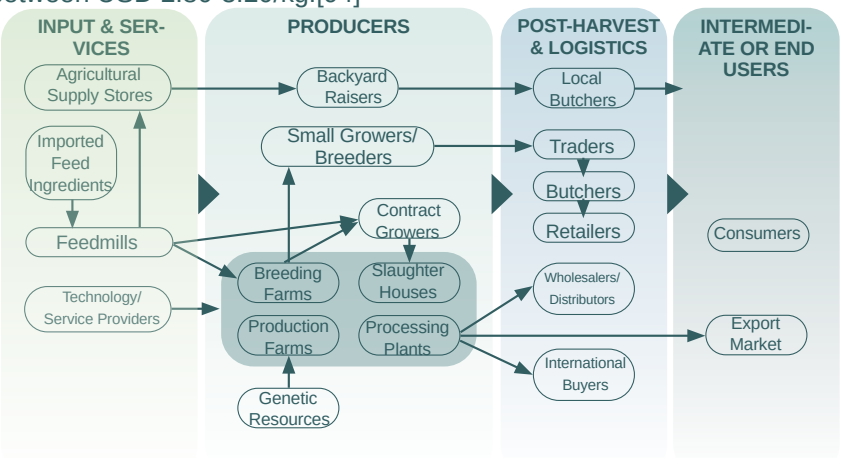


Figure 19. Swine Industry supply chain in the Philippines

THAILAND

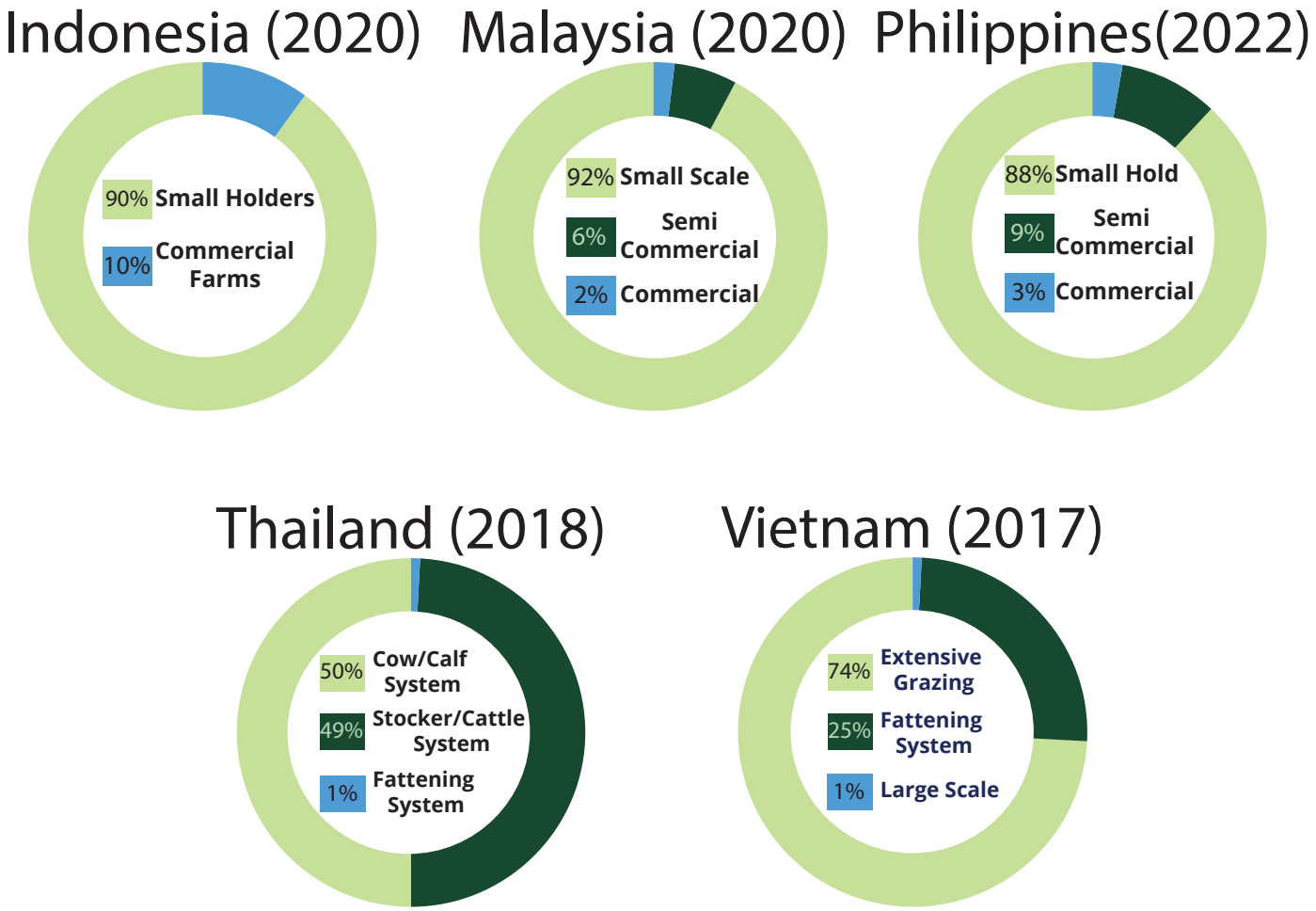
Pig production in Thailand has significantly intensified since the mid-2000s. There are three groups into which pig farmers can be categorised into based on their production systems. Firstly, the farrow-to-finish production system refers to farms that oversee the breeding of pigs, the production of piglets, and the fattening of pigs on the same farm. The second system, known as the nursery system, only raises breeding pigs and produces piglets. Lastly, the finishing system raises weaners until they reach the desired weight for the market. [95] When it comes to farm sizes, 91.2% of the farms are considered smallholders: backyard farms have a maximum of 5 heads,[282] commercial farms have a maximum of 50 , and farms are considered large-scale if they hold more than 50 heads (with further classification for small, medium and large sizes). There are two different groups of breeds of pigs in the country: the native and the commercial. The differences between the two breeds lie both in terms of the speed of growth (commercial pigs tend to grow faster) and in terms of resilience to local climate and disease (with the native breed being better at surviving hot and humid climates, and showing higher resistance to endemic diseases). [95] Standard farming is controlled and certified by the Department of Livestock Development. Big enterprises have expanded their businesses through contract farming.[96]

VIETNAM

The pig-raising industry is extremely important in Vietnam with 70% of the total amount of industrial feed being consumed by pigs. The number of pig-raising farms fell by more than 65% between 2005 and 2014. The number of commercial pig farms using industrial feed accounted for 86.3% of total feed consumption, while small-scale commercial pig farms accounted for only 42%, and smallholder farms accounted for 25.7%. The housing system that is most commonly employed for pig farms in Vietnam are permanent stalls. The vast majority of farms (71.8%) have concrete flooring. In relation to industrial pig production, windowless houses accounted for only 3% out of the total number of farms, semi-windowless houses accounted for 21%, and open-style swine houses accounted for 76.0%. [78]

CATTLE FARMING

Beef and dairy farming in the region are mainly driven by smallhold producers with Vietnam and Thailand having the highest levels of industrialisation. Figure 20 below shows the levels of industrialisation based on the information available for some of the SEA-6 countries.



Note that the charts are only showing the number of **farms and are **not representative of the proportion of cattle** relative to the conditions that they are farmed in.*

Figure 20. Industrialisation numbers for beef cattle farms in SEA-6

The following sections contain short analyses of the cattle farming industry in each SEA-6 country. Overall, the cattle industry in the region is small with most countries needing imports of dairy products and meat products to supplement the need in their countries. In Malaysia, the government is pushing for higher industrialisation practices with free range farming of cattle not being encouraged. Other welfare issues have to do with the breeds of cows in the Philippines, since the imported animals in the country can't thrive in tropical conditions.

INDONESIA

In Indonesia, the demand for beef and dairy products has increased with the rapid population growth and the rise of household incomes. .[97] Smallholder beef producers represent around 90% of the producers and they provide 65-70% of all domestic beef products. [98–100] Most of Indonesia's fresh milk is produced by the members of 59 dairy cooperatives whose dairy cattle, according to the Indonesian Dairy Cooperatives Association, yield 13 litres of milk per head on average. Around 98.5% of Indonesia's dairy cow population is located on Java Island, while small dairy cattle operations can also be found in the Northern Sumatra and Lampung provinces. [101]

Crops generally fulfill household needs, with surpluses sold or bartered, and livestock income is considered secondary or only used in emergencies.[102] Hence, smallholder livestock farmers have been depicted as "users" and "keepers" rather than "producers". Smallholders have small numbers of animals (2–5 head) which, in the absence of crop-livestock integration, generally graze in backyards, on roadsides, and in local forests [98,102]. The number of households that hold 2-3 heads of cattle is approximately 5 million.[103] Indonesian beef farming system types include breeding, fattening and combinations of both. Most livestock-keeping smallholders (76%) operate breeding farms as compared to those that focus on fattening (24%). While it is known that a number of households combine both breeding and fattening, there is no official data for these farms. Selling decisions are based on household needs, and so livestock sale from breeding systems serves as a form of additional income. On the other hand, the fattening systems are depended on for regular income. [103,104]

MALAYSIA

Malaysia is very much reliant on imports for beef, with domestic production only contributing 21.72% in 2019.[105] The major factors that influence the local beef production are the low initial numbers of animals, the high cost of the feed, an insufficient number of personnel with enough technical knowledge at handling the animals and the low survival rates for the different breeds in the local environment. [106] Beef cattle farms constitute more than half of the total registered farms in Malaysia, with most farms (i.e., over seven thousand) situated in Kelantan. Overall, the number of farms for ruminants are far greater than the number of farms for non-ruminants . This is because livestock farming of ruminants is only practiced by smallholders while farming of non-ruminants is dominated by commercial enterprises that cater for large-scale production[105] A total of 50,941 large ruminant farmers (cows - buffaloes) are involved in the industry, with 92 - 93% of them being small-scale farmers. About 36% of local ruminant meat production is contributed by conventional livestock production. There are three possible kinds of meat production systems: (1) traditional or conventional farming which mostly involves free-range farming (extensive), (2) semi-intensive farming, which also includes the growing of permanent crops such as oil palm, rubber, or feedlot, and (3) intensive farming. Traditional free-range farming is not encouraged today because it can cause nuisance issues, especially in places close to residential areas or

cities. The feedlot system is used for fattening purposes, especially for the slaughtering of male livestock. The government has established the National Feedlot Center where leading companies are assigned with streamlining meat value chain operations including relocating contract farmers to satellite farms, and slaughter and processing plants.[107]

With regard to dairy cattle, there were 18,398 dairy cattle breeders in the country in 2018, with 38.5 million litres of milk produced. In order to meet the national demand of 62.8 million litres of milk, the Government is importing liquid milk from major source countries such as Australia and New Zealand. In 2018, it was estimated that 78.14% of breeders belonged to the category of small breeders, i.e., owned less than 30 cows. Only 9.95% of breeders were considered to be of commercial status, owning more than 50 cows each. [108]There have been talks for a big Qatari company, Baladna, to invest in a dairy venture that is expected to produce hundreds of millions of litres of fresh milk per year. [109]

THE PHILIPPINES

In The Philippines, the total cattle inventory was estimated at 2.58 million heads as of 30 September 2022. Of this total cattle inventory, smallhold farms accounted for 88.0%, while the remaining consisted of semi-commercial and commercial farms with corresponding shares of 9.1% and 2.9%. [110] The Philippines produces only 1% of its milk supply. This is due to continued use of the imported Sahiwal-Holstein hybrid cattle, which are not prolific and cannot thrive in tropical countries due to high heat, humidity and the presence of local parasites. In addition, the breed is very expensive and can only produce a maximum of 10 litres of milk per day.[111] Backyard operations dominate much of the cattle farms, numbering around 2.3 million heads. The figures stand in great contrast to those of commercial farms which have an annual inventory ranging from 150,000 to 180,000 heads.[112]

THAILAND

In Thailand, the beef cattle markets are separated based on the price and quality of beef . They lack efficient operational structures that clearly identify the major stakeholders in the value chain, starting with primary producers in the cow-calf and stocker systems through to retail consumers. Beef cattle marketing includes the producers, buyers (middle man or trader) of live cattle, processors, wholesalers or distributors of beef, retailers, consumers, and more formal systems including groups or cooperative communities of cattle producers. Distributors source supplies of cattle for slaughter through traders who are responsible for locating cattle. Most animals are still sold directly from the local farm and are then traded to the next stakeholder in the supply chain. There is a need for the development of the value chain to ensure that all stakeholders in the industry have the opportunity to gain economic incentives in addition to generating an income.[113] Cattle in finishing systems are provided with a specific fattening feeding regime in an intensive system to obtain a specific market weight for sale. The duration of the production cycle from birth to market for finished cattle usually lasts for an average of 3 years. The number of cattle per

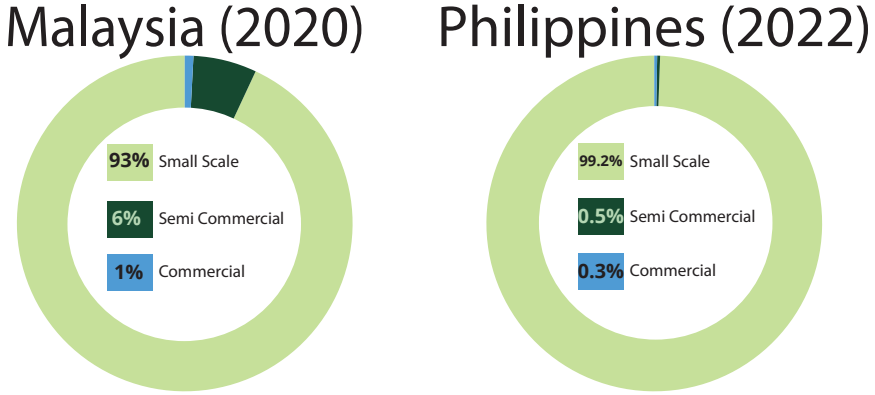
feedlot ranges from 10 to 600 heads. Cattle are normally fed high-energy concentrates in addition to rice straw or roughage in a 70 (concentrate):30 (roughage) ratio[113] and would require 8 to 12 months to reach 550 to 600 kg in body weight[114]. The main feeds consist of carbonaceous concentrate which accounts for 60% to 80% of production costs depending on factors such as the season, farm location and intensiveness of production. Total mixed rations are formulated from a mixture of locally available feedstuffs and agricultural by-products: mostly cassava chips, by-products from pineapple waste, rice straw, and dried brewers grains.

VIETNAM

In Vietnam, in 2009, the average herd size per cattle farm was 6.2 heads and 1.9 heads for buffalo farms. Households that owned more than 10 cattle or buffalos accounted for 10% and 1.5% of the total number of farms respectively. Nearly half of the cattle population were located along the North and South Central Coast while more than half of the buffaloes (56.7%) were found in the North Mountainous and Midland regions . The average number of cattle farms with permanent pens accounted for 34.7%. The highest ratio North Central Coast region had the highest number of permanent pens (97.1%) and the Central Highland (CH) region had the lowest. In 2014, the majority of cows (83.8%) were located in only six provinces / central cities: Hanoi, Son La, Nghe An, Lam Dong, Ho Chi Minh City, and Long An. In the Red River Delta, 90% of cows were owned by individual farmers with an average of 3.91 dairy cows per farm. In Ho Chi Minh City, farms with less than 20 dairy cattle contributed to 98.9% of the dairy cattle population. Cows were fed between 20 kg and 40 kg of roughage and fresh matter and were housed in permanent pens. [78]

SHEEP/GOAT FARMING

In general, the sheep/goat market in the region is relatively small. However, the past few years have seen a small increase in market share with an average production rate of 7.5%[115]. Given the small market, it was relatively harder to find accurate information about the different types of farms present in each country. Available information for Malaysia and the Philippines is presented in Figure 21.



Note that the charts are only showing the number of **farms and are **not representative of the proportion of sheep/goats** relative to the conditions that they are farmed in.*

Figure 21. Industrialisation numbers for sheep and goat farms in Malaysia and the Philippines

Consumption volume is generally low, although sheep meat can be considered a common part of diets in countries like Malaysia and Singapore. The Meat & Livestock industry of Australia conducted a study aiming to find out consumers' perception (i.e., agreeability) towards including lamb in their diets. The results of that study are presented in Figure 22[114]

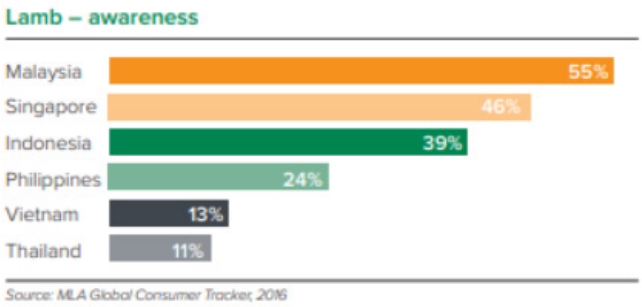


Figure 22. Lamb Awareness Study conducted by the Meat & Livestock industry of Australia surveying the SEA-6 countries

INDONESIA

In Indonesia, the demand for sheep and goat (also known as small ruminants) meat is growing steadily, with half of the animals slaughtered each year being used for Aqiqah – the sacrifice of a sheep or goat to mark a child's birth.[116] Nearly 99% of small ruminants are raised in smallholder farms. The Indonesian government promotes the intensification of the production of small ruminants to increase animal protein consumption and to increase the household income for those living in rural areas. Although grazing has been practised mainly when rearing sheep, grazing alone is rarely practised today. The majority of small ruminants are now kept in confinement or reared using a combination of grazing and confinement.[117] Farmers possess minimal marketing information and do not earn much from the sale of their sheep. In Java, farmers sell their animals through the local village collector, who is responsible for taking these animals to the small ruminant market. These markets are organised every 5 days and traders operate between these markets. Prices are based on a visual appraisal of the animal and an estimate of its body weight. [118]

MALAYSIA

In Malaysia, the sheep and goat industry has been relatively small, with goats and sheep making up only ⅓ of the total number of ruminants in 2020. The high cost of production and the small return of investment are the two main factors that make producers shy away from investing in the small ruminant industry. Figure 23 showcases the supply chain of goats and sheep in the country.[119]

As shown in the figure, almost 90% of the supply comes from imported sources. The local breeders sell approximately 80% of their livestock to end-users directly, especially for the traditional practice of Aqiqah and for animal sacrifices by Muslim consumers.

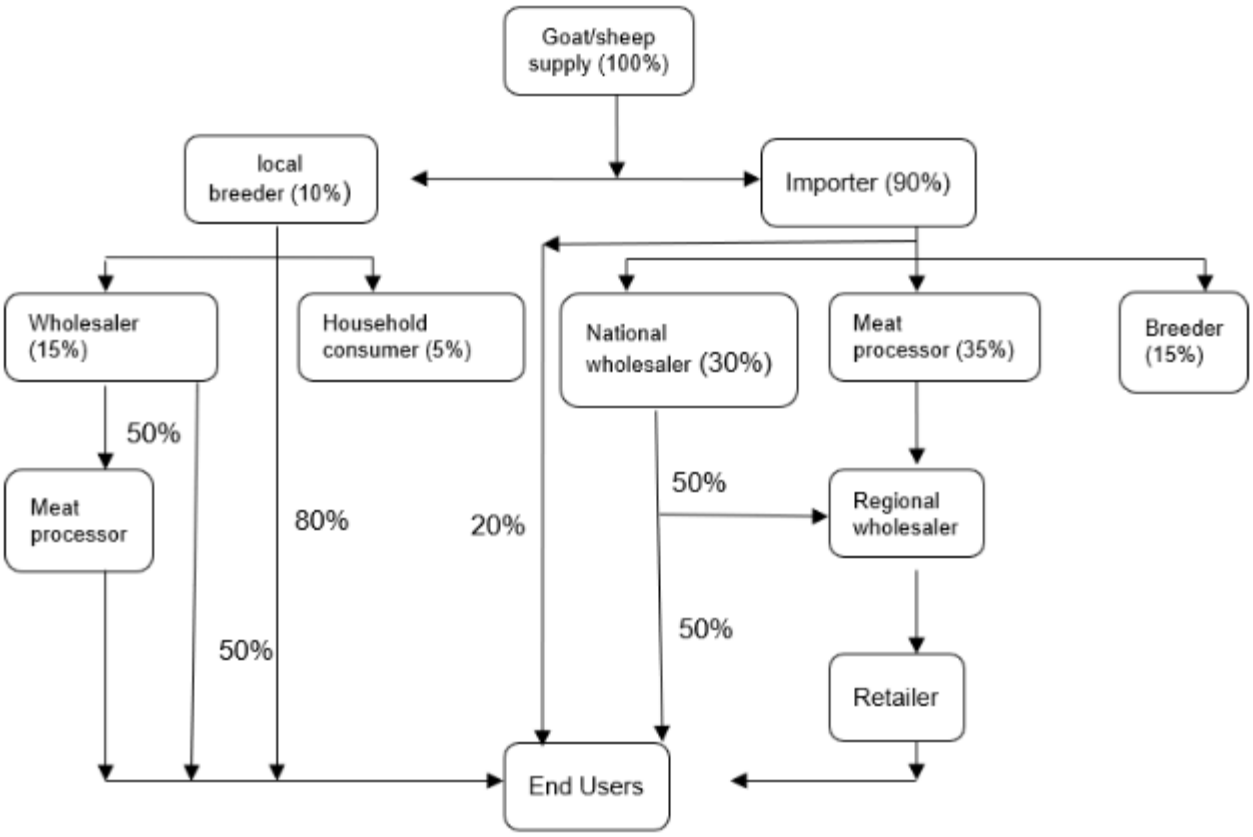


Figure 23. Supply chain of sheep and goats in Malaysia

THE PHILIPPINES

In the Philippines, small-hold farms account for 99.2% of the total goat inventory, while the remaining consist of semi-commercial and commercial farms with corresponding shares of 0.5% and 0.3%. [120] There are different production methods used in the country for sheep. The first method involves total confinement where lambs are kept in corrals or barns throughout the year and their needs are met while maximising production. The second method involves semi-confinement, where lambs are kept in confinement until they reach market weight, and ewes graze on pasture. The third method involves range/grass-based systems, which is the most traditional method of production. Ewes and lambs are grazed throughout the summer and lambs are then sent to the market in the fall.[100]

THAILAND

In Thailand, goat production contributes significantly to its socio-economic landscape. A study from 2022 showed that the average herd size was 76 goats per family and most of the goats(~90%) were raised in semi-caged conditions. The goats were kept in cages at night with supplemental thickening food and were allowed to graze during the day.[121]

VIETNAM

In Vietnam, most goat production takes place in the northern Ninh Binh province and the southern-central Ninh Thuan province. Animal capacity at each farm in these two regions range from 1,500-3,000 heads.[122] The Vietnamese government plans to consolidate the industry by creating larger farms to ensure a stable supply and pricing while providing farmers with insurance for their flocks. [123] The general meat distribution channel in Vietnam can be viewed in Figure 24.

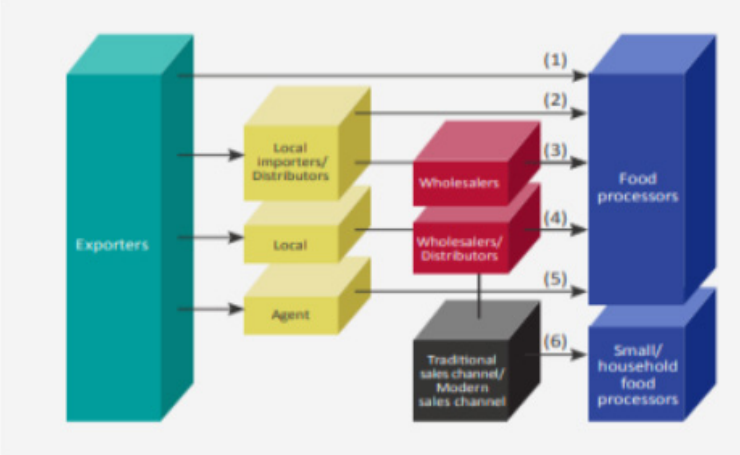


Figure 24. Meat distribution channels in Vietnam

The most common distribution channels are 1, 2 and 6. Local businesses often collaborate with exporters since imports of meat can only be undertaken by Vietnamese companies that are certified traders. Local businesses thus play a big role in the promotion and distribution of sheep and goat meat.

TRANSPORTATION

Due to the limited information available regarding the exact conditions of transport for live animals, this section mostly includes information gleaned from media reports and information about transportation bans from different countries. It is noted that media reports might not present a full picture of the conditions during transportation. However, this report aims to provide accessible and relevant information to raise more awareness about the potential welfare issues present in the transportation of live animals.

Research papers have focused on the attitudes of stakeholders and their knowledge of animal welfare in the livestock industry. With regard to improving the welfare of animals they owned, the motivating factors for stakeholders ranked according to their importance were: religion, increase in their knowledge levels regarding the issue, monetary gain, availability of tools and resources, community issues, and obtaining the approval of their supervisor and peers. Notably, strong beliefs in the influence of animal welfare laws, the power of the workplace and the importance of personal knowledge were common factors shared across all countries included in the survey. [124]

In another study, almost 22% of stakeholders regarded themselves as “having little to no knowledge of animal welfare” during transport or slaughter. The same study provided training in key aspects of animal welfare with the respondents reporting increased levels of knowledge for animal welfare during slaughter and transport.[125]

INDONESIA

In June 2022, it was reported by an Agence France-Presse photographer that a crane was used to transfer very weak cows from a boat in the eastern Javanese city of Surabaya. The crane transferred the animals by using a piece of rope that looped around the animal’s skull and sometimes moved them with their necks outstretched. A campaigner from the Jakarta Animal Aid Network mentioned that there is still much work to be done in relation to implementing and enforcing animal welfare laws in Indonesia.[126]

MALAYSIA

In 2016, the non-profit organisation Sahabat Alam Malaysia (Friends’ of the Earth Malaysia) published an article documenting inhumane transportation of livestock. During transportation, haulers typically try to pack as many animals as possible into a vehicle which leads to overcrowding and very high stocking densities. Some animals are kept upright by the pressure of the bodies of other animals around them. [127] For example, chickens are squeezed into one cage and stacked in transport trucks. This leads to minimal movement until the birds reach their destination, increased exposure to heat and sun and extended periods spent without food and water depending on the length of the trip.[127]

During transportation on ships, there have been many reports of animals dying due to breakdowns in ventilation systems onboard ships, bad weather and rough conditions. Suffocation, starvation, dehydration and disease, sleep deprivation, diarrhoea, heat stress, respiratory disease, trauma and motion sickness all take their toll on the animals who collapse, stay where they fall and die slowly and painfully. [127]

In 2017, The Guardian reported that almost 100 out of 1,236 cattle died on an eight-day trip from Darwin to Malaysia. It was the maiden voyage of a new livestock vessel but this incident caused its Australian certificate to be revoked. The report states that 90 animals were euthanized as a result of slipping, with the overall mortality rate standing at 7.79%, much higher than the permitted 0.5% for voyages lasting less than ten days.[128]

Another example illustrating a negative consequence of transporting live animals was the Malaysian outbreak of the highly pathogenic influenza flu strain, H5N1. Given the pattern of the outbreak, the FAO identified that the transport of live birds reared for human consumption was the primary culprit in the rapid spread of the virus.[129] Reports like these have led animal rights groups in the country to petition to stop the transport of live animals altogether.[130]

THE PHILIPPINES

To the best of our knowledge, there are no reports regarding the conditions of the transportation of live animals in The Philippines. However, given that The Philippines is an archipelago consisting of more than 7,100 islands, live animal transportation is probably inevitable.

THAILAND

In July 2022 the Department of Livestock Development issued a temporary ban on the transportation of certain livestock into Thailand. The measure was implemented mostly to prevent the potential spread of the highly pathogenic avian influenza, (i.e., African swine fever), and lumpy skin disease from affected countries like South Africa, Vietnam, Indonesia, Cambodia and Italy. [131] While no specific information on the conditions of travel are available, the fact that live animals travel to Thailand from faraway countries like South Africa and Italy is an animal welfare concern due to the prolonged travel times.

VIETNAM

In July 2016, a live cattle export company had its licence suspended in Vietnam after the Federal Department of Agriculture uncovered animal verification and traceability issues regarding its exportation procedures. This suspension is considered to be the most severe action taken by far by the regulator, since the introduction of the Exporter Supply Chain Assurance System in 2011. The company was reissued their licence after they submitted updated control and management plans. [132]

SLAUGHTERHOUSES

This section aims to shed light on the practices and conditions inside slaughterhouses (also referred to as abattoirs interchangeably) of each country. Even though the conditions inside slaughterhouses are very important in ensuring the quality of the end product and its safety for consumption, it is often very hard for governments and authorities to implement control measures.

INDONESIA

In Indonesia, a 2021 study presented in the International Conference on Tropical Agrifood, Feed, and Fuel, showed that in abattoirs in Bali, 69% of cows vocalised their stress post-cut, 82.4% showed tail movement and 57% showed a return of consciousness with a reflex of straightening their heads and bodies. This was attributed to improper handling before the slaughtering process. [For more information on welfare standards regarding the slaughtering process, please read Section1.1.2] [133] Furthermore, a video exposed by the People for Ethical Treatment of Animals (PeTA) showed animals returning to consciousness after botched stunning and more, which suggests prolonged pain and suffering for the animals.[134] . A 2014 review by WATT Poultry reported that only 24% of the country's chickens are slaughtered in abattoirs and only 34% of poultry abattoirs hold a veterinary certificate, which is required for slaughterhouses to sell and dispatch meat to modern supermarkets, fast food restaurants and hotels.[135]

MALAYSIA

In Malaysia, slaughterhouses have to follow the halal guidelines according to the Islamic Development Department (Jakim). An article from the Malaysian Insight detailed the procedure of an industrial processing line that slaughters 10,000 birds per day. The process includes stunning

(via an electrical bath), washing the chickens with hot water ranging from 60 to 62 degrees Celcius to remove the feathers, and hanging them from their feet. [136]

THE PHILIPPINES

In The Philippines, the National Meat Inspection Service within the Department of Agriculture is tasked with the responsibility of implementing policies, programmes, guidelines, as well as rules and regulations pertaining to meat inspection and meat hygiene.[137] According to their 2020 report, there were 130 accredited slaughterhouses, 120 with AA hygiene level and 10 with AAA hygiene standards.[138] A study published in 2020 evaluated four slaughterhouses with different facilities, processing operations and management practices in the Cotabato Province. The study showed that there was an overall parasite prevalence of 60% in the faecal samples of the swine and 31.43% of swab samples were positive for Toxoplasma. The study concluded that the observed facilities had outdated equipment, as well as inadequate waste disposal systems. [139]

SINGAPORE

In Singapore, animals are subjected to strict inspection and surveillance once imported. Currently, there are over 1,000 accredited establishments from 36 countries that export various meat and egg products to Singapore. As the pigs get shepherded from the barge into the abattoir located at Buroh Lane near Jurong Port Road, inspectors will keep an eye out for anomalies on the animals' gait, body condition, and skin colour. A veterinarian will also be present to inspect the animals' organs using a stethoscope. Pigs that pass the inspection of the Agri-Food and Veterinary Authority of Singapore (AVA) are then branded with a pink mark by a staff from the commercial abattoir. Pigs that fail the inspection, which number two to three daily, are further examined by an AVA supervisor who looks out for signs like abscesses in the liver. A pink sticker with the word 'detained' is pasted on the pig as it is pulled away from the main line for further inspection.

AVA will cull the infected animals in the event of a disease outbreak in the local farms. One such example was when a poultry farm was affected by a Salmonella outbreak in 2015. Local poultry farms are bird-proofed to prevent contact between wild birds (that may carry viruses) and the domesticated birds.[140]

THAILAND

In Thailand, there have been articles reporting nonoptimal conditions in the slaughterhouses of the country. An article from The Guardian reports that "Electrical stunning is sometimes done and usually with completely unregulated stunning equipment, which is sometimes homemade. It's consistently wrongly applied and completely ineffective as it doesn't even span the brain. It's just cruel electric shock and pain."[141] Photographer Andrew Skowron has documented in his website photos from pig slaughterhouses on the main street of the Pathum Thani province near Bangkok. [142] A study from 2022 published in PLoS One aimed to determine the level of bacterial contamination from chicken meat sampled across 569 chicken slaughterhouses in the country. The extent of the non-compliance to government-mandated quality control regulations

was measured by monitoring levels of aerobic plate count [APC] (24.6%), and bacteria such as Staphylococcus aureus (6.3%), Enterococcus spp. (24.7%), coliforms (13.5%), Escherichia coli (33.3%), and Salmonella spp. (33.4%) in the meat samples collected.[143] The government of Thailand has previously dedicated efforts in implementing control measures over bacterial contamination in slaughterhouses. However, standard compliance is still a challenge. Results of the study indicated that the scalding process, evisceration, equipment used, and slaughterhouse structure were the critical issues that warranted improvement.[143]

VIETNAM

In Vietnam, slaughterhouses have been put under a microscope by the media in the last few years. In 2016, Australia banned a number of slaughterhouses in Vietnam for alleged animal cruelty practices[144]. Furthermore, a video that was leaked in 2016 showed cattle being cruelly slaughtered using sledgehammers[145]. As with animal production, the government is leaning towards more industrialised slaughterhouses. In 2018, according to the Hà Nội Veterinary Department, the city had 1,070 animal slaughterhouses, of which 1,048 were traditional family-sized houses, 15 were semi-industrial-scaled units, and only 7 were industrial-scaled units. Notably, only 168 family-sized slaughterhouses were granted licences[146]. The latest report states that many commercial slaughterhouses in Vietnam are on the edge of bankruptcy as they compete with illegal manual abattoirs. “Illegal manual abattoirs attract customers due to low cost and lax quarantine and hygiene regulations compared to commercial slaughterhouses,” said Nguyen Viet Dung, the Director of Ngoc Viet Long Binh Food Company [147]

2.3 TRADE DIRECTIONS AND INSIGHTS FROM THE SEA-6

Trade is another aspect of the landscape of animal farming in this region. In this section of the report, we look into the trade dynamics from a few angles, in terms of both the movement of live animals across borders and as animal products.

TRADE OF LIVE ANIMALS

LIVE ANIMALS FROM SEA-6 COUNTRIES: WHERE DO THEY GO TO?

Figure 25 shows the top 10 destination countries of live animals exported from the SEA-6 countries in 2020 and 2021. First, we can see that animals produced in the SEA-6 countries are mostly exported within the region, not outside of Southeast Asia. Second, Singapore is the destination where the most live animals were transported to – substantially more live animals went to Singapore than any of the other neighbouring countries.

Third, while Cambodia, Myanmar, Brunei and Laos were not included in our scope for analysing their animal agriculture landscape, they are observed to be the top countries receiving live animals, after Singapore. This suggests that these are countries with lower levels of animal agricultural production and rely on neighbouring countries.

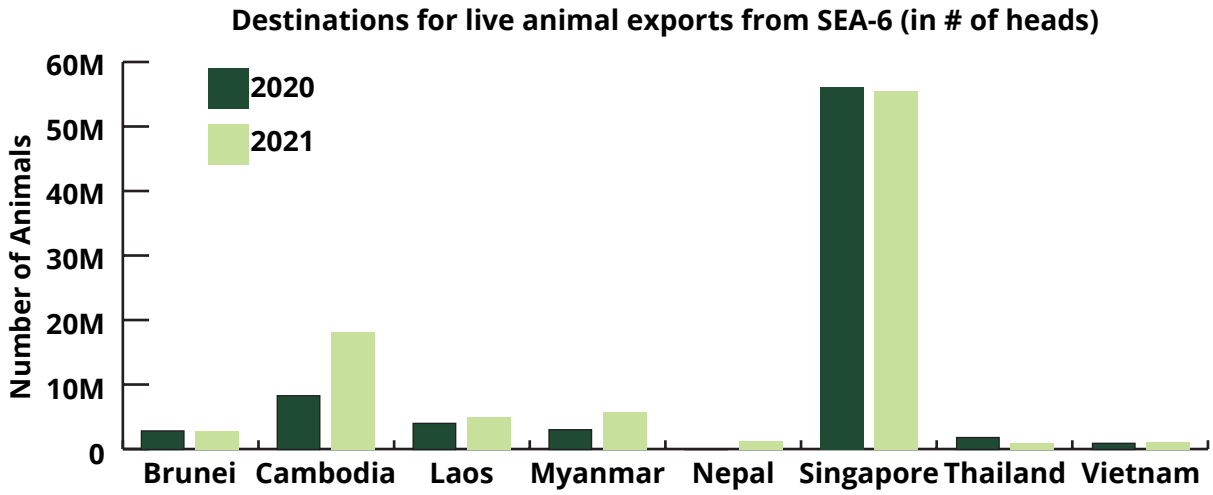


Figure 25. Destination countries of live animal exports from SEA-6

In Figure 26, we break down the types of live animals that are exported from SEA-6. By taking a closer look at the top five importers of live animals from SEA-6, we see that chickens are by far the most transported animal in the region. The other animals that are transported live within the region are significantly lesser in numbers – the next two types of live exports are ducks and pigs.

For Singapore, most of the live chicken imports are linked to neighbouring Malaysia and they are dependent on the broiler chickens produced in Malaysia. Other poultry, which refers mostly to ducks, constitute close to 10% of the imported live animals in Singapore. As we have seen in Chapter 2, Singapore maintains three poultry slaughterhouses which process these live animals for consumption in Singapore.

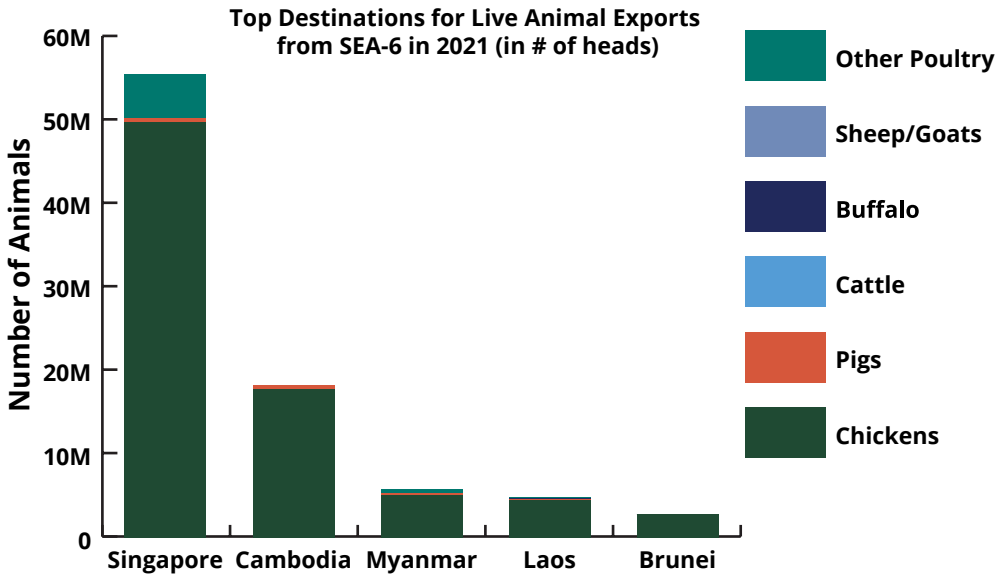


Figure 26. Top importers of live animals from SEA-6 by animal

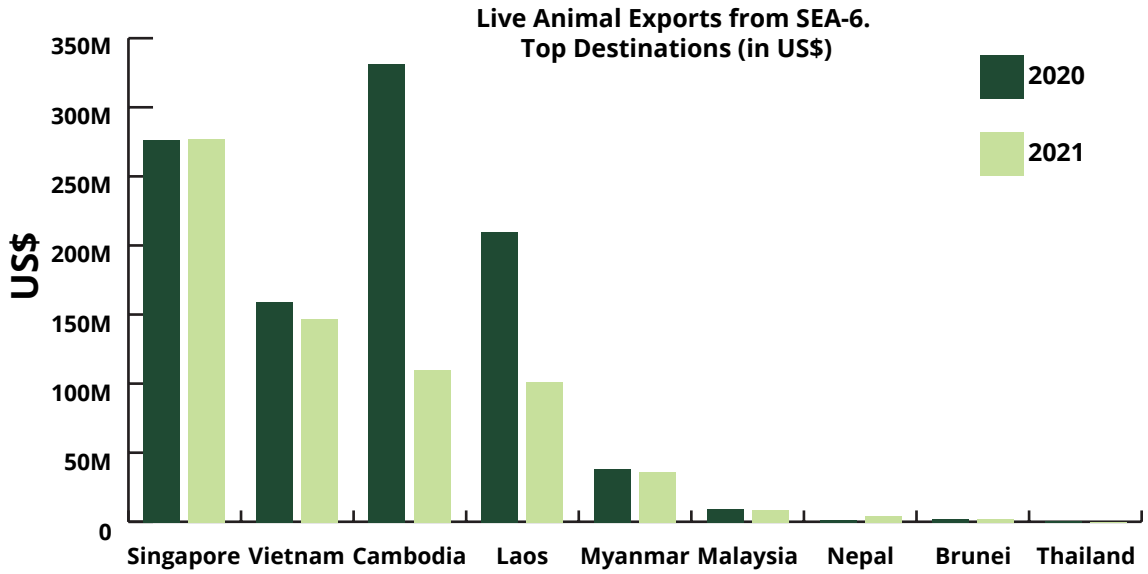


Figure 27. Top importers of live animals from SEA-6 by animal

LIVE ANIMALS FROM SEA-6 COUNTRIES: BY ECONOMIC VALUE

We are interested in the scale of animal agriculture in Southeast Asia. This is reflected not only in the number of animals being moved across borders but also their associated economic value. From this angle, we discover a different understanding of the dynamics of trade of live animals.

In Figure 27, we are still looking at the countries that import live animals from SEA-6. However, we now see Vietnam as one of the top countries importing live animals.

Cambodia, as a lower middle-income country, plays an outsized role in the economic value of importing live animals in this region. In 2020 the country imported around 2,000-3,000 pigs per day from Thailand and a large proportion of cattle (~43%) processed in slaughterhouses came from Thailand[148]. However, we notice a significant drop in the value of imports to Cambodia in the following year. This is probably because the country proceeded to ban imports of live chickens in order to help local farmers during the Covid-19 crisis.[149] Furthermore, animal production in 2021 increased for Cambodia by 11.2%, and the country banned the import of pigs from Vietnam for nine months.[150] These numbers indicate that Cambodia is a country to pay attention to and is noteworthy for their animal agriculture activities.

LIVE ANIMALS TO SEA-6 COUNTRIES: WHERE DO THEY COME FROM?

After looking at where the live animals are transported to (from SEA-6), we will now share where the animals came from. Figures 28 and 29 help us understand that Malaysia is the main country of live animal export in the region. As mentioned above, Singapore has been the main destination for live chickens.

It is interesting to note that even though the rest of the top 7 exporting countries are transporting a much smaller quantity of animals compared to Malaysia, they are countries that are very far away from the SEA-6. We are not sure if the imports of the

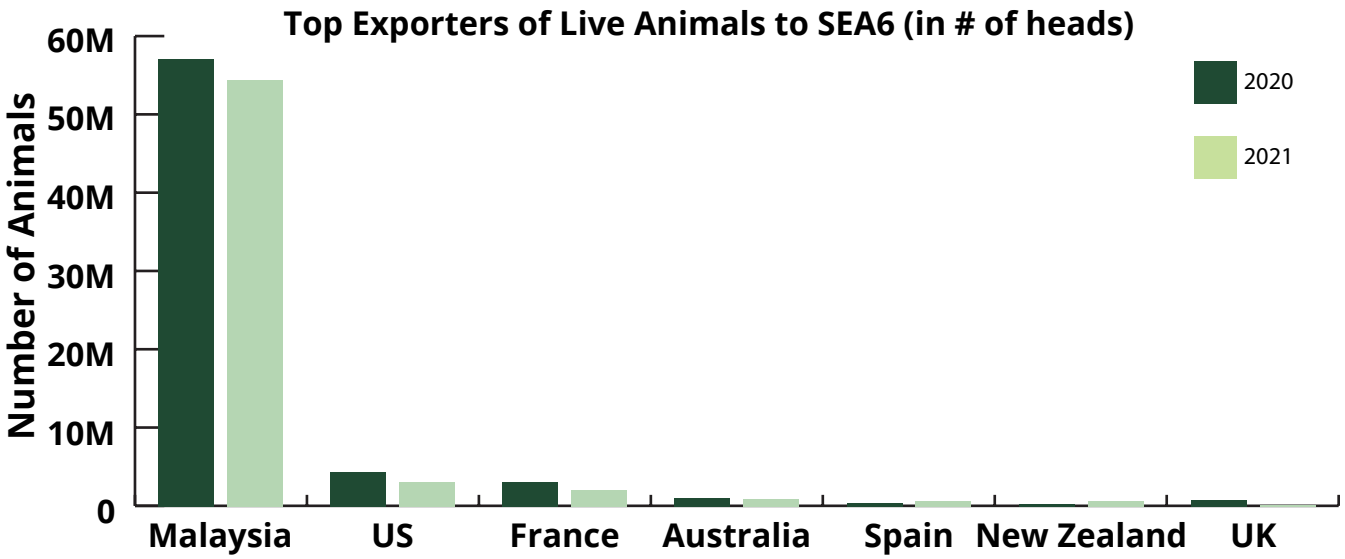


Figure 28. Top exporting countries of live animals to SEA-6

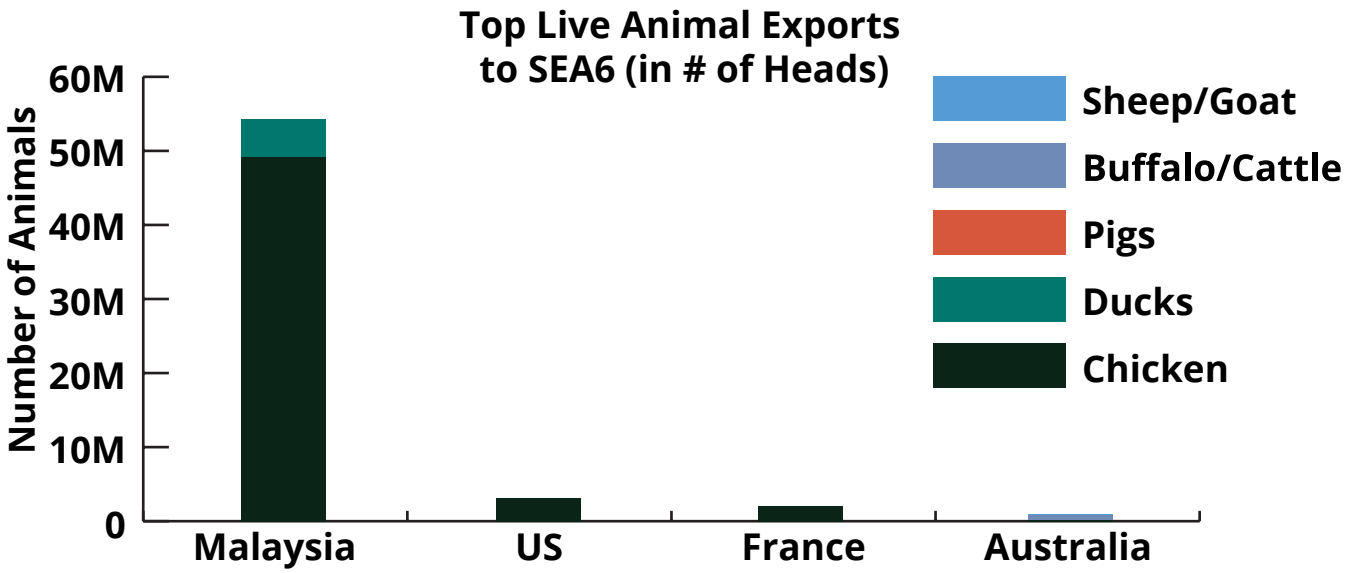


Figure 29. Breakdown of live animal exports in SEA-6 for 2021

live animals from the US, France, Australia, Spain, New Zealand, and the UK are day-old chicks (DOC) for grandparent/parent stocks or if they are for meat. However, we think that it is unlikely that they are for direct consumption.

While the charts show Malaysia as contributing most of the live animal exports to other parts of SEA-6, the number of live animals from the other countries are not insignificant. Figure 30 shows the different animals being imported from the top four countries to SEA-6.

For instance, Australia exported close to 1 million animals in 2021. Most of these animals were exported to Indonesia. Indonesia imports over 500,000 heads of cattle from Australia annually, which accounts for 62% of Australia's total cattle and beef exports. As mentioned in Chapter 2.1, Indonesia's cattle market is dominated by smallholder farms that often raise their cattle for their own sustenance rather

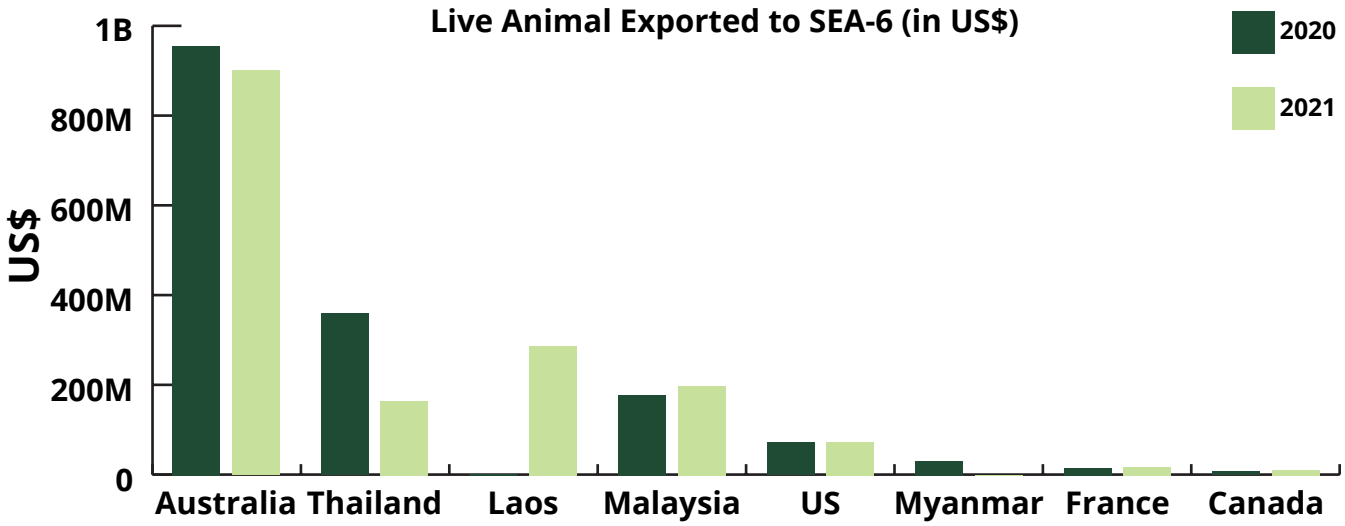


Figure 30. The total monetary value of live animal exports per country to the SEA-6

than the commercial market. It seems that part of how the country manages their local meat supply is from such higher imports from Australia. [151]

LIVE ANIMALS TO SEA-6 COUNTRIES: BY ECONOMIC VALUE

Figure 30 reflects the economic value of the live animals that were exported to SEA-6, from anywhere in the world. Australia "earned" the most from the SEA-6 countries with close to USD$1 billion worth of live animals sold to this region in both 2020 and 2021. While Malaysia exported the most live animals to other SEA-6 countries, the economic value did not turn out to be the highest. Malaysia's live animal exports in this region constituted close to USD$200 million in value (both 2020 and 2021), less than either Thailand or Laos.

Thailand has a big live animal export industry

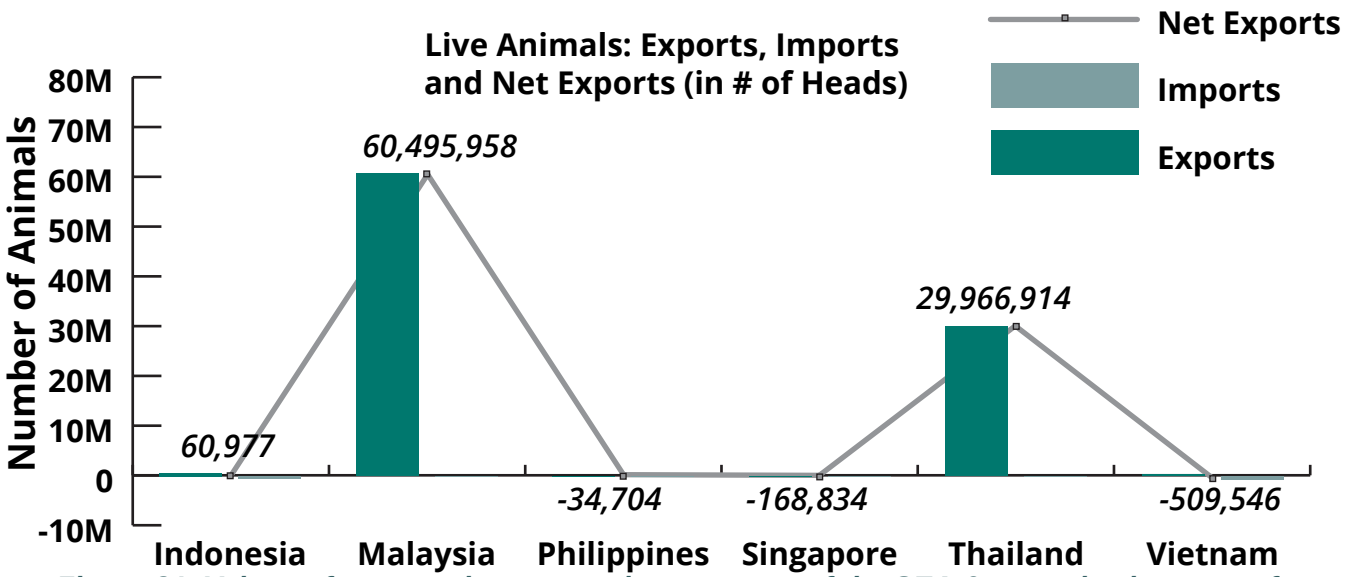


Figure 31. Values of exports, imports and net exports of the SEA-6 countries in terms of numbers of animals for 2021

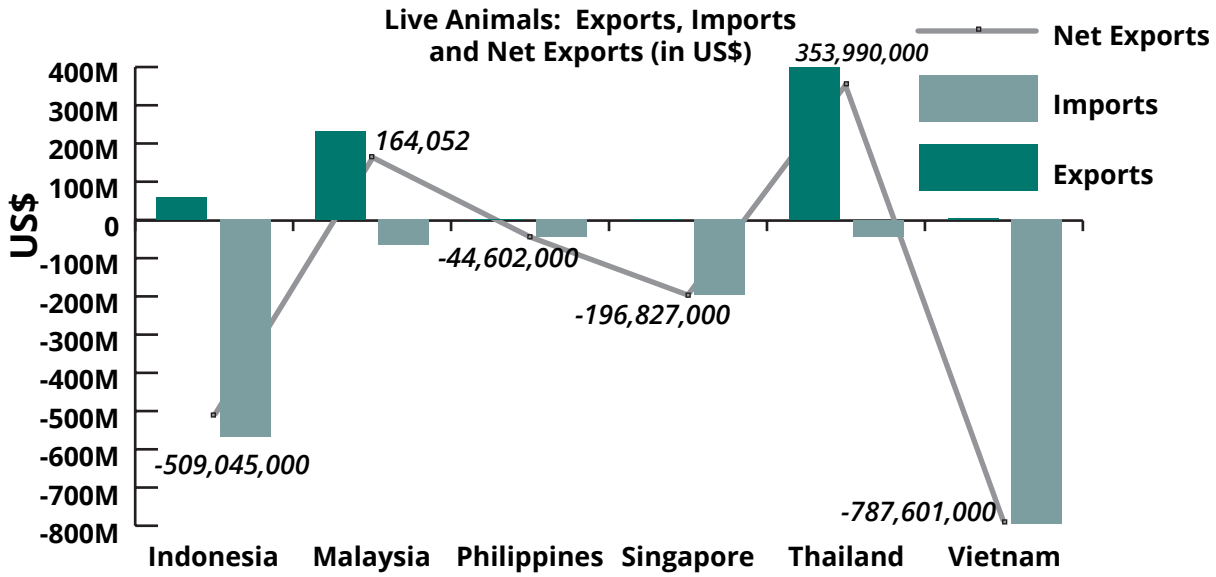


Figure 32. Values of exports, imports and net exports of the SEA-6 countries in terms of monetary value in 2021

that also provides animal products. When it comes to live animal exports, their relatively high economic values indicate that they are exporting mostly ruminants (e.g. cattle, sheep) to the other SEA-6 countries. The same goes for Laos whose industry is mainly dominated by cattle. [152] Malaysia, which exports mostly broiler chickens, thus had comparatively less economic value.

Figure 32 shows that in terms of the economic value of live animals, Thailand earned more than Malaysia, even though Malaysia exported more live animals than Thailand.

The Philippines and Singapore are also net importers based on economic terms. Vietnam is the largest importer of live animals, spending close to USD$790 million in 2021.

While Indonesia exported more animals than

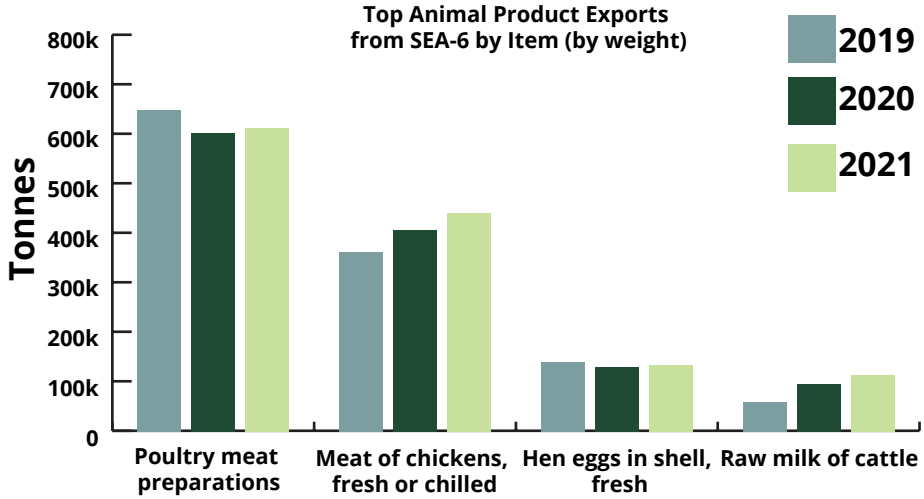


Figure 33. Animal products exported from SEA-6 by item for the years 2019 to 2021

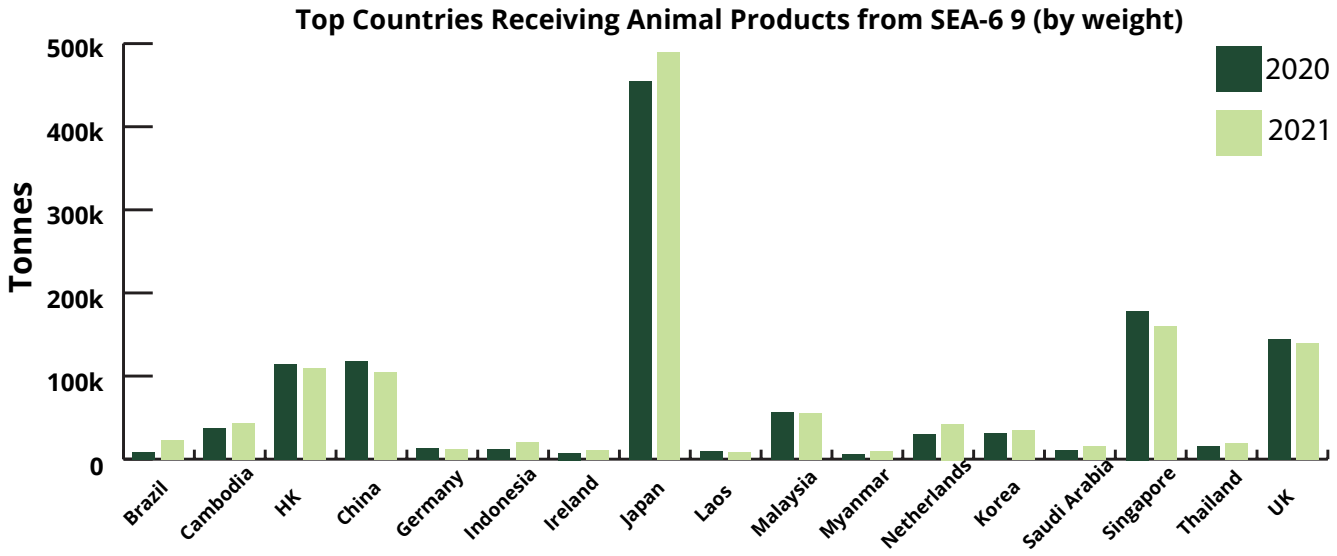


Figure 34. Top importers of animal products from SEA-6

they imported, they are overall spending more on imported live animals than earning from what they exported.Trade of Animal Products

We have reviewed what the state of live animal trade looks like in the SEA-6 countries. We will now look at the trade of animal products, which includes processed poultry products (e.g. chicken nuggets, chicken wings, etc), raw chicken meat, eggs, and dairy milk. They are measured in tonnes instead of by individual animals.

Figure 33 shows that processed poultry products are the leading item of animal products exported from this region. Raw chicken meat and milk cattle are showing a steady increase, with milk export almost doubling in two years.

ANIMAL PRODUCTS FROM SEA-6 COUNTRIES: WHERE DO THEY GO?

Figure 34 shows the top countries and territories that import animal products produced in SEA-6 in the years 2020 and 2021. Japan is by far the largest purchaser of animal products from the SEA-6 region.

Other sizable geographies include Singapore, the UK, China and Hong Kong. While Japan, Singapore, China and Hong Kong are all locations in Asia, the UK is much further away. From our understanding, a significant contributor to the provision of animal products from SEA-6 to the UK could be attributed to a single Thai company, CP Foods, which has a strong

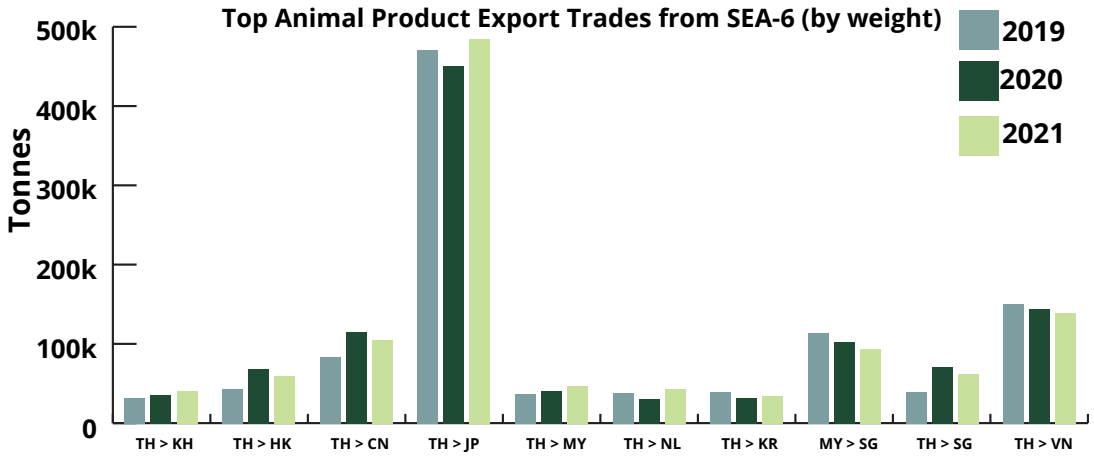


Figure 35. Direction of trade for the top 10 markets importing from SEA-6

reach into the UK market.

ANIMAL PRODUCTS FROM SEA-6 COUNTRIES: BILATERAL RELATIONSHIPS

For further insight, we also looked at which of the SEA-6 countries is leading the export of animal products to the countries mentioned above.

Figure 35 shows the top 10 markets importing from SEA-6 countries and the direction of trade (i.e. from country A > to country B). Thailand has been dominating the export trade out of all the SEA-6 countries. 9 out of the top 10 bilateral exports from the region are from Thailand.

The only other country from the region that made it to the top 10 bilateral trade, in terms of volume of animal products exported, is Malaysia. Similar to live animals traded, the animal products from Malaysia to Singapore are mostly from chickens.

THE BIGGEST EXPORTER IN SEA-6: THAILAND

Thailand has a strong animal agriculture industry and is the biggest exporter amongst the SEA-6 countries, in terms of animal products by volume and live animals by trade value. Thailand exports the most animal products to Japan, which has had a bilateral trade agreement with Thailand since 2007[153].

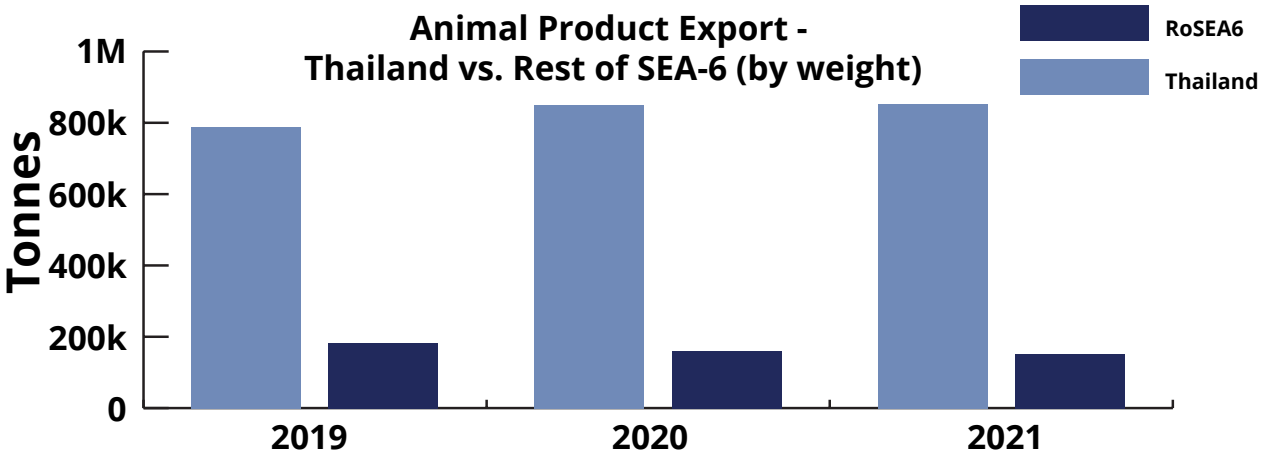


Figure 36. Comparison of animal product exports between Thailand and the rest of SEA-6 (RoSEA-6)

Furthermore, the country has had an extensive relationship with the European Union (EU) regarding the trade of animal products. The products are subject to zero or reduced duty import quotas under the World Trade Organisation (WTO) agreements. In 2018, around 47% of imported poultry meat in the EU came from Thailand.[154]

Figure 36 further showcases how Thailand has been by far the largest source of animal products amongst the SEA-6 countries. Thailand has at least 4 times the export volumes than the rest of the region combined. The multiple trade agreements with other countries has also helped facilitate the international expansion of Thai companies like CP Foods. In fact, Thailand is the world's 5th top exporter of poultry meat products in the world.[154]

Thailand has experienced great growth in exports since the early 2000s. The trade balance for dairy products has shifted in the country from net negative to positive, while the growth of swine and poultry meat has increased exponentially. The only market that seem to not experience growth for Thailand is the cattle beef market.[154]

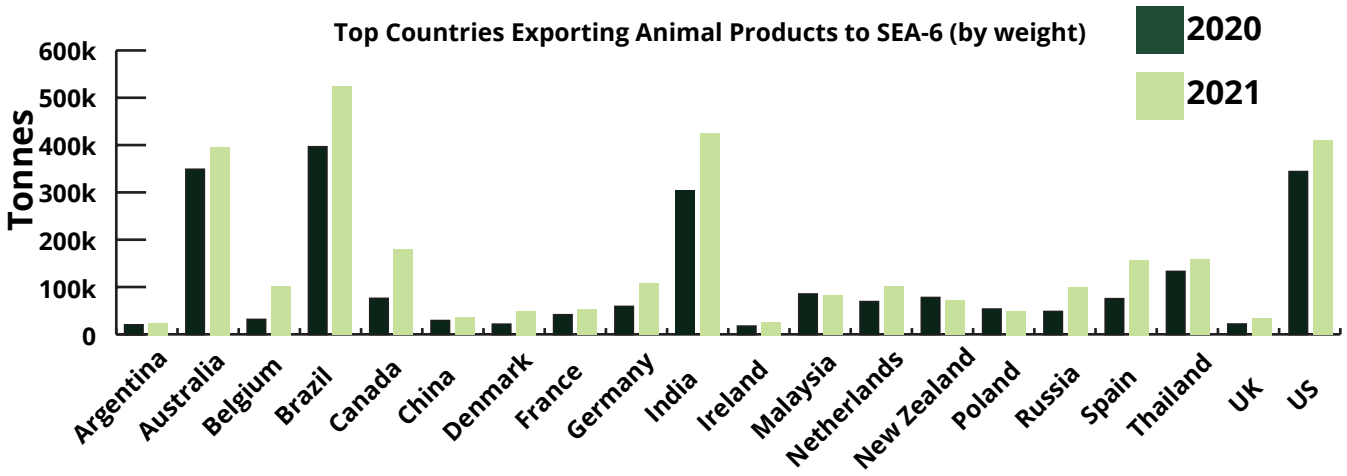


Figure 37. Exporting countries from which the SEA-6 countries are importing for the years 2020 and 2021

ANIMAL PRODUCTS TO SEA-6 COUNTRIES: WHERE DO THEY COME FROM?

On the import side of things, the SEA-6 countries are importing products from a wider variety of countries all over the world. Figure 37 shows the top 20 countries that the SEA-6 countries are importing from. Brazil, the US, India, and Australia are the major exporters of animal products for this region.

Brazil has been a main exporter of animal products for all SEA-6 countries for years. Their position as the leading exporter of poultry products in the world is observed in this region as well[155]

The imports from the US are a reflection of the continuous growth of collaboration between the region and the US. One of the animal products coming from the US is milk, which has experienced a big increase since 2006. The increased income per capita in the region has led to a dietary transition that has led to an increased consumption of dairy.[156]

ANIMAL PRODUCTS TO SEA-6 COUNTRIES: WHAT ARE THEY?

To further understand the import picture for the SEA-6, figure 38 shows the top animal products that are being imported from all over the world. Following the global trends of chicken consumption, chicken meat is the main product that is being imported to the SEA-6 region. The import of animal products experienced a dip in 2020 due to the global pandemic but in 2021 the numbers have all bounced back up.

UNDERSTANDING THE TRADE OF ANIMAL PRODUCTS IN SEA-6

As a last insight on the trade of animal products in this region, we have Figure 39 which shows the net import and export of animal products amongst the SEA-6 countries. In terms of monetary value, most of the SEA-6 countries are importing more than they exporting. As we have highlighted, the major exception is Thailand. [154]

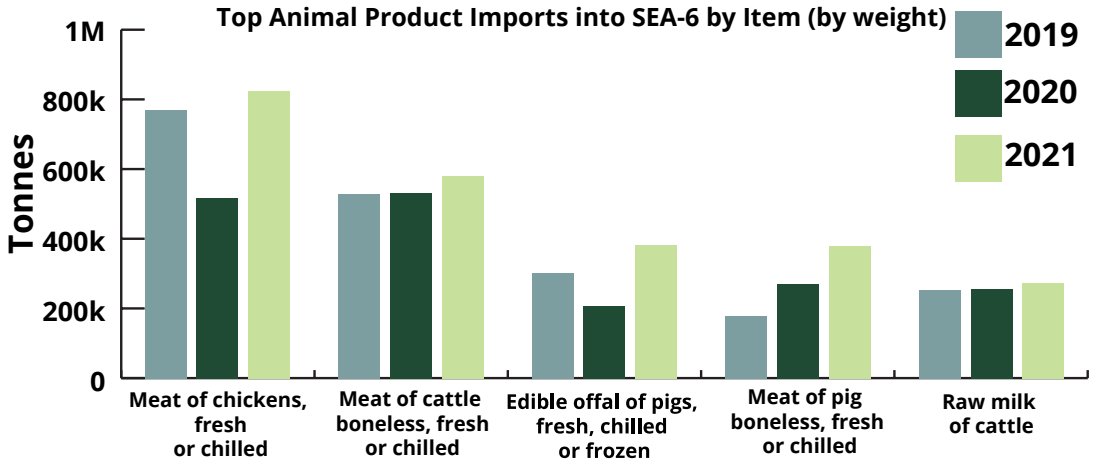


Figure 38. Top animal products imported into SEA-6

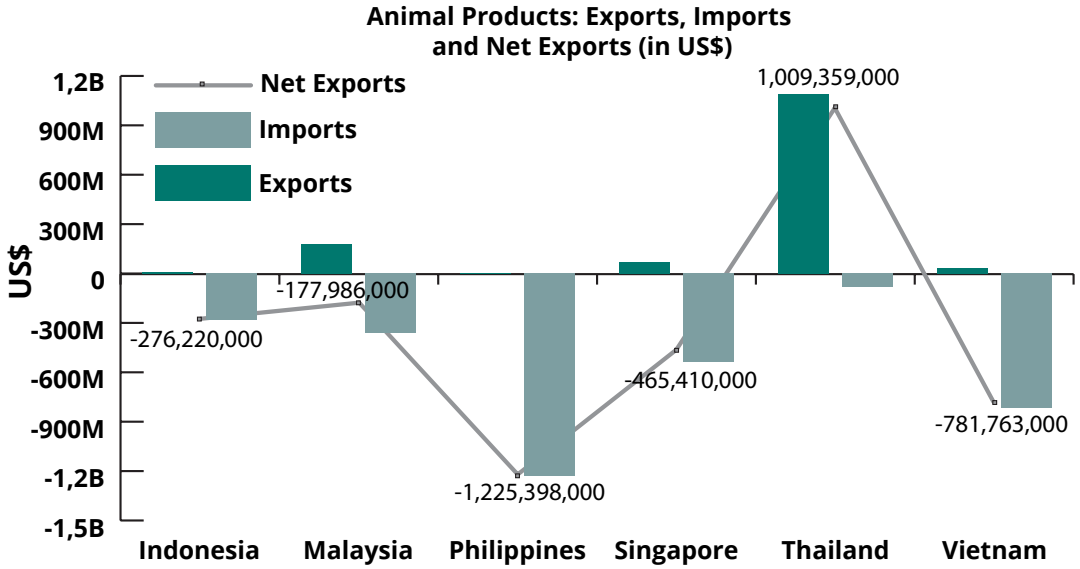


Figure 39. Values of exports, imports and net exports of the SEA-6 countries in terms of monetary value

In this section, we have painted the landscape of farmed animal trade in the SEA-6 region. There are billions of animals that are greatly affected each year, both within and across borders. Trade is an area that needs to be considered when evaluating the welfare of farmed animals.

Live animals seem to be mostly farmed and transported within the region. They are thus transported over the duration of hours or days, rather than weeks. Regardless of relatively short or long journeys, transportation can be a stressful period for the animals. Overcrowding, heat stress and extreme weather conditions are still welfare issues that need to be addressed even in the shortest transportation distances (see Chapter 1.5 for transportation guidelines by the WOAH).

Our conjecture is that many of the SEA-6 countries have lower levels of animal agriculture productivity, and hence rely on other neighbouring countries for their fresh meat supplies and international sources for processed animal products. The animal welfare implications go beyond the transportation process. Farmed animals' welfare is an international issue, thus the rules and regulations of animal farming in different Southeast Asian countries should be taken into account, as we try to ensure that welfare standards for how the animals are being treated and slaughtered are also implemented in the destination countries.

2.4 FREE TRADE AGREEMENTS AND CORPORATE PURCHASERS

After discussing the directions of trade, we thought it would be relevant to look into the trade agreements between SEA-6 countries and their trade counterparts to see if animal welfare is included as a topic. Free trade agreements (FTAs) could be a lever to effect animal welfare-related change if countries are exporting meat to economies with more established animal welfare practices. On the other hand, trade agreements between countries with no discussion of animal welfare practices could potentially threaten the welfare of animals if countries with different animal welfare standards collaborate. The liberalisation of trade could lead to the flooding of one market with cheaper animal products from abroad, which could put pressure on local producers to cut corners and find ways to compete on price. Nevertheless, the existence of those trade agreements could be an opportunity for the improvement of animal welfare practices. Countries can share technical knowledge, or even have provisions to trade in only higher-welfare products, giving incentives to producers to improve animal welfare.

An example of an FTA containing a good discussion of animal welfare provisions is the UK-Austalia FTA, which contains a whole chapter on animal welfare and antimicrobial resistance. The very first article of that chapter recognises that animals are sentient beings and that sustainable food production systems are connected with improved animal welfare.[157] The United Kingdom in the last few years has worked on signing new FTAs with many countries, which would probably have a positive impact on animal welfare if the UK also tables animal welfare as a requirement. As of March 2023 the UK has reached an agreement with many countries including Malaysia, Singapore and Vietnam which will be signed later in the year.[158] Examples of how FTAs could have negative impacts on animal welfare if they do not address animal welfare are the early 2000s FTAs signed between the EU and Algeria, Morocco, Tunisia Egypt, and Jordan. The organisation Eurogroup For Animals published a brief about the detrimental effects of those trade agreements that included botched stunning, prolonged, and painful slaughter procedures, brutal restraining, and more.[159]

The EU has increased its welfare standards over the years and since we have seen SEA-6 countries exporting to the EU we tried to find agreements between countries. In August 2020, the EU and Vietnam signed an FTA that contains a provision allowing the EU and Vietnam to cooperate on animal welfare. Specifically, article 16.3 states: "The Parties agree to cooperate on animal welfare as necessary, including technical assistance and capacity building for the development of animal welfare standards."[160] Since this is all the FTA mentions there have been some criticisms of it, with the Eurogroup for Animals releasing a brief mentioning that since the agreement doesn't include any conditionality related to animal welfare, the increase in trade will probably favour intensive farming practices that do not favour animal welfare.[161]

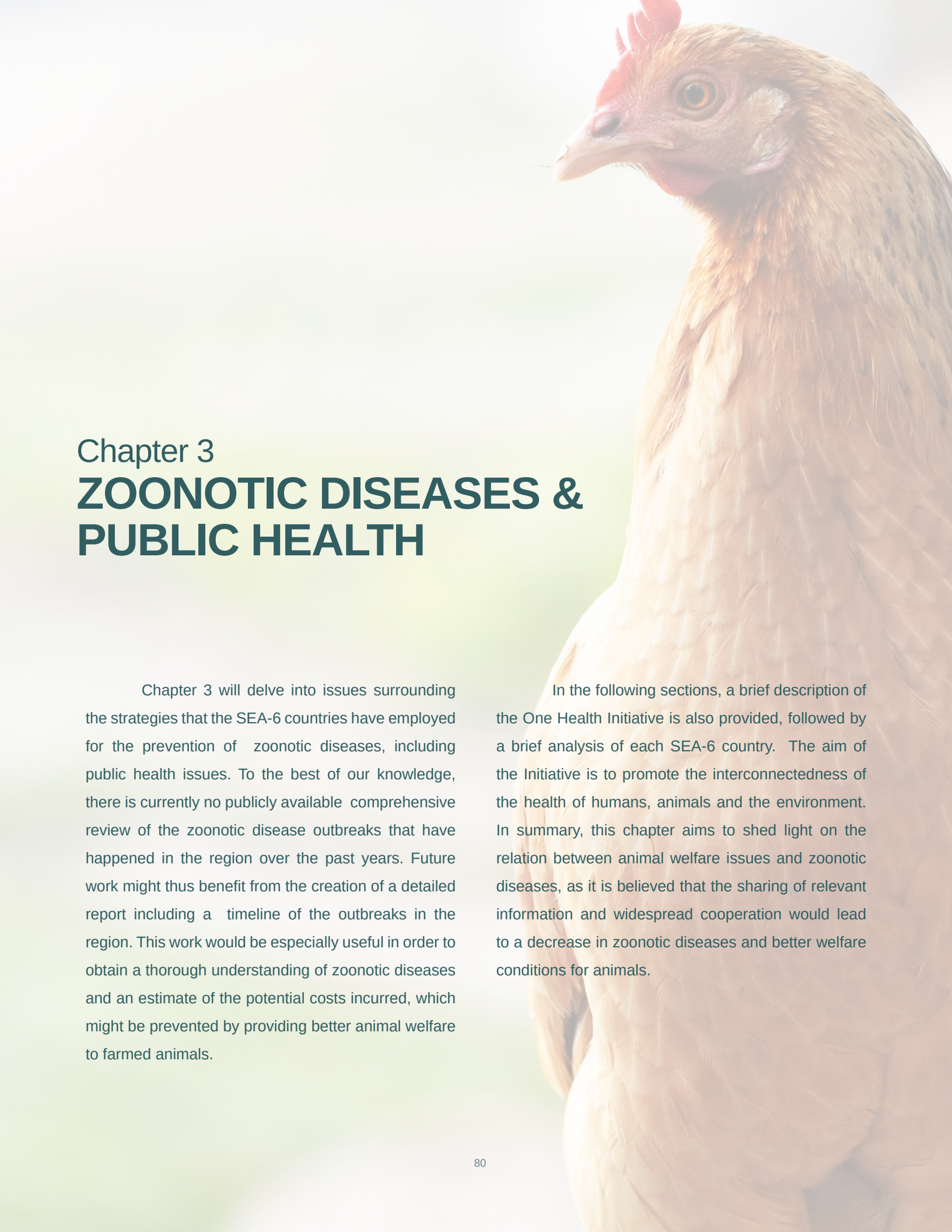
Singapore also has an FTA with the European Union, and in article 5.1 the text mentions that the countries are to collaborate "to protect human, animal or plant life or health".[162] It also mentions that the countries will collaborate "on animal welfare matters of mutual interest to the Parties".[162] The FTA, in article 5.8 mentions that the countries have an inspection and certification system in accordance with relevant

international standards, and the World Organisation for Animal Health (WOHA fka OIE) is mentioned as one of the international standards.[162] It is unclear if there is a conditionality related to animal welfare.

What about Thailand? After all, Thailand is the country with the highest number of exports of animal products from SEA-6. The EU suspended trade negotiations with Thailand in 2014 after a military coup ousted the civilian government[163] Since then, the country held general elections in 2019, and early in 2023, the negotiations over a free trade agreement were agreed to start again. Nevertheless, in October 2022 the European Union published a Partnership and Cooperation Agreement (PCA) entitled “Framework Agreement On Comprehensive Partnership and Cooperation Between the European Union and its member states, of the one part, and the Kingdom of Thailand, of the other Part”. In article 11 of the PCA, it is mentioned that the parties will cooperate in the promotion of the global transition towards more sustainable food systems. The countries want to promotee dialogue, capacity-building activities, and cooperation on issues like the reduction of environmental and climate impact of food systems and the reduction of the use and risk of pesticides, animal welfare, and antimicrobial resistance.[164] Since the discussions on the free trade agreement will continue in 2023, it is an opportunity for the animal welfare aspect of the agreement to be set in stone with more strongly worded guidelines.

Japan and Thailand have an Economic Partnership Agreement (JTEPA) named “Agreement Between Japan and the Kingdom of Thailand for an Economic Partnership” , which however focuses mostly on economic efficiency and consumer welfare. [165]

Lastly, the Association of Southeast Asian Nations (ASEAN) has established the ASEAN Economic community that envisions countries in the region as a single market. In 1992 the ASEAN leaders mandated the creation of the ASEAN Free Trade Area (AFTA). Since then, efforts were intensified to broaden the region’s economic potential.[166] During the 37th Meeting of the ASEAN Ministers of Agriculture and Forestry (AMAF), the delegates produced a publication entitled “Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry (2016-2025)”. As one of the strategic thrusts planned for the period, the countries showed an interest to develop common positions on issues related to trade, climate change, forestry, biodiversity conservation, and food safety. The guidelines from the World Organisation for Animal Health are mentioned as an aspect that the association will engage with. [167] Working with those guidelines in mind, the association issued the “Good Animal Husbandry Practices for Layers and Broilers Food Safety Module” even before the 37th meeting. In 2014 under an activity funded by the ASEAN-Australia Development Cooperation Programme Phase II, the standard was issued that was aimed to work as a template for countries that didn’t have a good agricultural practices standard in place and also to start the harmonisation process between countries to have a common standard[168,169]. Additionally, a standard for the Good Animal Husbandry Practices for Pigs was issued in 2018 that was adopted at the 40th AMAF.[170] Both guidelines are not completely the same as the guidelines issued by the WOAH, but they do reference the guidelines multiple times for the welfare of animals during transportation, feed, and protocols during a suspected disease outbreak.



Chapter 3

ZOONOTIC DISEASES & PUBLIC HEALTH

Chapter 3 will delve into issues surrounding the strategies that the SEA-6 countries have employed for the prevention of zoonotic diseases, including public health issues. To the best of our knowledge, there is currently no publicly available comprehensive review of the zoonotic disease outbreaks that have happened in the region over the past years. Future work might thus benefit from the creation of a detailed report including a timeline of the outbreaks in the region. This work would be especially useful in order to obtain a thorough understanding of zoonotic diseases and an estimate of the potential costs incurred, which might be prevented by providing better animal welfare to farmed animals.

In the following sections, a brief description of the One Health Initiative is also provided, followed by a brief analysis of each SEA-6 country. The aim of the Initiative is to promote the interconnectedness of the health of humans, animals and the environment. In summary, this chapter aims to shed light on the relation between animal welfare issues and zoonotic diseases, as it is believed that the sharing of relevant information and widespread cooperation would lead to a decrease in zoonotic diseases and better welfare conditions for animals.

3.1 ZOONOTIC DISEASES AND AMR STRATEGIES

Zoonoses or zoonotic diseases, are infectious diseases transmitted from vertebrate animals to humans and they pose an increasing concern since they add new infectious diseases that could be dangerous for humans.[171] According to the American Centres for Disease Control and Prevention (CDC), scientists estimate that 60% of infectious diseases can be spread from animals while 75% of new infectious diseases come from animals.[172] The main drivers of zoonosis and the leading causes of the increase in infectious diseases have been land usage and animal agriculture[173]. Figure 40 shows a diagram that was constructed by Johnson and colleagues in 2020 based on data analysed from wild and domesticated mammalian species that share viruses with humans. In the diagram, species node size is relative to the zoonotic virus richness calculated in that species. The diagram highlights the interconnectedness of different animal species and how easily zoonoses can spread. [174]

In addition to the highly infectious nature of zoonotic diseases, antimicrobial resistance (AMR) is making the treatment of infectious diseases more difficult. Humans use antibiotics to fight against infections and they are also used in animal agriculture in order to increase feed efficiency. Microorganisms that cause these infections can slowly and naturally develop some resistance towards antibiotics. However, the overuse and misuse of antibiotics has created a situation where some simple infections cannot be treated with the antibiotics anymore.[175] According to reports, ~5 million people died from illnesses in which bacterial AMR played a role in 2019. Furthermore, a 2016 review on AMR predicts that 10 million people

“ 60% OF INFECTIOUS DISEASES CAN BE SPREAD FROM ANIMALS WHILE 75% OF NEW INFECTIOUS DISEASES COME FROM ANIMALS ”

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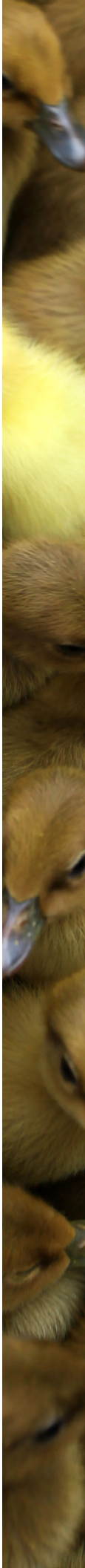

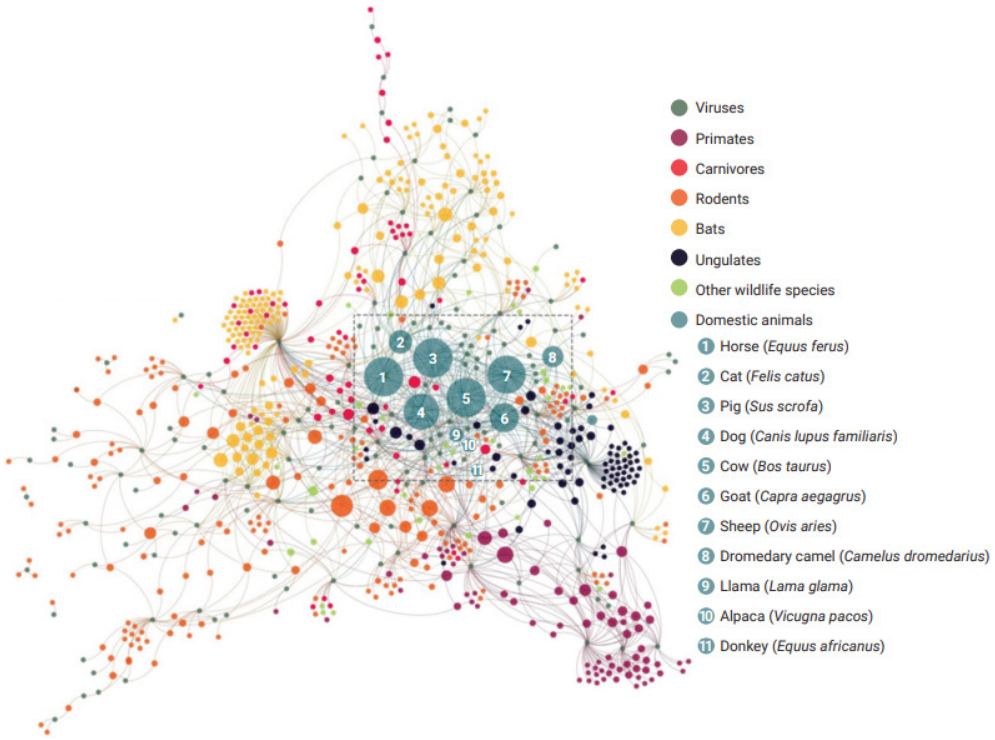

Figure 40. Diagram demonstrates the association between zoonotic viruses and mammalian host species

will die every year due to AMR by 2050. [176]

The countries included in this report are rapidly expanding, and also produce a large amount of animal products. Given how interdependent the SEA-6 countries are, it is believed that it would be beneficial to look into the past strategies these countries have employed against zoonotic disease outbreaks. Furthermore, we will outline their strategies against AMR and the One Health approach, which is an Initiative that all SEA-6 countries included in this report support.

Indonesia has previously experienced a Highly Pathogenic Avian Influenza (HPAI) outbreak lasting from 2003 to early 2004 affecting 15 out of 30 provinces, which resulted in 16.2 million poultry dead or stamped out in control efforts excluding those lost from backyard farms. In addition to farm-level impacts, there were drops of 45-60% in the demand for day-old chicks and feed inputs during the outbreak, in addition to a reduction of just over a third in employment in the poultry industry. In 2006, HPAI became prevalent in the country based on Indonesia's report submitted to the World Organisation for Animal Health.[177]

In 2005, the country reported the first human deaths caused by the Avian Influenza (AI). As an emergency response, a plan to cull approximately 200 pigs in a village near the Jakarta suburb of Tangerang where a man and his two daughters died of the avian flu was made. However, officials killed only 18 pigs instead, along with dozens of chickens and ducks, according to a Reuters article. This was due to the consideration that the original plan might have impacted the local economy negatively, according to a radio interview made by the Minister for Agriculture, Anton Apriyantono. According to his spokesman, Hari

Priyono, the plan was to kill only the pigs that tested positive for the avian flu, which accounted for the 18 pigs slaughtered. It was also promised that pigs that tested positive in the subsequent days would be slaughtered immediately. [178]

In 2009, health experts criticised the country's strategy of vaccinating all poultry against the influenza. The high number of backyard chicken farmers was the main point of contention since the vaccination programme would be too slow and too costly.[179]

A 2019 article reviewed the measures implemented as a result of the HPAI outbreak in Indonesia. The findings of the research showed that the primary aims of the Indonesian government were to safeguard humans from HPAI transmission by mitigating HPAI disease in livestock. The measures with the highest priority were: preventive vaccination of poultry, improving biosecurity, and stamping-out infected flocks. This showed that the government predominantly chose a vaccination-based HPAI mitigation strategy. However, the chosen strategy has a low implementation feasibility. The study further emphasised the challenges of vaccinating chickens in backyard farms with low levels of biosecurity.[180]

Indonesia has banned the use of antimicrobials for growth promotion at the beginning of 2018. Despite that, wide misuse of antibiotics have been reported. Many farmers give antibiotics to their livestock by themselves, because they are easy to obtain and this practice is currently unregulated by the law. In addition, the large number of small farms makes it difficult to implement control measures. Veterinary research centres also report that there are many animal products that contain antibiotic residues. However, identifying problems related to antibiotic residues in the livestock sector have not been prioritised, as the sector still mainly focuses on other safety issues, such as the misuse of formalin, borax, and hormones in animal products.[181]

Malaysia has experienced outbreaks of different zoonotic diseases throughout the years including the Nipah virus infection (1998), the Severe Acute Respiratory Syndrome (SARS) disease (2003), the Avian Influenza (2004, 2009 and 2014), and the Zika virus disease (2016). To date, different approaches have been used to respond to each pandemic. However, most efforts to control zoonotic diseases in the country have been reactive rather than proactive. [182] The Nipah virus first appeared in peninsular Malaysia in 1998, killing 105 persons, and led to the slaughter of approximately 1.1 million pigs. Thought to be Japanese Encephalitis (JE) at first, it turned out to be a virus hitherto unknown in humans, which had crossed over from fruit bats to humans via pigs. Humans had planted fruit orchards in previously forested areas on a large scale, in a region inhabited by fruit bats, which served as natural reservoirs of the Nipah virus. Human settlers also established intensively-managed pig farms at the edges of the habitats of fruit bats. The bats started feeding off the fruit trees around pigsties, and facilitated viral transmission by bringing the two previously spatially separated species together , which ultimately led to the virus being passed on to humans.[183]

In 2007, a review article entitled "Lessons from the Nipah virus outbreak in Malaysia" was published. This article looked into the chronological spread of the virus in the country and the strategies that the government had employed as more information

became available about the virus. Since the virus was initially attributed to JE, early control measures including anti-mosquito foggings and vaccination of pigs were ineffective. The epicentre of the virus outbreak in the town of Ipoh saw 15 fatalities, 9 of whom were subsequently confirmed to have been infected by the Nipah virus at autopsy. Unfortunately, pig-farmers affected by the outbreak sold pigs to other farms across the country. By February 1999, the outbreak had spread to Sikimat, Sungai Nipah Village and Bukit Pelandok (which contain the largest pig-farming communities) in Negri Sembilan, some 300 km south of Ipoh. This second epicentre was more severe, contributing to 89 deaths. Because of the sale and export of pigs, the virus spread all over the country and to Singapore. Healthcare workers were the first to realise that the outbreak was not due to JE as only adults were affected and not children, although many of the patients had previously already been immunised against the virus. Furthermore, autopsy reports were not consistent with that expected for cases with JE. In addition, ill pigs developed a severe cough and later died from the disease. However, the conflicting reports from the government at the time delayed the appropriate actions for disease control. It was only in March 1999 that Dr. Kaw Bing Chua from the University of Malaya identified that the virus was one that was previously unknown to Science. This helped tremendously in the subsequent screening and diagnosis of NiV infection. The outbreak in Singapore ended with the prohibition of the importation of pigs from Malaysia and the closure of abattoirs. The outbreak in Malaysia finally ceased with widespread surveillance of pig populations, and the culling of over a million pigs.[184]

Malaysia has experienced several Avian Influenza Virus (AIV) outbreaks over the past three decades. Four waves of High Pathogenicity Avian Influenza (HPAI) took place in 2004, 2006, 2007, and 2017 respectively. The first epidemics of the HPAI H5N1 subtype occurred in Kelantan, Kuala Lumpur, and Perak in 2004. Studies suggest that early detection of the virus is key to containing outbreaks. In the years before the first infection, surveillance was poor and it led to the subsequent outbreaks of 2004 and 2007. However, after 2007, DVS did not report any further H5N1 virus infections until 2017. The long period without any subsequent outbreaks suggest that the H5N1 virus was spread from farm to farm by poultry movement and inefficient biosecurity. [185] In the 2017 wave after the initial confirmation of the virus, an interagency group was formed with the cooperation across different departments (Ministry of Health, Malaysia Civil Defence Department (APM), the Police force, local governments etc). A total of 56,961 birds and 17,531 eggs were destroyed, involving a total of 1,243 premises in March of that year with the farmers receiving compensation. In order to avoid the spread of the virus caused by the potential smuggling of animals, roadblocks were established, which resulted in 288 birds being confiscated. After the culling, surveillance was further intensified using swabs and random tests on birds to contain the spread of the virus. [186]

The indiscriminate use of antibiotics in factory-farmed animals leads to AMR in poultry and people. In Malaysia, factory-farming is one of the major contributors to the economy. The country's Poison Act of 1952 mandates the registration of antimicrobials used in humans and animals with the National Pharmaceutical Regulatory Agency (NPRA). Animal feeds are also required to be registered with the

Department of Veterinary Services under the Feed Act 2009. Generally, antimicrobials are used for treating infections. However, they have also been routinely used for disease prevention and for promoting growth. Malaysia has conducted continuous AMR surveillance on foodborne pathogens such as Salmonella and the commensal bacteria, E.coli, in food-producing animals. In general, Salmonella and E.coli samples which were isolated from broilers, pigs and chickens, were found to be highly resistant (above 50 per cent) to drugs. The government of Malaysia has established an AMR policy, which aims at prohibiting the use of Critically Important Antimicrobials in humans and Veterinary Critically Important Antimicrobials in food-producing animals, for growth promotion and disease prevention. [187]

In the Philippines, the Philippine Integrated Disease Surveillance and Response (PIDSR) framework outlines the monitoring, response, and management of disease outbreaks. In November 2022, the country experienced an African Swine Fever outbreak with 26 municipalities, 17 provinces and 9 regions in the country being affected. The government restricted movement of any livestock or swine products in and out of the affected municipalities. Farmers within a 1-kilometre (km) distance of affected areas were put under surveillance. [188] Upwards of 250,000 pigs were culled in an effort to control the outbreak in the country.[189]

The Philippines experienced its first HPAI outbreak in August 2017. After the confirmation of the outbreak, officials announced a 1-km quarantine radius around the epicentre of San Luis. All fowls found within the area were culled and buried, with an estimated population of 200,000[190] Even though the first outbreak was dealt with quickly, the country experienced a new outbreak of HPAI in 2022 and 2023. The Philippine government has since adopted a comprehensive strategy to fight the outbreak. This includes timely information dissemination, thorough disease investigation, immediate culling and proper disposal of all remaining birds in affected farms, intensive surveillance in the 1-km quarantine zone around the infected farms, and heightened transport requirements for poultry commodities such as requiring negative AI tests and other relevant documents. The first outbreak was confirmed in January 2022 and a total of 198 cases were recorded nationwide in August, resulting in the mortality of 182,968 heads and the culling of 1,267,055 poultry.[191] The Philippines have passed The Philippine Action Plan to combat AMR. This plan is based on the One Health approach and was developed with the support of the World Health Organisation. Since the inception of the plan, the country has managed to[192]:

- Commit to a comprehensive, financed national plan with accountability and civil society engagement
- Strengthen surveillance and laboratory capacity
- Ensure uninterrupted access to essential medicines of assured quality
- Regulate and promote rational use of medicines, including in animal husbandry and ensure proper patient care
- Enhance infection prevention and control across all settings
- Foster innovations, research and development
- Develop a Risk Communication Plan to combat AMR

In January 2004, the HPAI virus of the H5N1 subtype was first confirmed in poultry and humans in Thailand. Control measures such as the culling of poultry flocks, restricting poultry movement and improving hygiene were implemented. Poultry populations across 1,417 villages in 60 out of 76 provinces were affected. A total of 83% of infected flocks confirmed by laboratory testing included backyard chickens (56%) and ducks (27%). Outbreaks were concentrated in the Central, the southern part of the Northern, and Eastern regions of Thailand, which are mainly made up of wetlands and water reservoirs, and are dense poultry areas. More than 62 million birds were either killed by HPAI viruses or culled. The H5N1 virus infected 17 humans and caused 12 deaths in Thailand. A number of domestic cats, captive tigers, and leopards also died of the H5N1 virus.[177,193]

In 2021, Thailand registered the emergence of two zoonotic disease outbreaks. Together, Lumpy skin disease and the Porcine Reproductive and Respiratory Syndrome (PRRS) infected around 7,200 cows and killed more than 200 pigs. PRRS, a viral disease in pigs, impairs the reproductive and respiratory systems and was first reported in a pig farm in Lamphun Province in September of 2020.[194]

Thailand has strict controls on zoonoses and the prevention of emerging and recurring infectious diseases. The Department of Disease Control (DDC) collaborates with the Department of National Park Wildlife and Plant Conservation (DNP) as well as the Thai Red Cross Emerging Infectious Disease Health Science Centre of the King Chulalongkorn Memorial Hospital. In early 2021, there were claims that the COVID-19 Coronavirus originated from Thailand. The interdepartmental team then conducted tests to investigate the chances of animal to human transmission. Samples were also collected from wildlife species in Thailand at the beginning of COVID-19 because it was suspected that this disease originated from animals. However, these studies proved inconclusive as no clear evidence was obtained regarding the origins of the virus. On the other hand, the research did show that some wildlife species are a common source of viral diseases – the coronavirus found in them had a similar genetic code (91.5% similarity) to the COVID-19 virus. However, that variant is not transmissible to humans. The DDC and DNP as well as the Department of Livestock also cooperate on projects that aim to prevent disease transmission from animals to humans while monitoring and searching for hidden pathogens. In Bangkok, there has also been ongoing efforts to clean and monitor the five wildlife and pet markets on a regular basis.[195]

When it comes to AMR, Thailand has led the way in applying stricter regulations on antimicrobial use in livestock. For example, a ban on the use of antimicrobials for growth promotion was implemented in 2015. Despite a more extensive infrastructure and a tighter control over antimicrobial use in Thailand, researchers have described a black market and the illegal use of antimicrobials in livestock. The Animal Health and Products Association (AHPA), which is the trade association for veterinary pharmaceuticals, has collated antimicrobial sales data to estimate antimicrobial use. Since 2013, the AHPA has used the European Surveillance for Veterinary Antimicrobial Consumption (ESVAC) metric of mg of antimicrobial per population correction unit (mg/PCU) when administering antimicrobials. These data identified pigs to be the species with the highest consumption of

antimicrobials with a value of 238 mg/PCU in fattening pigs compared to 16 mg/PCU in broiler chickens.[196]

In Vietnam, HPAI caused by viruses of the H5N1 type was first identified as a cause of serious disease in the winter of 2003-2004. Between December 2003 and March 2004, 24% of Vietnam's communes and 60% of towns were affected across 57 out of Vietnam's 64 provinces; 45 million poultry were culled or have died, comprising around 17% of Vietnam's poultry population. The threat to human and poultry health continued in Vietnam with outbreaks confirmed in 18 provinces in 2009. Although human fatalities decreased from a high of 20 in 2004 to 5 in 2009; there were nevertheless two deaths from six cases in 2010. The largest losses were felt by small-scale commercial chicken producers with limited numbers of other livestock. Many had borrowed money to fund poultry production and found themselves in debt when their birds died or were culled.[177]

Rabies used to be the most serious zoonotic disease based on the number of infected human cases and the geographic distribution of its spread. HPAI, rabies, anthrax, leptospirosis and Streptococcus suis (S. suis) have been commonly reported in Vietnam. In 2015, a study was conducted to establish strategic priorities for zoonotic disease control in Vietnam, and 5 out of 12 diseases were selected for prioritisation. The diseases included AI, rabies, S. suis, Pandemic Influenza and foodborne bacterial diseases[197]. Late in 2022, Vietnam reported its first case of AI in a human since 2014[198]. Nevertheless, the country has experienced outbreaks of H5N1 virus in birds, culling more than 100,000 poultry in 2021[199].

African swine fever, one of the most devastating livestock diseases, was first detected in Vietnam in February 2019 and forced the country to cull around 20% of its hog herd in 2021. It was reported in 2022 that Vietnam had developed a vaccine that could be administered to pigs. This vaccine would provide immunisation against African swine fever and Vietnam aims to become the first country to commercially produce and export it.[200]

Commercial wildlife farming, that is the breeding in captivity of wild animals that are normally not domesticated in order to sell them as pets or to sell their meat, fur, leather, and traditional medicine, is a thriving trade in Vietnam. However, this practice is dangerous as commercial wildlife farms can make the transmission of zoonotic diseases between different species more likely. According to a recent report, Mr. Trinh Le Nguyen, the Executive Director of PanNature, was quoted as saying 'around 18 thousand facilities breed many hundreds of thousands of wild animals covering 100 rare and precious species,' . Wildlife farming is still legal in Vietnam as the government takes into consideration the fact that it contributes to economic development and rural employment. It is also seen as reducing pressure on endangered animals in the wild that would otherwise be hunted down.[201]

With regard to antibiotic use, evidence shows that 88-97% of drug stores dispense antibiotics without a prescription despite the fact that it is prohibited by Vietnamese law.[202]. In the livestock sector, surveillance of antimicrobial resistance in animals is still at a nascent stage. Surveillance in animals and food of animal origin is carried out by the Department of Animal Health under the Ministry of Agriculture and Rural Development. The ministry collates and reviews all the information generated on antimicrobial

resistance and antimicrobial use to better understand the epidemiology of antimicrobial resistance and develop policies on antimicrobial use. The department also registers drugs imported for veterinary use, manages data on the imports and manufacturing of antimicrobials, and leads antimicrobial resistance surveillance.[203]

Most poultry farms use commercial feed for feeding which makes up approximately 30% of the total feed consumed in the country. Around 70% of broiler feed samples showed at least one type of antibiotic from the tetracycline and tylosin groups. [78]Vietnam is a potential hot spot for the emergence of AMR due to the high burden of infectious diseases that are directly transmissible and that are foodborne, coupled with limited enforcement of regulations that penalise non-compliance, as well as the relatively unregulated access to antimicrobials for humans and high antimicrobial usage for livestock. [204] Residues of antibiotics have been identified in eggs and meat from retail outlets in Vietnam despite regulation of maximum residue limits. The majority (>75%) of farmers believe that there is an economic advantage to antimicrobial use in livestock and reported that antimicrobials contributed toward greater farm profitability and lower mortality rates in livestock.[196]

One Health

The One Health concept recognises that the health of humans, animals and the environment are veryThe One Health approach recognises that the health of humans, animals and the environment are very closely connected. One Health promotes the collaboration between multiple levels, sectors and

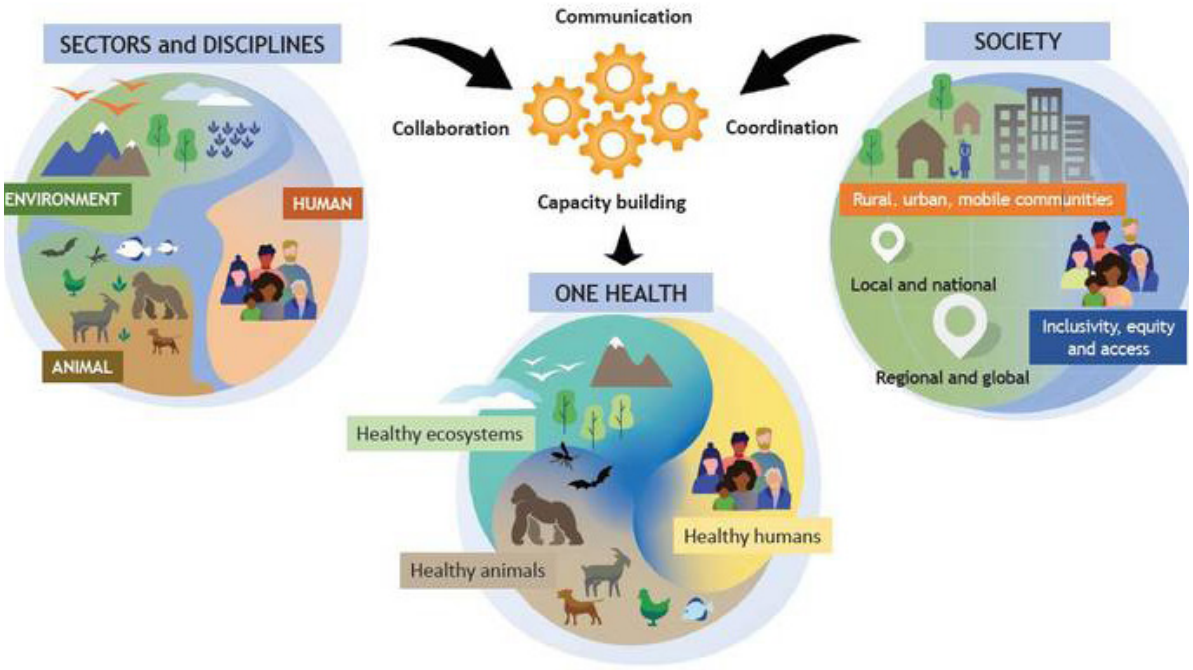

Figure 41. Image developed by the One Health High Level Expert Panel

disciplines to address the multifaceted environmental challenges. One Health aims to mitigate and manage the risks of zoonoses, to address anti-microbial resistance as well as issues related to plant and animal health. The United Nations system has been taking steps to consolidate One Health at the global, regional and national levels. For instance, the Food and Agriculture Organisation (FAO) has produced a "Strategic Action Plan on One Health" and developed a programme on "Strengthening and Extending the One Health Approach to Avert Animal-Origin Pandemic 2020- 2024". The World Health Organisation (WHO) has developed a "One Health Approach for Action Neglected Tropical Diseases (2021-2030)" and tools to inform national strategic health planning (e.g., OneHealth Tool). Strategic frameworks have also been developed with the collaboration of the Tripartite organisations (FAO, WHO and OIE) and the United Nations Environment Programme (UNEP), including the "Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface" or the "Strategic Framework for Collaboration on Antimicrobial Resistance".

The One Health approach is implemented in all of the countries included in this report. In 2011, the Southeast Asia One Health University Network was established with support from the United States Agency for International Aid. The aim of the network is to develop a resilient and competent One Health workforce through education, research and training provided by University networks in Southeast Asia. [173]

In 2016, four districts in Indonesia were selected as One Health pilot areas based on their high risk of zoonotic diseases. The Action Plan implemented focused on capacity-building activities in order to improve the capacities of field officers to prevent, detect and respond to zoonotic disease events. The activities included informant interviews, workshops, training, field observation, and data collection. Results from the first initiative showed that more than 80% of field officers in pilot areas integrated responses and 25% of zoonoses cases have been addressed using the One Health approach. [205]

In Thailand, farmers, local health volunteers and health professionals are using mobile devices to directly report detections of zoonotic diseases that may pose a serious health threat. This early reporting to the Ministry of Public Health allows for faster disease investigations. There is a team of One Health experts who are in-charge of monitoring the data and can initiate a rapid response to control potential outbreaks should the need arise. [206]

3.2 BARRIERS TO HIGHER WELFARE: COSTS & IMPLEMENTATION CALLENGES

Most of the emerging viral pathogens in the world have zoonotic origins. [23] This section of the report will look at zoonotic disease outbreaks through a different lens – the financial impacts of such outbreaks. The financial cost of emerging viral zoonotic diseases contributes to a fraction of the world's lost gross national income. A 2018 review calculated that the average gross national income lost from a pandemic is 0.6% of the world's gross national income.[207] When that number is applied to the global gross national income of $87 trillion i Most of the emerging viral pathogens in the world have zoonotic origins. [23] This section of the report will look at zoonotic disease outbreaks through a different lens – the financial impacts of such outbreaks. The financial cost of emerging viral zoonotic diseases contributes to a fraction of the world's lost gross national income. A 2018 review calculated that the average gross national income lost from a pandemic is 0.6% of the world's gross national income.[207] When that number is applied to the global gross national income of $87 trillion in 2019, the average loss comes up to $522 billion per outbreak. [208] It is thus also important to consider the financial costs associated with zoonotic diseases. For example, what would be the estimated total economic cost incurred from past pandemics? How much would preventative measures cost? And how would these preventive measures impact the life of animals, producers, and even on the price of goods?

Given the growing public concern regarding animal welfare, industries that abide by legal regulations and meet the expectations of the community are granted a “social licence to operate”, and farming industries that do not maintain community support risk losing this licence. For example, if the Australian red meat industries do not take animal welfare t into account and lose their consumer support, it is estimated that this would result in a potential accumulated loss of $3 billion dollars (USD) by 2030. [209]

However, providing better welfare to farm animals comes at an inherent cost. Many different aspects of the systems that are part of the industry require improvements, and it is difficult to define an all-encompassing solution. Studies have suggested different courses of action in order to minimise the risk of future outbreaks and the faster detection of novel pathogens. For one, virus spillovers, which occurs when a virus is transmitted from a reservoir population to a novel host, are a common event and can potentially cause the emergence of zoonotic diseases. Importantly, due to the greater interaction between humans and animals today, there are higher chances of a virus spilling over. One course of action to prevent zoonosis is to expand viral discovery and viral surveillance. Bernstein and colleagues (2022) suggest that a global virus discovery project would be beneficial to humankind. It is suggested that an unbiased testing approach targeting viral families can potentially identify the presence of zoonotic pathogens, which may be in the hundreds of thousands.[210] The creation of a viral library would help target where activities should be focused geographically and help with downstream prevention through rapid identification of pathogens when they emerge.[208] A second course of action would be the constant monitoring of wildlife hunting and trade. On a

global scale, wildlife hunting threatens more than 300 terrestrial mammal species with extinction.[211] The breadth and depth of the wildlife trade include many animals that host a high diversity of zoonotic diseases. One recent example is the emergence of COVID-19, which resulted in China increasing restrictions on the wildlife trade. In February 2020, the country permanently banned wildlife food consumption to protect health.[212] However, it is also important to note that reducing China's consumption of wildlife for food comes at a significant cost. Lastly, deforestation has been widely considered to be the leading cause of pathogen emergence and is one of the greatest threats to terrestrial biodiversity.[213] Courses of action for the primary prevention of the spread of zoonotic diseases in China would thus include the closure of the wildlife farming industry, viral discovery, early detection and control, the implementation of programmes to reduce spillover from livestock, and deforestation reduction. On a global scale, the median cost for the primary prevention is estimated to be around $20 billion which is ~1/20 of the minimal annualised value of lives lost to emerging viral zoonoses and <1/10 of the annualised economic losses.[208]

It has been suggested that less intensified farming practices can help to decrease the risks of zoonotic diseases emerging[214,215]. However, the term “intense” is poorly defined and it broadly refers to practices that maximise yield. Lower yielding production systems typically involve poorer biosecurity and require more workers and land to farm, which, unfortunately do not negate the possibility of the emergence of infectious diseases. [216] Thus, decreasing the production yield is not a “one-size-fits-all” solution, and makes finding an approach

Table 10. Summary of farming practices and their effect on the emergence of zoonotic diseases

Farming Practices	Description and effects on zoonosis
Biosecurity	Intensive/closed systems tend to have better biosecurity than smaller/ low-yield farms.
Livestock Movement	Large-scale production tends to go with longer distance livestock movements (but not always). This is worse for infectious diseases
Population size	Larger livestock population tends to present a larger potential host population with more opportunities for contact and transmission
Livestock Density	This factor tends to interact a lot with the size of the flock. Both stocking density and farm density within a landscape tend to have higher infectious disease risks. However, in some cases, higher density tends to select for less virulent strains
Livestock Health and Welfare	Poor livestock health and welfare can cause immunosuppression and facilitate pathogen shedding and transmission. ‘Intensive’ systems and ‘factory farms’, which are typically high-yield, have been linked with relatively poor livestock health and welfare
Disease Resistance	High levels of innate disease resistance or immunity in a farm may confer resistance and potentially impede re-emergence. There is, however, evidence that sometimes the opposite is true—partially immune populations can have longer and larger outbreaks
Genetic Diversity	Could have either positive or negative impacts on Infectious disease risk. Pathogens may diversify more when exposed to a greater genetic diversity of host species but it could also provide resilience to the disease. This is an open question still to be answered.
Land use	Lower yield production systems would use more land so higher chances of interaction with other animals which may transfer diseases.

that balances the risks of an outbreak and meeting livestock demands more complicated. A review from researchers at the University of Cambridge and the University of Leeds looked at the effects of the main risk factors that are linked with management practices. Importantly, the researchers took into account that the demand for animal products is expected to increase in the future. The different management practices studied thus focused on high-production systems in order to meet the increasing demand. The key practices and their effects are shown in Table 10.[217]

As can be seen, the problem of improving farming practices while minimising the risks of the emergence of zoonotic diseases is not straightforward and there are questions that remain unanswered. The researchers suggest including discussions regarding infectious diseases into the broader discourse over sustainable food systems and one possible way would be to integrate them into ecosystem service frameworks. This kind of framing would allow the mainstreaming of disease control into a holistic understanding of optimal farming practices.

The overall production costs of better welfare systems as described in Chapter 1 are generally higher, although there are some “win-win” situations. For example, healthier animals will result in lower veterinary costs as well as reduced disease and mortality rates. In addition, it could also lead to better growth rates and feed conversion.[218] In some cases, improved welfare may add very few extra costs. For instance, more gentle handling of cattle may involve few other costs apart from personnel training and yet bring more benefits through reduced bruising and carcass downgrading.[218] In other cases, welfare improvements may involve major capital investment, especially if the producer has to convert an existing building and replace equipment. In these situations, the producer may choose to wait until the working life of their equipment is up before replacing it with a new one. For example, the capital cost of installing group housing for sows might be less than purchasing new sow stalls, which they might have done originally. This solution would therefore be more cost-effective as well as improve the welfare of animals.

The main issue with providing better animal welfare is the higher production costs, which have to be borne by someone for the viability of producers. Many studies have been done over the years to determine the value of the extra cost. Data presented in a socio-economic report prepared for the European Commission show that a free-range egg costs just 2.6 euro cents more to produce than a battery egg (i.e., an egg produced from a hen that is kept in a battery cage), while a barn egg costs just 1.3 euro cents more to produce than a battery egg.[219] Another European parliament study compared the egg production costs between the EU and selected third countries (Argentina, Brazil, India, and the US). It was shown that the main factor influencing the production cost between the EU and each third country is the difference in feed costs.[220] In the same study, it was calculated that the reduction of stocking density from 42kg/m2 to 38kg/m2 would add a 2% increase in production costs while a further reduction to 34kg/m2 would add a 2.5% increase to production costs.[220] There is some evidence that the additional costs involved in providing better welfare can be offset by the production advantages from the resulting improved health and welfare of the birds. For example, slow-growing birds had much lower levels of breast blisters, thigh scratching, hock burn, and foot pad lesions than

commercial broiler chickens .[218]

Pig production costs (i.e., building and running costs) for group housing systems are actually not significantly higher as compared to sow stalls despite being the higher welfare option.[221] A 2007 study focusing on pork production in European countries indicated that the average increase in production costs for group housing is only 1.06 cents per kg of pig meat.[222] A 2011 US study that compared different pig production systems in the country found that the cost of changing pork production from sow stalls to group housing would increase the costs at the farm level by 9% and at the retail level by 2% if all the additional costs were passed on to the consumer[223]. This would translate to an increase of only 11 euro cents per kilogram. According to consumer surveys, the average American is willing to pay 5 times that amount for a pig that was raised in better welfare conditions.[223] Another example of the high cost that is associated with better welfare is illustrated by the Australian government voluntarily phasing out sow stalls in 2017. [224] Even though there are recent articles reporting that some pigs are still held in narrow stalls as of 2022 [225], the estimated cost of this ban for the industry is approximated to be $38-73 million dollars.[209]

With regard to cattle, a study done in 2011 on cattle feedlots showed that providing shade infrastructure to reduce the heat intensity experienced by cattle has a cost of $45-54 dollars for 2 to 4.7 m2 of shade per animal. Based on this information and the feed conversion rate, the study showed that cattle

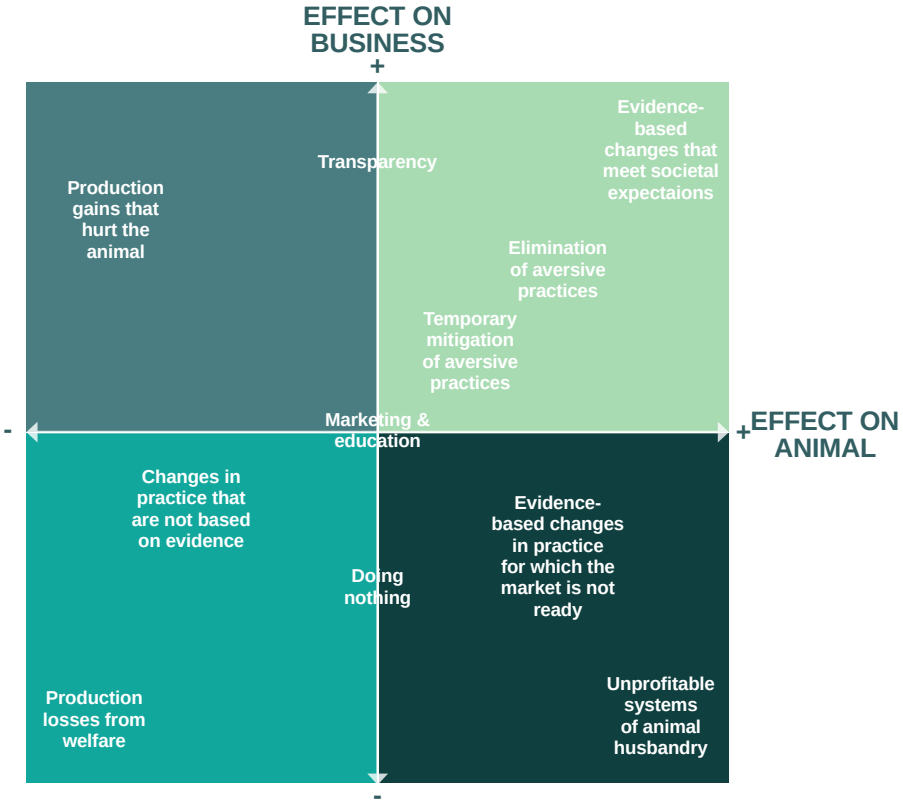

Figure 42. Decision tool for businesses considering changes in practices to improve farm animal welfare. The horizontal axis depicts the effect of the change in practices on the welfare of the animal, with more positive effects towards the right. The vertical axis depicts the effect of the change in practice on the profitability of the business, with more positive effects towards the top.[208]

that were fed under the shade in the summer led to at least a $15 dollar increase in profit per animal when no heat-induced mortality were taken into account .[226]

Based on the above examples, it is easy to understand that business owners have many factors to consider when making decisions about animal welfare and the viability of their business. Researchers from the University of Queensland and The University of Melbourne have created the decision tool shown in Figure 42 in order to help decision-makers facing dilemmas about animal welfare and profitability.[209]

The above research findings mostly applied to European countries, the US, and Australia. To our knowledge, there has not been any extensive research on the impact of higher animal welfare practices on production costs in Southeast Asia. It is expected that the findings for Southeast Asia would deviate from the above since the climate and initial infrastructure are different. However, the current results are promising when considering the efforts put into providing higher welfare to farm animals. A study published in December 2022 on the perspective of egg producers on the adoption of cage-free systems in China, Japan, Indonesia, Malaysia, Philippines, and Thailand showed that most producers (65%) would consider cage-free systems to be feasible in their home countries.[227]The convenience of operations and the reduction of costs were the most frequently cited reasons by producers for using cage-based systems. Most producers (72%) reported that they would need more support in the form of personnel training and resources to establish cage-free farms . The reasons for adopting cage-free systems included improving bird welfare, gaining access to a wider market, and brand differentiation. On the other hand, a total of 217 barriers to moving to cage-free systems were identified by cage producers. These barriers often represented recurring themes that were predominantly centred around land availability, cost, management, and disease mitigation. One interesting finding from this study is that 75% of egg producers from Thailand reported that cage-free systems were not feasible in their country.[227] This is interesting because it contrasts with the stance of most other countries included in the study and Thailand, as seen in previous chapters of this report, has one of the biggest farm animal industries among the SEA-6. This further highlights the need for more specific research within the region to examine how feasible better welfare systems are for the farming industries in Southeast Asia.

Chapter 4

COMPANIES ACTIVE IN THE REGION & CONSUMER BEHAVIOUR

This final chapter will focus on the companies active in the farming industry across the SEA-6 countries and their commitments to animal welfare. Specifically, the companies include those that are at the producer and corporate purchaser levels. In addition, this chapter will look into the decision-making process underlying the purchasing behaviour of consumers for meat products, data for which was provided by GlobalData. Understanding consumer behaviour can be very helpful in identifying trends in each region and gaps in the knowledge of the public in relation to animal welfare. This chapter will also explore the labelling practices in each of the SEA-6 countries and examine how easy it is for consumers to identify products that meet higher welfare standards.

4.1 COMPANIES ACTIVE IN THE SECTOR AND THEIR ANIMAL WELFARE PLEDGES

Companies can provide valuable insights into consumer awareness of animal welfare in the markets they operate in, as they adjust their products and services to reflect consumer preferences. Additionally, company activities can inform the public about new trends and educate them on unfamiliar concepts. Therefore, we sought to understand the general trend of corporate engagement in the animal welfare space. Unfortunately, there is a lack of transparency in commitments to animal welfare, as evidenced by the absence of Southeast Asian companies in The Business Benchmark on Farm Animal Welfare Report 2021, except for Charoen Pokphand (CP) from Thailand[228].

CP, which holds controlling stakes in Charoen Pokphand Foods (CP Foods), a leading global producer of feed [229] and a top 10 producer of poultry and pork [230], has been included in the Tier 3 impact rating in the report. This indicates that the company has established some animal welfare framework in their business but further improvements are needed. CP's animal welfare policy is focused on the principles of the Five Freedoms, which applies to the company and all its subsidiaries. Personnel are trained to be equipped with the necessary knowledge and understanding of animal welfare, [231]. The company aims to extend the implementation of animal welfare policies to their contract farmers by their stated goal of 2030 [232].

Furthermore, the company has made public commitments targeting by 2030[232]

1. 100% of sows raised in group gestation pen housing system
2. Increase the production capacity of cage-free eggs by 30% per year based on Y2020
3. 100% environmental enrichment for broiler

In addition, CP has publicly stated that all farmed animals destined for slaughter undergo stunning using various methods. Chickens and ducks are stunned using an electrical water bath, while pigs are stunned using carbon dioxide or low-voltage electric current [233].

Since animal welfare has increasingly become a point of concern for many people globally, companies have made public commitments for improved animal welfare throughout their supply chain. We first looked for a general list of companies active in SE Asia that had made animal welfare commitments and publicly announced them. Lacking the ability to compile such a list ourselves, we had to rely on other organisations that had already done this. In the end, the only list of animal welfare commitments we found were compiled by Chicken Watch detailing companies that had committed to either cage-free eggs or more humanely raised “better chicken”.[234] In Southeast Asia, there was only 1 “better chicken” commitment from Singapore; the rest of the 326 commitments were all for cage-free eggs. The table summarising the data can be found in Table 11.

Table 11. Cage-free egg commitments in SEA-6 from Chicken Watch

Country	Total # of Commitments	From SEA Companies	From International Companies
Indonesia	67	18 (27%)	49 (73%)
Malaysia	52	4 (8%)	48 (92%)
Philippines	51	5 (10%)	46 (90%)
Singapore	58	5 (9%)	52 (91%)
Thailand	62	11 (18%)	51 (82%)
Vietnam	36	4 (11%)	32 (89%)

It is evident that the majority of commitments come from international company branches that have made these commitments at a global level. Even in Indonesia, which has the highest number of cage-free commitments from local companies, only three out of the 15 local commitments are from relatively small restaurants and businesses. In other words, it does not appear that local companies are leading the way in animal welfare commitments in Southeast Asia. The complete list of companies and their commitments can be found **here**.

As mentioned in chapters 2.3 and 2.4, trade also plays a significant role in animal welfare, as some free trade agreements require companies to adhere to higher welfare standards if they wish to export to certain countries. However, after thorough desktop research, we only found supplier data from supermarkets in the UK, as they publicly disclose their supplier lists as part of their corporate social responsibility efforts. Two supermarkets, Tesco and Sainsbury, include CPF (Thailand) PCL as a Tier 1 food supplier. Conversely, Waitrose and Lidl UK do not have any listed partnership with CPF (Thailand). Companies in the EU did not follow the same practice, so we were unable to find any other relevant information. Nevertheless, considering that CP is the only food producer from Southeast Asia with a global presence, it is reasonable to assume that other companies are unlikely to have similar supplier partnerships with EU or UK retailers.

Lastly, other than showing the general trend of companies in Southeast Asia we also wanted to provide a list of top animal producers in SEA-6. The lists were obtained from Watt Global Media's work as Watt Poultry and Watt Swine and can be viewed in the table below.[235,236]

Table 12. List of top Poultry producers in SEA-6

Poultry			
Company Name	Country	Company Name	Country
CJ Cheil Jedang Indonesia	IDR	Alturas Group	PHL
CP Indonesia	IDR	Bounty Agro Ventures	PHL
Japfa Comfeed	IDR	Foster Foods Inc.	PHL
Malindo Feedmill	IDR	Marcela Farms	PHL
New Hope Group	IDR	Red Dragon Farms	PHL
PT Dinamika Megatama Citra	IDR	Robina Agri Partners	PHL
PT Janu Putra Group	IDR	San Miguel Foods	PHL
PT Sapta Karya Megah	IDR	Venvi Agro-Industrial Ventures Corp.	PHL
Sierad Produce	IDR	Japfa Ltd.	SGP
Sujaya Group	IDR	N & N Agriculture Ltd.	SGP
Tanjung Mulya	IDR	Seng Choon Farm	SGP
Wonokoyo Group	IDR	Toh Thye San Farm	SGP
Ayamas Integrated Poultry	MYR	Bangkok Ranch Public Company Limited	THA
CCK Consolidated Holdings	MYR	Betagro Group	THA
CP Malaysia	MYR	Chaveevan Group	THA
DBE Gurney Resources Bhd	MYR	CP Foods	THA
FFM Berhad	MYR	GFPT	THA
Lay Hong Berhad	MYR	Kasemchai Farm Group	THA
Leong Hup International Berhad	MYR	Laemthong Corp. Group	THA
LTKM Berhad	MYR	Panus Poultry Co.	THA
Malayan Flour Mills	MYR	Saha Farms	THA
PK Agro Industrial Products	MYR	SunGroup	THA
PWF Consolidated	MYR	Thai Foods Group	THA
QL Resources Bhd	MYR	CP Vietnam Corp.	VNM
QSR Brands (M) Holdings Sdn Bhd	MYR	Japfa Comfeed Long An	VNM
Teck Ping Chan (TPC) Plus Berhad	MYR	Unitek Enterprises Vietnam Company	VNM
Teo Seng Capital Bhd.	MYR	Vissan	VNM

Table 13. List of top Swine producers in SEA-6

Company Name	Country	Company Name	Country
CP Indonesia	IDR	Robina Agri Partners	PHL
Japfa Comfeed	IDR	San Miguel Foods	PHL
Malindo Feedmill	IDR	Venvi Agro-Industrial Ventures Corp.	PHL
Sujaya Group	IDR	Japfa Ltd.	SGP
CP Malaysia	MYR	Betagro Group	THA
Malayan Flour Mills	MYR	CP Foods	THA
Alturas Group	PHL	GFPT	THA
Bibiana Farms & Mills	PHL	Thai Foods Group	THA
Cavite Pig City	PHL	CP Vietnam Corp.	VNM
Easy Bio Philippines Inc	PHL	GreenFeed Vietnam Corporation	VNM
Jaro Development Corp	PHL	Japfa Comfeed Long An	VNM
Marcela Farms	PHL	Masan Meatlife	VNM

4.2 CONSUMER BEHAVIOUR

Enhancing public awareness and understanding of animal welfare is a vital factor in enhancing the well-being of farm animals. In this section, our aim is to identify various trends in the region pertaining to the consumption of animal products as well as alternative meat products, and to explore the underlying reasons behind these purchasing patterns. To accomplish this, we will be utilising consumer survey findings provided by GlobalData.

It is projected that by 2030, consumers in Asia will allocate an additional US$ 4.4 trillion towards food expenditure, driven by demographic shifts and evolving consumer needs. This surge in demand is anticipated to be met with an extra US$ 750 billion in spending across the entire food value chain [237].

The second Asia food challenge report highlights that Asian consumers are currently displaying heightened concerns about the food they consume. The following key consumer trends have been identified, with the understanding that these trends are often interconnected and mutually influential [2].

1. Healthier Diets - Replacing processed foods, red meat, and sugar with healthier alternatives.
2. Fresh foods: Choosing quality products associated with freshness
3. Safe and traceable sources: Requiring greater food safety and production validation measures
4. Sustainable consumption: Tackling the environmental impact of food consumption

5. Alternative Protein: Growing interest in innovative plant-based and cultured meat alternatives
6. Online Purchasing: Increasing the use of e-commerce.

The fact that Asian consumers now possess greater disposable income does not imply that they will become less mindful in their spending habits. According to a 2020 survey conducted by PwC, consumers in Indonesia, Thailand, and Singapore prioritize the freshness of produce over lower prices, indicating that they value value for money rather than simply opting for the cheapest option available [2]. When it comes to dairy products, 50% of respondents in the SEA-6 countries consider high-quality ingredients as a benchmark for good value for money, while 35% expect these products to offer multiple benefits and functions [238].

Health has been one of the main drivers of product consumption and choice for consumers in the region. As seen in Figure 43 the vast majority of consumers either always or often take into account the product's impact on their health and well-being when choosing products to consume. Overall, 73% of the respondents in SEA-6 consider their health and well-being before purchasing a product. The meaning of "health" can vary across the region, with Malaysian consumers seeking to reduce sugar in their diets, Thai consumers aiming to eliminate fatty foods, Indonesian consumers focusing on ingredient quality and nutritional value, and Singaporean survey participants integrating fitness into their dietary habits as part of preventive health measures.[2]

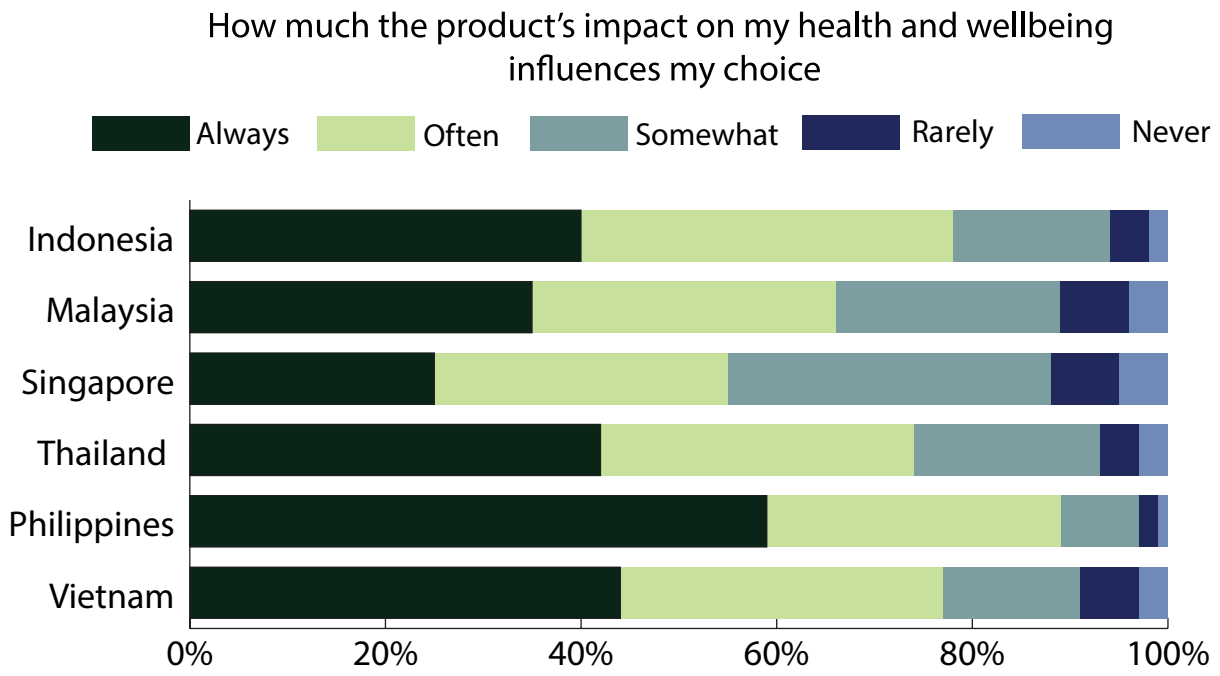

Figure 43. Survey results for the question "How much does the product's impact on my health and well-being influence my choice"- Data provided by GlobalData

Generally, households in SEA-6 have started having what are considered to be healthier habits with more cooking at home, replacing meats with fruits and vegetables and cut down on sugary snacks.[78] This trend is shown by the fact that 54% of consumers in SEA-6 either started cooking at home for the first time or started doing it more frequently. However, only 29% of respondents either stopped or lessened their delivery/takeaway orders. The actual responses per country vary and can be seen in Figure 44and Figure 45[238]

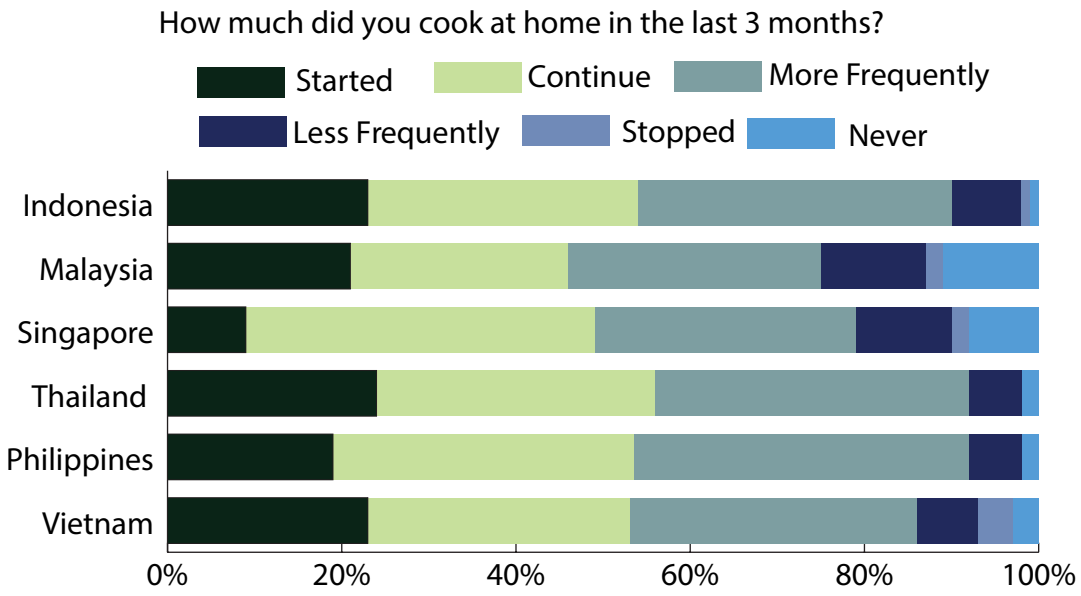

Figure 44. Survey results for the question "How much did you cook at home in the last 3 months?" - Data provided by GlobalData

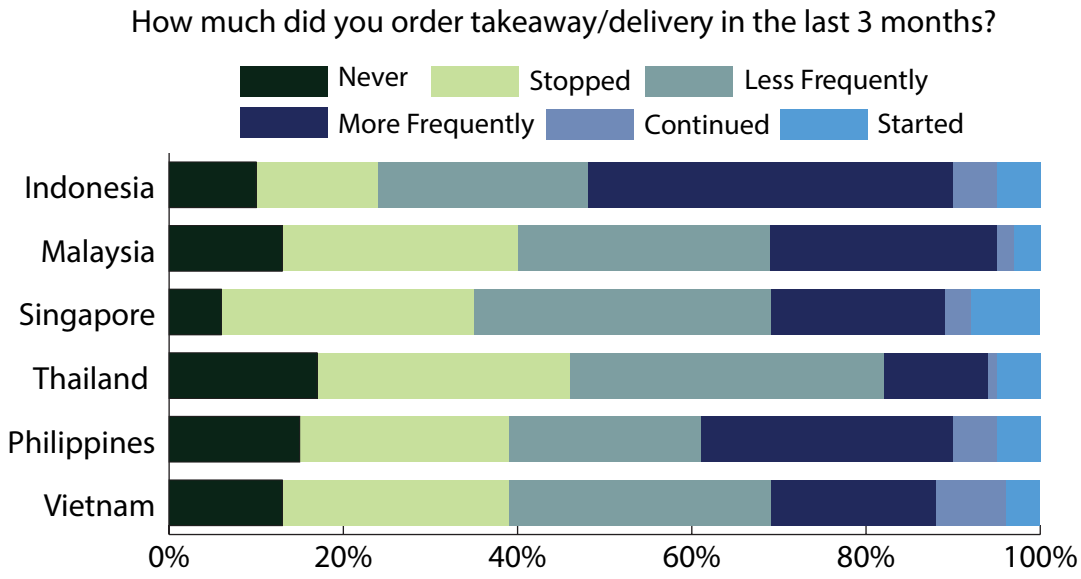

Figure 45. Survey results for the question "How much did you order takeaway/delivery in the last 3 months?" - Data provided by GlobalData

When it comes to the quality of produce, similarly to the perceptions of health, each country seems to have a different understanding of the term. Nevertheless, freshness seems to be the common denominator with people in the region wanting to pick produce that is fresh and is even willing to sometimes pay a premium for it.[2,239] In Indonesia for example, people tend to prefer uncooled, freshly slaughtered poultry meat sold in wet markets and by street vendors. While chicken is the most widely consumed meat in the country, there are different campaigns to boost the consumption of ducks as well. [240]

Safety is another major factor that plays a role in the purchasing behavior of consumers. The region has experienced a lot of food scares in recent years such as China's infant milk scandal[241], E.coli, and African swine fever[242]. Because of that, the population in the region pays a lot of attention to the traceability of their food. In a survey found in the Asia Food Challenge report in 2021, 71% of Indonesians are likely to trace their food sources due to safety. This number in Thailand is 67%, in Vietnam 56%, in the Philippines 53%, in Singapore 45% and in Malaysia 43%.[2]

As climate change becomes more of a concern in the region, consumers are becoming more informed and more aware of the environmental impact of their food consumption. A survey from the World Economic Forum reported that 80% of respondents in Southeast Asia have altered their lifestyles to be more environmentally sustainable.[243] This means that consumers are trying to limit food waste and buy locally-produced food. As seen in Figure 46 Indonesians are by far the most environmentally aware population when it comes to their purchases followed by Thailand and the Philippines.

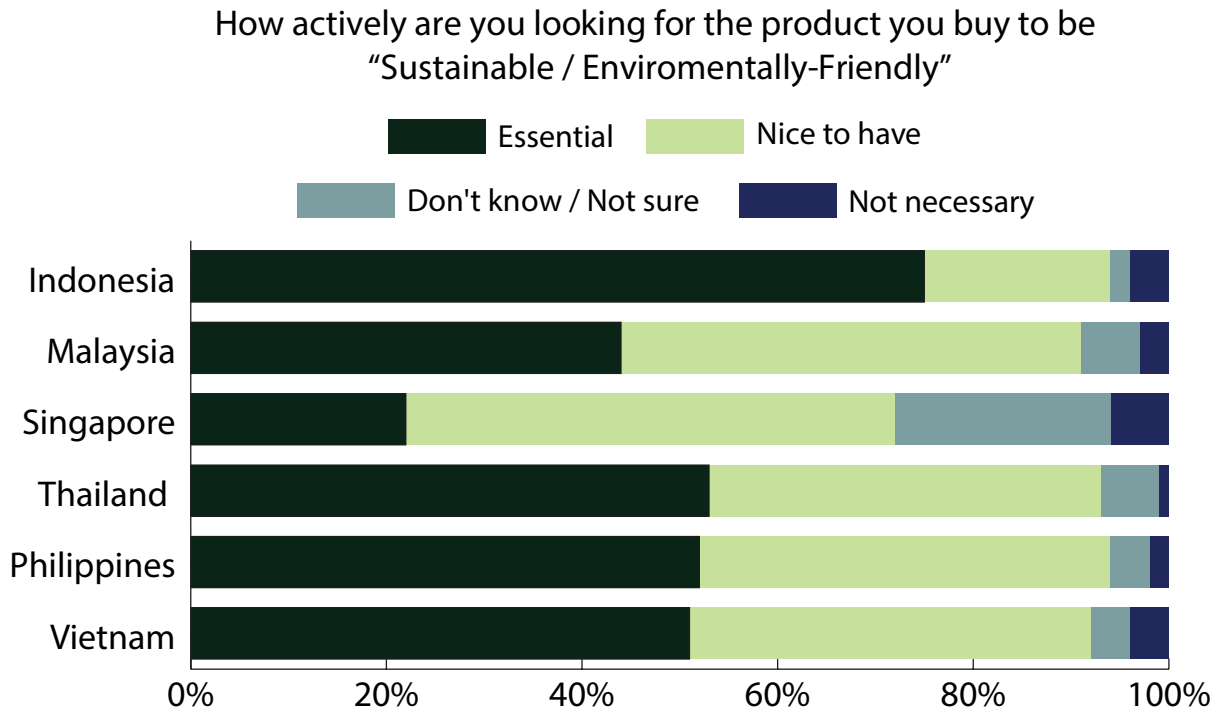

Figure 46. Survey results for the question "How actively are you looking for the product you buy to be sustainable / environmentally friendly?" - Data provided by GlobalData

The alternative protein market has grown in the last years globally and the SEA-6 region is no different. The growth in demand is led mostly by younger consumers that are more critical of meat production's impact on health and the environment. As seen in Figure 47 while health and safety are the leading causes of why someone would choose a plant-based alternative in the region, both sustainability and animal welfare are high on the list of consumers. [238] As we see, animal welfare is starting to be a factor in the choice of consumers in the region. We were not able to find specific survey results on the interest of consumers in animal welfare specifically, however, there have been different research outcomes over the years. In Thailand, 86% of consumers have concerns about antibiotic use in farming – which often hides low welfare standards. 97% and 91% of Thai consumers think that the government should increase minimum welfare standards and restrict the use of antibiotics in farm animals respectively[244] In Malaysia research looking into the consumer's intention to purchase environmentally friendly foods, ranked animal welfare quite high since it was an indicator of food safety, nutritional benefits and quality of food.[245] Similarly, in Vietnam, 75% of Vietnamese consumers said they had not heard of 'animal welfare'. Yet 71% believed pigs should be kept in good hygienic conditions[161]

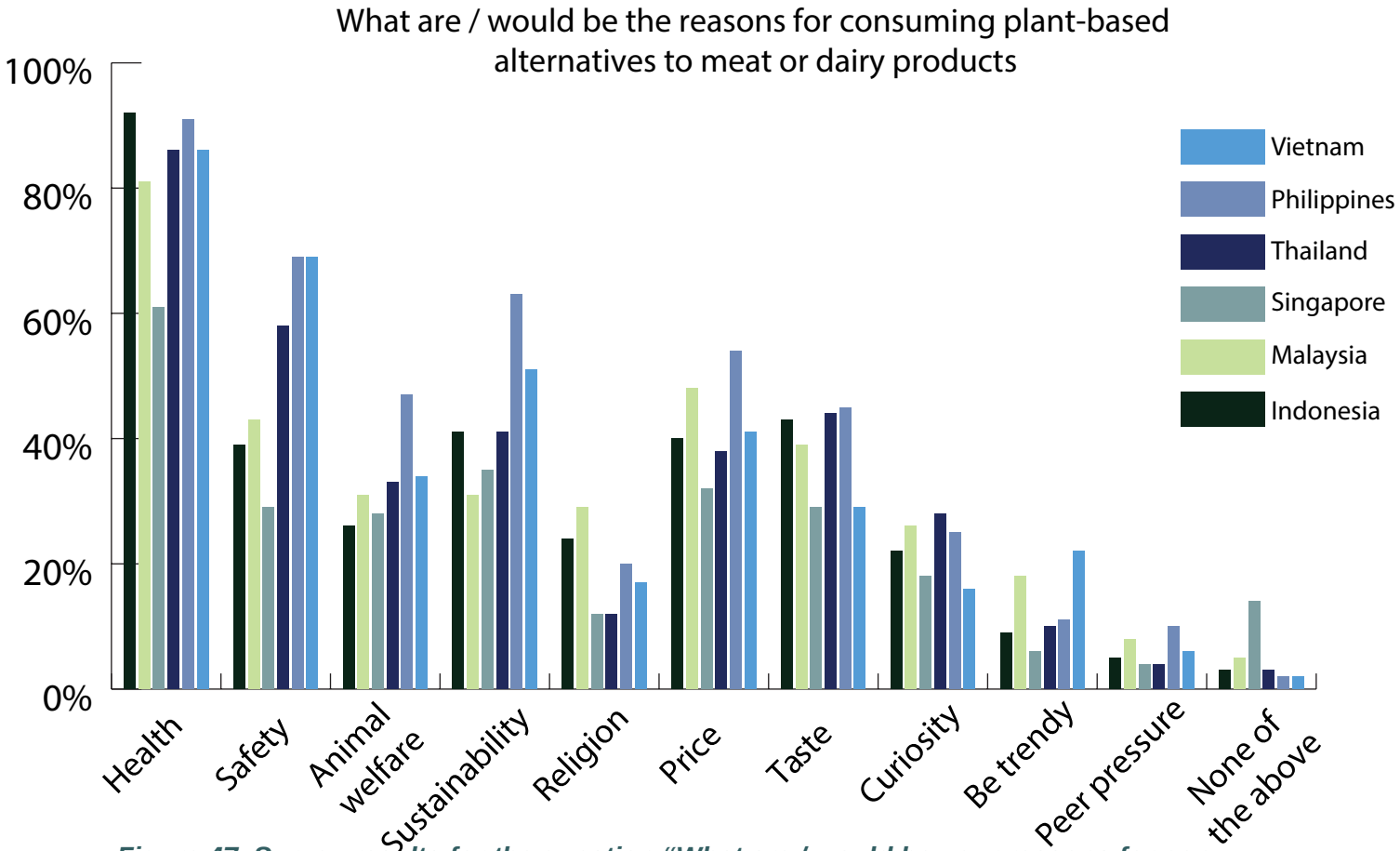

Figure 47. Survey results for the question "What are / would be your reasons for consuming plant-alternatives to meat or dairy products?" - Data provided by GlobalData

Another indicator of the consumer's attitude towards higher welfare animal products is seen by the survey results shown in Figure 48. The survey shows that consumers especially in countries like Indonesia and Thailand care that the products they purchase are produced ethically. This could be interpreted as higher welfare for both animals and producers.

At present, consumers in SEA 6 do not spend a lot on plant-based meat alternatives with meat still being the preferred choice of protein. Figure 49 shows the breakdown by country with Vietnam and Thailand being the biggest markets for plant-based meat alternatives. The price of these products might be considered a barrier, however, a lack of education on alternative proteins might also be lacking. [2] A research report from the University of Maastricht showed that the more well-informed the public is about cultured and alternative meat, the higher the probability of them paying a higher price. [246]

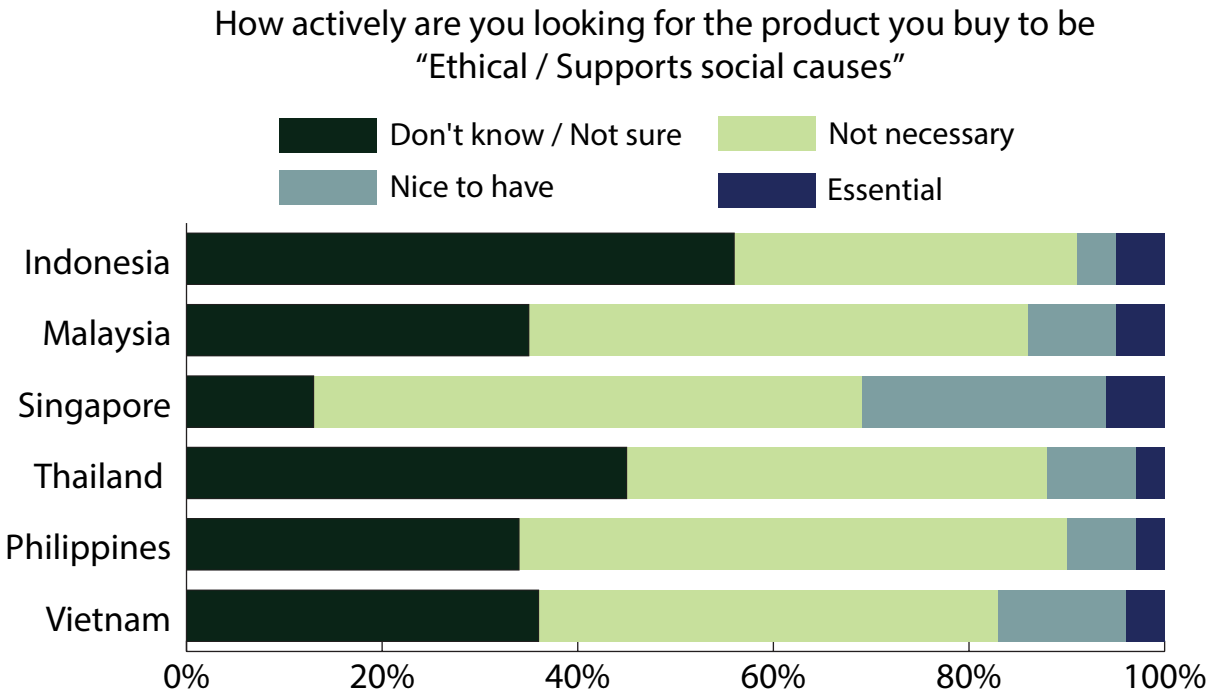

Figure 48. Survey results for the question "How actively are you looking for the product you buy to be "Ethical / support social issues" - Data provided by GlobalData

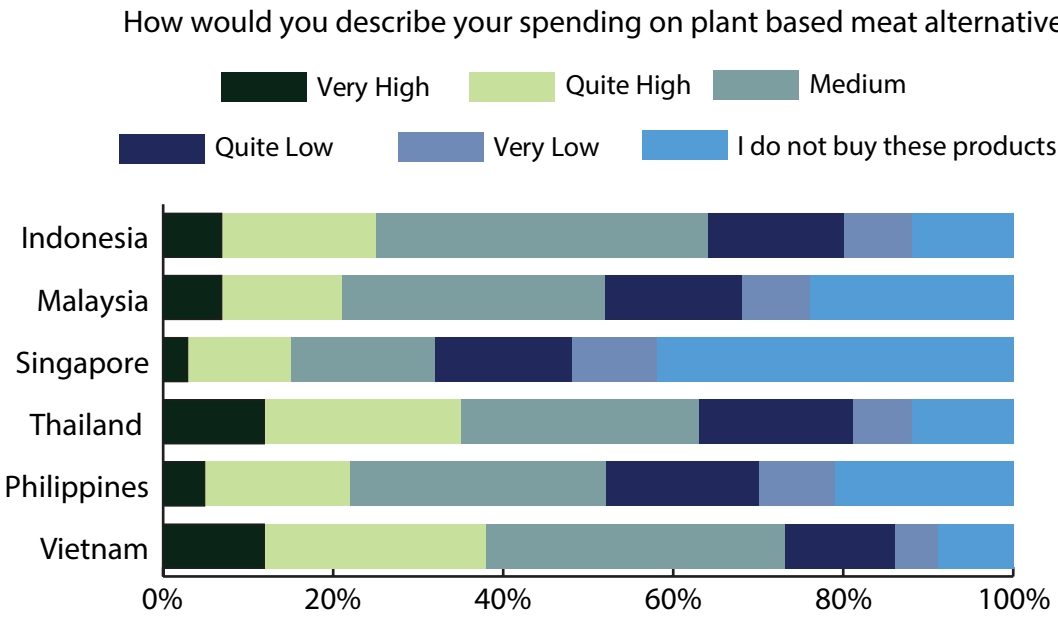

Figure 49. Survey results for the question "What are / would be your reasons for consuming plant-alternatives to meat or dairy products?" - Data provided by GlobalData

Nevertheless, whatever the barrier to higher consumption of plant-based alternatives is, the survey results shown in Figure 50 show that the population in SEA-6 are not skeptical and are willing to choose plant-based alternatives if they fit their nutritional needs and meet their values. A further study into what are the factors that would make a consumer choose or not a plant-based alternative product would be very insightful for the future of these products in the region.

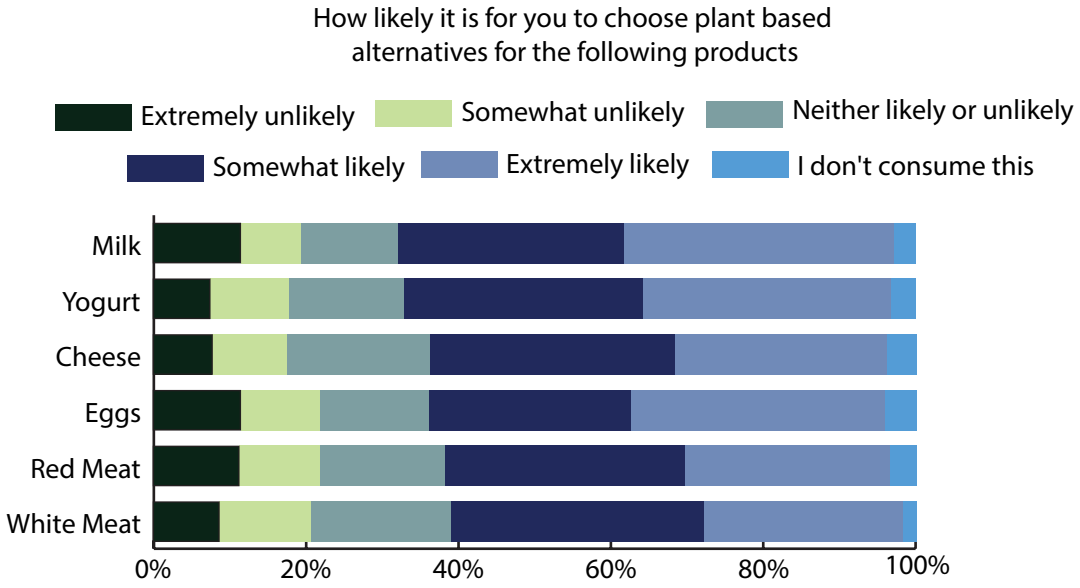

Figure 50. Survey results for the question "How likely it is for you to choose plant based alternatives for the following products" - Data provided by GlobalData

4.3 LABELLING PRACTICES

Animal welfare labelling is still not very widespread in Southeast Asia, and it can be challenging for customers to identify products that meet higher animal welfare standards. In this section of the report, we wanted to understand what are the labelling practices in the SEA-6 countries and if there are any organisations in the region that deal with animal welfare labels for products. Ultimately, we want to find out how informed can consumers be on animal welfare practices with the labels on the products.

Organic labelling will be discussed a lot for each of the countries as one of the labels that have some implications for animal welfare. Even though it is mostly a label associated with fruits and vegetables organic livestock production offers some benefits for animals. The USDA organic livestock conditions include access to pasture, shade, indoor shelter and an exercise area. Furthermore, the health and care of the livestock include organic feed and organic medication. However, if the producer finds that treatment with organic medication isn't effective he should not withhold treatment in the effort to keep the animal organic. There are some welfare issues that are not addressed in organic regulations like[247]

- No rules to protect organic male chicks in egg-laying operations.
- Organic poultry that are raised for meat are allowed to be kept under constant lighting and be overfed.
- Not clear regulations about space allowed for organic dairy cows.
- Organic pigs may have their tails cut and ears notched.
- No clear regulations for organic animal slaughtering.
- Keeping the above in mind, we will mention the regulations available in each country for the organic label. These regulations could work as information about the types of labels associated with animal welfare.

A further caveat for the below is that this is a literature review, there were only a specific amount of resources we could spend in order to identify the labels present in supermarkets in the SEA-6. If the readers may know of other labels please feel free to contact our organisation.

Indonesia

Processed foods that meet Indonesia's organic processed foods requirements may use the words organic and Indonesia's organic logo on their labels as below. Domestic and imported organic food must have an organic certificate issued by an Indonesian Organic Certifier or a Foreign Organic Certifier domiciled in Indonesia and accredited by the National Accredited Committee (KAN). Imported organic products are also allowed to have an organic certificate issued by the certifier in the country of origin that is recognised by KAN. Foreign organic logos can be placed next to the Indonesian logo that is shown in Figure 51.[248]

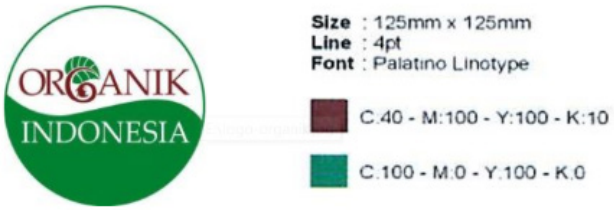

Figure 51. Indonesian Organic certification logo

With a growing number of consumers interested in organic products and an emerging economy in Indonesia, the potential for organic products seems positive in the long term, leading to a forecast value of Compound annual growth rate (CAGR) of 6.1% for the period 2021-2026[249]

In Indonesia, there are several accredited Organic Certification centers like CERES, BIOCert, and ICERT, among others, that can provide an Organic logo to be put on products to sell within the country. Based on Ministry of Agriculture Regulation No. 64/2013, imported organic food must be accompanied by[248]:

- Transaction certificate issued by the Organic Certification Institute (LSO) that has been certified by the National Accreditation Committee (KAN) whether it is a domestic LSO or foreign LSO domiciled in Indonesia. The LSO must perform certification of the business unit in the country of origin.
- A health certificate or certificate of sale issued by an authorized institution in the country of origin

Furthermore in the country the is the Halal label which has implications for animal welfare. The regulatory body for Halal certification in Indonesia is known as BPJPH (The Halal Product Guarantee Agency), which has the duty and function to ensure the halalness of products that enter, circulate, and trade in Indonesia. Indonesia's Government Regulation 39 of 2021 (GR 39/2021) sets out the requirements for businesses to obtain Halal certification for their goods and services.[250] The regulation outlines the list of equipment and requirements to obtain the certification but mentions nothing about stunning or animal welfare. [251]

Malaysia

Similarly to other countries, Malaysia has its own organic label that exists on products. The Organic Malaysia mark is a labelling scheme operated by Organic Alliance Malaysia in collaboration with the Crop Quality Control Division, Department of Agriculture, Malaysia. The Organic Malaysia mark is for use by registered operators on certified organic products (domestic and imported) that comply with the Malaysian organic standard MS1529 and whose certification is approved by the Department of Agriculture, Malaysia.[252] Registered products will be featured in the website product directory. The Organic Malaysia label can be seen in Figure 52. The product range is updated according to the actual range of products handled. The Organic Malaysia mark scheme includes training support, audit visits of participating operators as well as market surveillance for non-authorized use and misuse.

Figure 52. Organic Malaysia labels(left) and myGAP label (right)

Another label that exists in Malaysia is the myGAP label as seen in figure 53. The Malaysian Good Agricultural Practice is a certification scheme designed by the Department of Agriculture in 2002 to give recognition to farms that adopt APB with an environmentally friendly concept, safeguarding the welfare and safety of workers to produce quality, safe and edible products. myGAP is a rebranding to replace

the Malaysian Good Farm Practices Scheme (SALM). This scheme was developed based on Malaysian Standard MS 1784: 2005 Crop Commodities - Good Agricultural Practice (GAP).[253]promotion of the certification mentions that it promotes and takes into account the health and welfare of the worker there are aspects of it that help with the health of the livestock and reduce disease[254]

Certified Humane is a nonprofit certification organisation with a basis the Metropolitan Washington DC area and dedicated to improving the lives of farm animals in food production from birth through slaughter. According to their website, their standards incorporate scientific research, veterinary advice, and the practical experience of farmers.[255] The organisation has standards for animal care and slaughter for beef cattle, broilers, laying hens, dairy cows, goats, sheep, pigs, and more. So far in Malaysia, there is Farm Fresh, a dairy company that has been certified humane.[256] Additionally, there is Toh Thye San Farm, from Johor has certified its production, and Liang Kee Farming, an hour North of Kuala Lumpur has certified its free-range eggs.[257] The Certified Humane logo can be viewed in Figure 53.

Figure 53. Certified Humane logo

Lastly, the Department of Islamic Development Malaysia (JAKIM) gives clear guidance in the production of halal meat and poultry. Approved establishments shall be dedicated to producing halal meat, poultry, and their products throughout the supply chain from slaughtering until transportation according to Shariah Law at all times Halal slaughter involves restraining, stunning (if used), and severing of the trachea (halqum), esophagus (mari'), and both the carotid arteries and jugular veins (wadajain)[258].

The Philippines

According to the Fairs Annual country report there are no special requirements for organic labels.[259] However, the Bureau of Agriculture and Fisheries Standards has an Organic Agriculture division. The Organic Agriculture Division is responsible for the accreditation of Organic Certifying Bodies (OCBs); conduct of inspections on compliance of PGS Groups with Philippine National Standards on Organic Agriculture; registration of organic inputs, such as organic soil amendments and organic bio-control agents; registration of integrated organic farms with multiple commodities/production and of organic input producers; and rule on the appeal of farm/ farm owner on decisions made by organic certifying bodies and the concerned municipal/city PGS Groups on inspection and certification issues. The Organic Agriculture Division is also responsible for the monitoring of registered organic inputs producers and products, integrated organic farms; and enforcement of "organic" labelling requirements of agricultural and fishery products.

For eggs, the marking or labelling should be in compliance with the Department of Health (DOH) Administrative Order No.2014-0030 "Revised Rules

and Regulation Governing the Labelling of Pre-package Food Products".[260]

1. Name of the product or the word "eggs";
2. Weight classification of the eggs;
3. Name and address of producer, packer, and distributor/exporter;
4. The words "product of the Philippines"; and
5. The words "Best before" or "consume by".
6. Lot identification (refers to a specific code indicating food produced during a period of time and under more or less the same manufacturing condition.)

Only eggs coming from farms or production units certified by the competent authority should be labeled as 'cage-free'. The lot identification code shall be embossed or otherwise permanently marked individually on the immediate packages or containers. For Prepackaged foods in multi-unit retail packages such as candies with a surface area less than 10 cm2, the same may be exempted from the requirements of lot identification code only when sold together with the primary packaging.

For halal certification, the country has two national standards for Halal meat products. One is called the code of halal slaughtering practices for ruminants[261] and one code of halal slaughtering practices for poultry[262]

Singapore

Singapore food agency has a guide on Food Labelling and Advertisement. In their guide food labeled as organic needs to comply with FAOs GL 32–1999 "Guidelines for the production, processing, labelling, and marketing of organically produced foods". Specifically, the guide mentions section 6.3 of GL 32-1999 or its equivalent.[263,264]

When it comes to eggs, the country allows Cage-Free eggs; eggs laid by hens that are not housed in battery cages. They roam in a building, room, or open area that includes nest space and perches.[265] Singapore has only recently approved the sale of free-range eggs in the country after the approval of certain free-range layer farms in Australia[266]. Similarly to Malaysia, the Certified Humane label exists in the country and there is one farm (Chew's Agriculture) that has earned the certification from the organisation.[267]

When it comes to Halal regulations the Islamic Religious Council of Singapore has issued guidelines for the handling and processing of halal food. Appendix B has guidelines for Islamic Slaughtering. All life Halal animals must be killed in the most merciful manner possible to afflict the least pain on the animals. The guidelines include instructions before slaughtering, during slaughtering, and the handling after the slaughter of the animal.[268]

Thailand

Many sustainable agriculture labels exist in Thailand including GAP (Good Agricultural Practices). According to the farmers interviewed, the GAP certification (Q Label), created by the Department of Agriculture, became a minimum requirement to export to Europe[269]. A 2012 study reported that consumers in the country do get confused with the different labels[270] However, there are many labels in the country that represent environmentally friendly or hygienic products. The GAP certification is for fruit and vegetables so the only welfare that is mentioned in the policy is the farmer welfare[271]

In Thailand, the Standard of Production, Processing, and Labelling of Organic Agriculture Products has all the details about the requirements for products to be considered organic in the country. The 2003 version of the standard defines organic agriculture as “a holistic production management system which promotes and enhances agroecosystem health, including biodiversity and biological cycles. It emphasizes the use of natural materials and avoids the use of synthetic materials and also plants, animals, or microorganisms that are derived from using genetic modification or genetic engineering techniques. An organic production system is designed to handle agricultural products with an emphasis on careful processing methods in order to maintain the organic integrity and vital qualities of the product at all stages”. [272] The label for organically-certified products in Thailand is seen in Figure 54.

When it comes to eggs, the government has no regulation on the legal definition of “cage-free” when it comes to eggs.[273] The Central Islamic Council of Thailand has issued an announcement with guidelines for the Halal Slaughter of animals. The requirements mention stunning as “not recommended”[274]

Lastly CP foods has become the first Thai company that got the Farm F1rst certification from the UK, for its chicken production progress. It is unclear if the Farm F1rst certification is being used in products that are available in the country or if it’s just for the exports of the company.[275]

Figure 54. Organic Thailand label

Vietnam

Vietnam’s development of its organic farming strategy is ongoing. In 2006 the first National basic standard for organic production was issued, but there were no official programmes for its implementation. In 2017 the Ministry of Science and Technology issued the National Standards on Organic Agriculture TCVN11041, standardizing the production, animal husbandry, processing, and labelling of organic products. Furthermore, there were two decrees passed in 2018 and 2019 regulating certification, labelling, logo, traceability, and more. The understanding of consumers of organic branding is still developing and there are still other organic logos recognised in the country like the USDA Organic, Europe Organic, Australia Organic, and more. [276,277]

Another label existing in the Vietnamese market is VIETGap. The standards are compiled based on the provisions of Vietnamese Law (Foos Safety, Environmental Law, Water Resources Law, etc.), FAO guidelines, and reference regulations at the AseanGAP, Global GAP, EurepGAP, and HACCP standards. The standards include a series of principles and guidance to ensure and enhance the quality of meat products, improve the health of producers and consumers, protect the environment, and offer traceability. According to research, the standards have helped producers have

healthier animals throughout the farming process.[278] Furthermore, on the VietGAP website, there are more details about the conditions and requirements when raising animals that include details about animal feed, housing, waste management, veterinary hygiene, and more.[279] The GlobalGAP certification and label is also available in Vietnam with many local companies wanting to implement and comply with the standard.[280] The GlobalGAP certification has animal welfare specifications but only for broilers and finishing pigs[281]

Table 14. Animal welfare labels available in the SEA-6 countries.

INDONESIA	MALAYSIA	PHILIPPINES	SINGAPORE	THAILAND	VIETNAM
Organic	**Organic**	**Organic**	**Certified Humane**	**Organic**	**VietGAHP**
Halal	**MyGAP**	**Halal**	**Organic**	**Farm F1rst**	**Global GAP**
	Certified Humane		**Halal**	**Halal**	**Organic**
	Halal				**Halal**

CONCLUSIONS, LIMITATIONS AND FUTURE WORK

This basic landscape overview aimed to identify the scale of industrial farming, common farm practices, legislative regulations, the role of trade, implementation standards, attitudes towards farmed animal welfare and the key stakeholders that influence industrial animal agriculture.

This section will outline the conclusions drawn from the literature work presented in the report. As the scope of the research was much larger than initially intended, this section will also highlight the limitations faced and gaps identified in the current literature, which we would like to see filled in future research projects.

Our findings

Of the billions of land animals that are produced in this region, broiler chickens are the most farmed, followed by layer hens, ducks and pigs. To understand the present state of animal agriculture in Southeast Asia, we looked into the extensive livestock farming industry responsible for supplying meat, milk, and eggs. While our research has yielded insightful statistics on the types of intensification and highlighted the backgrounds in each country, much of the data was not up-to-date. As such, we could not provide a definitive account of the distribution and conditions in which the farmed animals are raised. It has been a challenge in accurately assessing the extent of industrialization, and recent figures are incomparable across countries due to a lack of standardisation. For instance, a big farm in The Philippines has more than 15,000 birds whereas in Malaysia or Thailand, 15,000 birds are considered small farms while large farms have more than 50,000 and 100,000 birds respectively.

We were able to list the legislations relating to farmed animals in the SEA-6 countries. In most cases, the laws use general terms, with no country explicitly recognising animal sentience. The Philippines stands out as the country with the most specific laws, as the Administrative Orders outline requirements for air quality and stocking density. Although governmental-issued guidelines for farming and husbandry practices were found in most of these countries, it remains uncertain if these guidelines are mandatory. In particular, enforcement policies are not mentioned in the legislation, except for Malaysia. Another key issue is the lack of uniformity across countries, leading to varying levels of animal welfare standards. This inconsistency is a barrier for establishing comprehensive guidelines and creates difficulties in enforcing consistent welfare practices.

With the analysis of trade numbers in Southeast Asia, we have discovered some insights into the dynamics of regional and international flow of live animals and animal-derived products across countries in the region. Malaysia and Thailand lead the region in live animal exports, indicating their advanced level of agricultural development. Notably, Thailand's export value for animal products is nearly four times higher than that of the rest of the SEA-6 combined. In terms of live animal imports, Indonesia serves as the primary destination for animals from Australia.

Livestock exports and imports reflect the economic realities and resource availability within each country. Although we have focused on the SEA-6 countries, we also learned that Cambodia, Myanmar, and Laos import live animals from within the region. It will be worthwhile finding out more about these countries' animal agriculture activities. The most relevant animal welfare issues to address through trade would be on transportation and slaughter standards.

From examining the disease outbreaks from farmed animals in the past 15 years, our review has underscored the critical issues of zoonotic diseases and antimicrobial resistance (AMR) within the region. The close interactions between humans and animals, coupled with intensified farming practices, presents a significant risk for zoonotic disease transmission. Most countries have followed a reactive strategy to combat these diseases, resulting in the culling of millions of animals over the years. The emergence and spread of diseases such as avian influenza, Nipah virus, and others highlight the need for robust surveillance, early detection, and rapid response mechanisms. Furthermore, the widespread use of antimicrobials in animal agriculture contributes to the development of AMR, posing threats to both animal and human health. Addressing these challenges requires collaborative efforts, improved biosecurity measures, and the prudent use of antimicrobials. Researchers have proposed integrating infectious disease discussions into broader conversations about sustainable food systems and incorporating them into ecosystem service frameworks. This holistic approach would raise awareness regarding the need for disease control and allow the public to know about these outbreaks more easily.

Companies have a significant part to play in animal welfare practices throughout their supply chains. While many companies have made public commitments for higher animal welfare, such as pledging to source cage-free eggs for their products, obtaining information on how their businesses operate proved challenging. There is a need for a more systematic way of tracking the commitments and for services that can support producers and companies to meet these higher welfare standards.

Equally important is the role of consumers in influencing the demand for animal products. Findings from public surveys indicate that consumers in the region are highly aware of the impact their choices have on health and the environment. They are also willing to switch to plant-based alternatives if they are healthier and more environmentally sustainable. Animal welfare was cited by up to 50% of consumers in this survey as a reason to consider plant-based alternatives.

Through informed choices, consumers can support humane and sustainable farming practices. To assess if consumers can make informed decisions, labelling practices in each country were also examined. Unfortunately, apart from organic certification, which is present in all countries, animal welfare labels are scarce and are labelled differently throughout the region. For example, “Certified Humane” is available in Malaysia and Singapore, while local "Good Agricultural Practices" labels exist in Vietnam and Malaysia.

Limitations

The research is subject to certain limitations that should be taken into consideration. The insights and

analyses are based on available information and data, which may contain errors or inaccuracies. Additionally, the data in this report may not be entirely up to date. We welcome and appreciate any feedback or inputs from readers regarding errors and aim to ensure that future updates of this report reflect the most accurate and up-to-date information available.

This landscape study relied heavily on existing literature – the research team did not conduct physical farm visits on the ground. This limitation restricts the ability to directly observe and gather firsthand data on the conditions and practices within the animal agriculture industry. However, we were able to keep our focus on the meta analysis of the region to provide the big picture overview in this report.

Language barriers posed a challenge as some of the available information was in the local languages of the Southeast Asian countries. Despite assistance from local volunteers and interpreters, the report predominantly relied on English-language references, potentially missing some data and nuanced information lost in translation.

Future work

There are several potential projects that can build upon this study. We focused a lot on the welfare issues but we also appreciate that there are other challenges for farmers, consumers and policy makers. The growing demand for animal-based protein in the region places pressure on the ability to sustainably produce enough meat, poultry, and dairy products. Balancing the need for increased production with sustainability, resource efficiency, and equitable access to food is essential to address the food security challenges. It will be useful for future research to look into the area of food security and the connection with a more sustainable animal protein production.

A focused investigation that provides specific numbers of animals in intensive, semi-intensive, and backyard farms would be valuable. Such a study would involve on-site visits and interviews with stakeholders in each country. By presenting these numbers in a standardised format, we can gain a clearer understanding of the scale of intensified farming and identify more effective ways to enhance farm animal welfare standards in the region.

Additionally, conducting a focused consumer study would deepen our understanding of public awareness concerning animal welfare This survey could provide insights into the reasons why people either support or do not support higher animal welfare standards. Similarly, conducting a survey with producers themselves would provide valuable perspectives on animal product production and shed light on the potential adoption of improved welfare practices in the future.

As Cambodia, Laos, and Brunei trade with live animals in this region, exploring the legislation and farming conditions in these countries would provide a more complete overall picture of farm animal welfare in Southeast Asia.

There is limited information available regarding the farming conditions of ducks, As waterfowl, ducks have specific needs and require access to both land and water. Given their substantial farmed population in the region, shedding more light on their farming conditions is crucial in understanding how to better address their welfare needs.

Last but not least, the inclusion of aquatic animals would significantly expand our understanding of the animal agriculture landscape in this region. It is thus important to not neglect future research on aquatic animals and how they are

produced, traded and consumed.

Industrial animal agriculture in Southeast Asia is confronted with a range of pressing issues that demand attention and concerted efforts for sustainable solutions. We hope that readers have found this useful in understanding what animal agriculture in Southeast Asia looks like, providing additional knowledge for anyone who is interested in helping to make our food systems more sustainable and humane. We hope that this can serve as a tool for more strategic and evidence-based approaches – to do good for animals, people and the planet.

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APPENDIX

With the increase in demand for food and animal products, the ways in which humans are using animals has evolved. In 2009, the United Nations predicted that our agricultural yield needed to be doubled in order to meet the demand for food by 2050. [19] Meat, milk and eggs are undoubtedly going to play an important role in achieving food security. There are multiple reasons why animal products are considered crucial for food security. Firstly, they are a source of high-quality protein. Secondly, the increase in affluence in the developing world will undoubtedly lead to an increase in consumption the of animal products. Thirdly, they produce manure which can be used as a fertiliser, other useful by-products and they provide an economic resource to communities. Lastly, animals efficiently convert the forages from grasslands into high-quality animal products, and grazing also can promote the health and biodiversity of grasslands if managed appropriately.[20]

However, with the increased usage of animals in agriculture, there are risks of industrialised farming practices that pose a risk to the health and welfare of the animals. The next few tables provide a summary of the risks identified with the farming of specific animals, as mentioned in the Routledge Handbook of Animal Welfare. The book was published in 2023 and is used in this report as a baseline for the main welfare issues that are present in different farming systems. [5] The use of modern production techniques and industrialisation doesn't necessarily translate to lower animal welfare in all situations or suggest backyard farming as the solution. The lists provided in the tables below are just meant as a guide for the problems that have been identified in the intensified production systems which are prevalent in the world.

Modern poultry farming is characterised by large group sizes and high stocking density. The relative low cost of poultry drives the intensification of the farming systems with each segment facing its own issues. The table below presents some of the concerns for farmed chickens (broilers and layers), turkeys and ducks. The list isn't exhaustive and more issues are discussed in the relevant chapter of the Routledge handbook. [5]

ATable 1. Common Animal Welfare issues in poultry farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
All Farmed Poultry	
High Stocking Density	High number of birds in restricted space
Transport	Transportation of hatchlings and catching and transport at end of production and of pullets in layers and breeders
Chickens - Laying hens (reared for up to 19 weeks, laying for up to 75 weeks)	
Behavioural restriction	Housing does not allow for the performance of behavioural needs, particularly in conventional cages

ATable 1. Common Animal Welfare issues in poultry farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Osteoporosis	Fragile bones prone to deformation or fracturing due to high calcium demands
Keel bone damage	Deformities and/or fractures of the keel bone
Injurious Pecking	Severe feather pecking, resulting in plumage or tissue damage, vent pecking, cannibalism
Beak treatment	Shortening and removal of the sharp tips of beaks
Piling	Pile up of birds that can lead to heat stress and suffocation
Induced moulting	Controlled loss and replacement of feathers to prolong laying cycle through forced weight loss
Comb dubbing	Trimming of comb in layer pullets to preserve feed conversion efficiency
Layer Parent Stock (reared for up to 19 weeks, laying for up to 75 weeks)	
Osteoporosis	Fragile bones prone to deformation or fracturing due to high calcium demands
Keel bone damage	Deformities and/or fractures of the keel bone
Behavioural restriction	Housing does not allow for the performance of behavioural needs
Injurious pecking	Severe feather pecking, resulting in plumage or tissue damage, vent pecking, cannibalism
Beak treatment	Shortening and removal of the sharp tips of beaks
Toe removal	Removal of the spur in roosters
Broiler Chickens (5-7 Weeks)	
Lameness	Conformational changes or pain from musculoskeletal disorders reduce mobility
Muscle disorders	Breast myopathies (wooden breast, white striping and spaghetti meat)
Contact dermatitis	Foot lesions, breast blisters, hock burns
Behavioural restriction	Barren environment or poor litter quality do not allow for performance of behavioural needs
Broiler Parent Stock	
Feed restriction	Reduced feed (quality or quantity) to slow growth and preserve reproductive function
Toe removal	Removal of the spur of roosters
Injurious pecking	Severe feather pecking, resulting in plumage or tissue damage, including cannibalism

ATable 1. Common Animal Welfare issues in poultry farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Beak treatment	Shortening and removal of the sharp tips of beaks
Aggression	Rooster aggression towards females and forced mating
Contact dermatitis	Foot lesions, breast blisters, hock burns
Lameness	Reduced mobility as the flock ages
Ducks (Pekin: 5-7 weeks, Muscovy: 10-12 weeks)	
Behavioural Restriction	Housing does not allow for the performance of behavioural needs, especially water bathing
Injurious pecking	Severe feather pecking resulting in plumage damage
Bill trimming	Shortening of the bill
Force feeding (Foie Gras Ducks)	Intubation and forced feeding to increase liver size
Feed Restriction (Duck Parent Stock)	Feed restriction to slow growth and preserve reproductive function
Turkeys (12 weeks for hens – up to 20 weeks for toms)	
Lameness	Conformational changes or pain from musculoskeletal disorders reduce mobility
Injurious pecking	Head pecking in turkey toms and severe feather pecking in hens and toms
Beak trimming	Shortening and removal of the sharp tips of beak
Contact dermatitis	Foot lesions, breast blisters, hock burns
Claw removal	Removal of the claws of forward-facing toes
Turkey Parent Stock	
Feed restriction	Reduced feed (quality or quantity) to slow growth and preserve reproductive function
Claw removal	Removal of the claws of forward-facing toes
Lameness	Leg weakness in turkey toms
Injurious pecking	Head pecking in turkey toms and severe feather pecking in hens and toms
Beak trimming	Shortening and removal of the sharp tips of beak
Artificial mating	Semen collection and artificial insemination, potential welfare concerns due to restraint

Poultry is expected to represent 41% of all the protein from meat sources by 2030. Pig meat comes second with 34%.[1] Pigs are farmed in a variety of systems depending on the region. With the increase in consumption, however, there is an increasing trend of farming them in intensive systems with some similar characteristics. The following table lists some of the issues that are present in these systems.[5]

AFigure 1. Examples welfare issues in poultry farm systems. (a)Over-crowding, (b)Overcrowding in transportation, (c) Confinement and injury in foie gras farm, (d) Contact dermatitis

ATable 2. Common Animal Welfare issues in pig farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Extensive Farming Systems	
Exposure to Climate Extremes	Animals may be subject to extreme heat with risk of sunburn, or extreme rainfall with muddy underfoot conditions and lack of dry resting areas
Biosecurity and Maintenance of Health	Wild Animals carrying diseases, parasite infestation, harder to spot sick animal
Predation	Wild carnivores may prey upon pigs, piglets
Unregulated social competition or human intervention	Social competition may lead shy pigs to have less access to resources, nose ringing prevents rooting behaviour
Nose-ringing	Prevents rooting behaviour
Intensive Farming Systems	
Space restriction in breeding sows	Great physical and behavioural restrictions on the sow (weakens bones and muscles), prevention of motivated foraging can lead to bar biting or sham chewing, prevention of proper expression of nest building behaviour

ATable 2. Common Animal Welfare issues in pig farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Social living in restricted space	Aggressive competition which can result to injury or death
Bad Flooring	Slatted Flooring may not offer proper thermal characteristics for the pigs which may result in them not being comfortable to lie down. Badly designed floor may cause injury
Barren environments	Without proper expression of foraging and exploration behaviours, they may be redirected to other animals (e.g. tail biting)
Harmful human interventions	Tooth Resection, tail docking, Ear notching, castration
High Stocking Density	High number of pigs in a restricted space

AFigure 2. Examples welfare issues in pig farm systems. (a) Overcrowding in transportation, (b) Sow confinement, (c) Ear Notching (d) Overcrowding

Cattle production systems are generally differentiated between those that are raised for beef and those raised for milk. The increased demand for both beef and dairy has led to a degree of intensification of the production systems. The high number of animals in each farm leads to a lower degree of interaction between farmer and animals and thus less attention is paid on the needs of the animals. The below table lists some of the issues that are present in these systems.[5]

ATable 3. Common Animal Welfare issues in cow farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Diseases	
Lameness	Especially in dairy cows kept indoors on concrete floors for long periods of time
Mastitis	Bacterial infection of the udder
Acidosis	Accumulation of acid in the rumen following overconsumption of carbohydrates
Hypocalcaemia	Deficiency of calcium (around the start of lactation)
Hypomagnesaemia	Deficiency of Magnesium (excessive potassium fertiliser application)
Feeding	
Climate Change	Will affect areas with naturally variable rainfall.
Lethargy	Low source of nutrients for any reason will result in lethargy
Metabolic Disorders	Due to bad nutrition, especially at the final stages of growth
Feedlots	High stocking densities, respiratory problems in dry weather, insufficient nutrients,
Housing	
Tie Stalls	Offer little opportunity for movement
High Stocking Density	Risk of overcrowding, and dairy cows' teats to be trodden on
Sizing of bed	Too short and the rear end hangs, too long and they excrete on the bed, too narrow they knock their hocks on lying and rising
Scraping of passage ways	Mechanical scraping can trap tails
Teat Cups	Setting of the vacuum level and pulsation frequency may cause pain and lead to mastitis
Robot Milkers	No proper supervision to deal with problems
Husbandry Practices	
De-horning	Horn bud removal usually with a knife, hot iron, or scoop. Risk of excessive blood loss, infection and even death
Desexing	Rubber ring around the testicles which then atrophy and die
Identification	Tagging, notching or tattooing of the ear, fire branding, micro-chipping or freezer branding
Implants	Hormones make cattle more susceptible to heat stress
Tail docking	2/3 of the tail is removed

ATable 3. Common Animal Welfare issues in cow farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Hormone injections	To increase fertility
Sexing	Male calves can be destroyed at just few days of age
Artificially controlled cycles	Slow release hormone treatment implanted into vagina. Natural mating is obviated in most dairy herds
Solitary confinement of bulls	Often practiced in dairy farms
Separation of Calve and mother	Calves are removed at a very young age, less than one week.
Isolation of Calves	Restricts them from the opportunity to move and socialise
Transportation	
Overstocking	In vehicles and moved for long distances without food and water
Long journeys by sea and road	For religious/cultural reasons cows need to be moved over long distances
Heat Stress	High heat output per animal and overstocking makes the situation worse. Also happens on long distances if cows are coming from cool climatic conditions
Fatigue stress	From repeated stepping especially on rough or winding roads and traffic
Fear	Happens a lot in sea transport with tides
Environmental stresses	
Thermal Stress	Depending on the ambient temperature, humidity, solar radiation and air velocity
Lighting	Cows have a limited ability to judge distance of things
Noise and vibration	Vibration from heavy machinery or traffic can also disturb cattle, especially the low frequency vibrations that travel further
Electricity	Fear of electricity is exploited with fences

AFigure 3. Examples welfare issues in cow farm systems. (a) Dehorning, (b) overcrowding, (c) Dehorning and tagging

Sheep and goat farms, although less common in tropical regions, present different problems associated with their farming conditions. The main issues concerning the welfare of sheep and goats are usually associated with their systems of management (indoor / outdoor) rather than their production purpose (milk, meat or wool). Some of the problems associated with with the farming of sheep and goats are summarised below.[5]

ATable 4. Common Animal Welfare issues in sheep and goat farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Husbandry Practices	
Undernutrition	Happens mostly in extensive farms
Lack of water	In extensive farms in dry periods
Exposure to physical extremes	In extensive farms through climatic changes
High Stocking density	Displacements, aggression, and activity increases
Bad Flooring	May cause injury to animals
Bad Bedding	Competition between animals for preferred bedding areas
Air Quality	Sheep and goats are susceptible to respiratory infections
Insufficient Ventilation	May cause heat stress
Lameness	Indicator of foot pain due to infections, horn overgrowth and separation
Gastrointestinal parasites	Through grazing of contaminated pastures. High stocking densities help with the spread of infections
Ectoparasites	Mites, lice, ticks, and blowfly larvae

ATable 4. Common Animal Welfare issues in sheep and goat farming systems (Adapted from Routledge Handbook of Animal Welfare)

Welfare Issues	Summary
Mastitis	Bacterial infection of the udder
Dystocia	Complicated birth process, often requiring human intervention. Multiple causes including stress, maternal nutrition and more
Pregnancy toxaemia	Caused by inadequate nutrition in late gestation.
Castration	Use of tight rubber rings (elastration), banding, instruments designed to crush the spermatic cords (known as Burdizzo), and surgical approaches
Tail docking	Same methods as described for castration, or by using hot docking irons
Mulesing	This process requires the removal of skin on either side of the anus, which then heals to a smooth, scar tissue.
Disbudding	Done to avoid handler or between-animal injury, especially when animals are kept in confined spaces. Done using caustic paste, scoops, or thermal cautery
Behavioural Freedom	
Fear and distress	Flight or panic reactions often caused by separation from social groups or interactions with humans and other predators
Separation of offspring and mother	Present in intensive farm systems
Wool biting	Diet-related as increased provision of fibre reduces the expression of this behaviour
Predation	When the flock is exposed to predator attacks

This report was published in June 2023.

If you have any questions, suggestions or want to contribute anything to this report please contact research@welfarematters.org.

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